Preface

On the Publication of the 2023 White Paper on Information and Communications in Japan

Minister for Internal Affairs and Communications

松本 剛明

Human beings have accumulated and expanded knowledge and made progress through the exchange of information using language. With the advancement of information and communications technology and digital technology, and the development of information and communications infrastructure, it has become possible to exchange information that goes beyond language and process vast amounts of data, across space and time. We are truly on a new stage, with great possibilities unfolding as well as unknown risks. In this age, where the state of the information and communications technology and digital fields determines the shape of the future, it is important for countries to cooperate with each other to form international rules in a borderless digital space.
The **G7 Digital and Tech Ministers' Meeting in Takasaki, Gunma,** was held in April this year. As a member of the presidency, I co-chaired the meeting, which adopted a Ministerial Declaration with guidelines for action by the G7 on key topics, such as Data Free Flow with Trust (DFFT), secure and resilient digital infrastructure, internet governance, and AI governance. At the G7 Hiroshima Summit in May, which followed the ministerial meeting, the launch of the **Hiroshima AI Process** was included in the summit declaration. Japan would like to lead the discussions that flow from the G7 to the rest of the world regarding ensuring the global interoperability of AI governance and the responsible use of generative AI.

In this White Paper on Information and Communications in Japan, Part 1 features **Toward Realizing the Resilient and Sound Data Distribution Society for the New Era.** It analyzes the current situation and challenges of data distribution and utilization as well as new trends, such as the discussions and outcomes of the G7 Ministerial Meeting on generative AI and the Hiroshima AI Process. Part 1 also states the initiatives needed to realize a society in which everyone can enjoy the benefits of diverse services utilizing data.
Part 2 analyzes the data on the latest market trends in the information and communications field, and it summarizes the current state and future direction of information and communications policies.
Based on the analysis of this White Paper, the Ministry of Internal Affairs and Communications will continue to make every effort into realizing a resilient and sound data distribution society by developing optical fiber and 5G, etc. that is based on the **Infrastructure Development Plan for a Digital Garden City Nation,** as well as promoting Beyond 5G research and development, contributing to the formulation of international rules for generative AI, and developing measures to combat disinformation and misinformation.

This year's White Paper on Information and Communications in Japan is the 51st edition, and it has been published for half a century since it was first published in 1973. I would like to express my sincere gratitude to the people for their cooperation with the information and communications administration, and I hope that this White Paper will be widely used to help further deepen their understanding of the information and communications technology and digital fields.

July 2023

Introduction

This is the 51st edition of the White Paper on Information and Communications in Japan, which has been published by the Ministry of Internal Affairs and Communications (MIC) annually since 1973. The White Paper's objective is to introduce the current state of information and communications in Japan and related policy trends.

The White Paper consists of two parts. The first part provides an overview the progress of data flows, which accompanied the advancement of telecommunications infrastructure in Japan, and it analyzes the current situation, the challenges and new trends of data flows and use, and it surveys initiatives toward a data flow society where everyone can enjoy the benefits of diverse services using data. The second part describes the current status and challenges surrounding ICT. This part consists of Chapter 4 with statistical information on domestic and overseas market trends surrounding ICT, and Chapter 5 with a summary of the status of ICT policy at MIC.

The data of this White Paper can be downloaded from the following page of the MIC website.
https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/2023-index.html

Past white papers can be downloaded from the following pages.
https://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/whitepaper/index.html

Legend

- "Year" refers to a calendar year from January to December, while "fiscal year" refers to a "budget year" from April to March of the following year.
- "Inc.," "CO., Ltd." etc. are omitted from the name of enterprises in principle.
- The following symbols are used for supplementary units:

  10 hundred quintillion (10^{21}) fold …Z (Zetta)
  1000 quadrillion (10^{18}) fold …E (exa)
  1,000 trillion (10^{15}) fold …P (peta)
  1 trillion (10^{12}) fold …T (tera)
  1 billion (10^{9}) fold …G (giga)
  1 million (10^{6}) fold …M (mega)
  1,000 (10^{3}) fold …k (kilo)
  One tenth (10^{-1}) fold …d (deci)
  One hundredth (10^{-2}) fold …c (centi)
  One thousandth (10^{-3}) fold …m (milli)
  One millionth (10^{-6}) fold …μ (micro)
- Units are rounded up to the nearest whole number in principle. The total of the breakdown and the value of the total column may not agree due to rounding.
- Total of composition ratios (%) may not be 100 due to unit rounding.
- Maps in these materials do not show the entire territory of the country.
- Figures, etc., without attribution are MIC materials.

Outline of the 2023 White Paper on Information and Communications in Japan

Part 1 Toward Realizing a Resilient and Sound Data Flow Society for the New Era

Part 1 provides an overview the progress of data flows, which accompanied the advancement of telecommunications infrastructure in Japan, and it analyzes the current situation, the challenges and new trends of data flows and use, and it surveys initiatives toward a data flow society where everyone can enjoy the benefits of diverse services using data.

Chapter 1 Advancement of the telecommunications infrastructure and progress in data flows

- A summary of the process of upgrading the telecommunications infrastructure of Japan and the progress from **Web 1.0, where one-way information transmission was central,** to **Web 2.0, where two-way information sharing is realized** through social media, etc.

Chapter 2 Current situation and challenges of data flow and use

- **A summary of the current state of data utilization by companies and consumer awareness in major countries, government measures for promoting data utilization** (e.g., the Comprehensive Data Strategy and the European Data Strategy), **and personal data protection measures** (e.g., the Revised Act on the Protection of Personal Information, GDPR), **etc.**
- **An introduction of advanced examples of services that utilize data in fields such as education and healthcare**
- **A summary of the status and challenges of concentrating data with massive platform providers** (e.g., concerns about transparency and fairness in data handling) **and outlines of domestic and international countermeasures** (e.g., the Revised Telecommunications Business Act and the Digital Market Act)
- **A summary of the current situation regarding the spread of disinformation, misinformation and illegal or harmful information on social media and other platforms as well as an outline of the measures taken by the public and private sectors in Japan and other countries** (e.g., institutional responses, such as the revised Provider Liability Limitation Act, fact-checking, enhancing literacy education, and discussions at international conferences, such as the G7)

Chapter 3 Toward realizing a resilient and sound data flow society

- A summary of **trends in new services that utilize data** such as the Metaverse, digital twins, and generative AI.
- A summary and analysis of **the issues and initiatives for realizing a society where everyone can enjoy the benefits of services using data** (e.g., **establishing a robust ICT infrastructure** that supports data distribution even in times of emergencies such as communications outages, **realizing Beyond 5G,** which enables ultra-high-speed, high-volume data distribution, **promoting international standardization** of data-related technologies, and **securing sound information spaces** by improving media literacy, etc.)

Part 2 Current Status and Challenges of Information and Communications

Part 2 provides an overview of market trends in the information and communications field and the status of digital technology utilization, and it summarizes the status, challenges and future directions of information and communications policies.

Chapter 4 Trends in the ICT market

- A summary and analysis of **the overall condition of the ICT industry in Japan and other countries** (e.g., the size of the information and communication industry and volume of exports and imports of ICT goods and services) and **the status of individual markets** (e.g., telecommunications, broadcast content and applications)
- A summary and analysis of **the utilization of digital technologies** in citizen's lives, corporate activities and the public sector **in Japan and other countries**

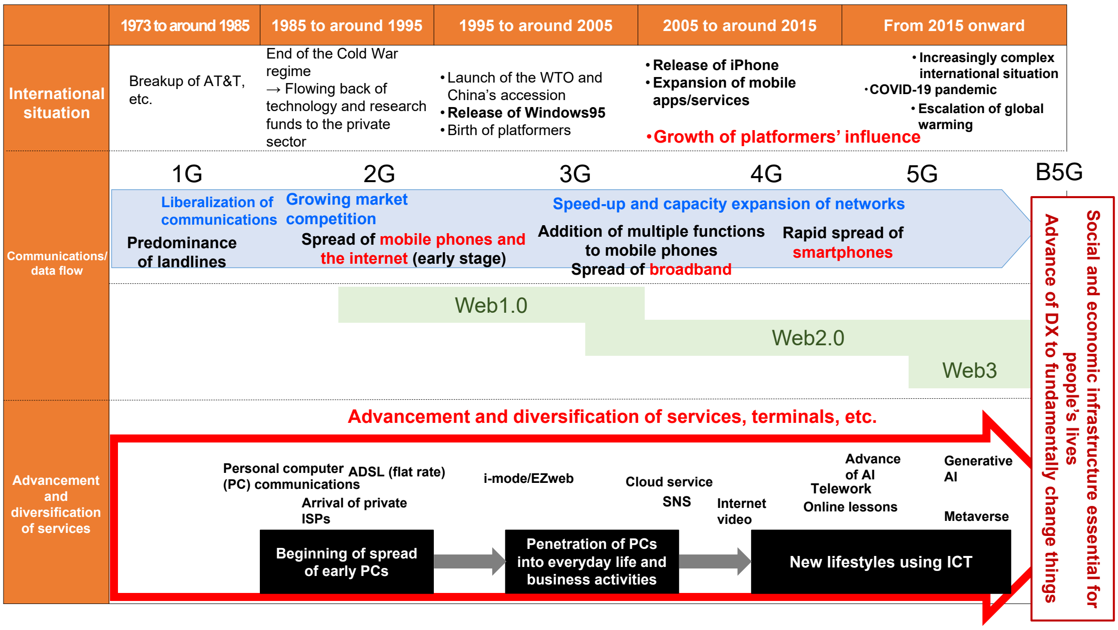
Chapter 5 The status of ICT policy at the MIC

- A summary of **cross-departmental initiatives in ICT fields** (e.g., promotion of the Vision for a Digital Garden City Nation), **the policies implemented by the MIC, and the future directions** in **each policy area** (e.g., telecommunications, radio and broadcasting policies)

Key Points of the 2023 White Paper on Information and Communications in Japan

Chapter 1 Advancement of the telecommunications infrastructure and progress in data flows

- **Data flows continue to grow** due to the **advancement of telecommunications infrastructure** and the **diversification of digital services**, among other factors.
- At an early stage of the Internet, **one-way data flows**, such as the viewing of websites, was predominant **(Web 1.0)**. Since the beginning of the 2000s, **two-way data flows between general users** have continued to grow due to the spread of social networking services (SNS) **(Web 2.0)**.



(Source) MIC

(1) Advancement of communications infrastructure to support data distribution

- Regarding fixed communications networks, the **fiber to the home (FTTH)** service was launched in 2001, and during the latter half of the 2000s, the transition from conventional **ADSL** progressed. FTTH surpassed DSL in terms of total subscriptions in 2008, and FTTH services continue to be the mainstream service.
- The **first generation** of the mobile communications network service was launched in 1979, and the **fifth generation** was launched in 2020. The network has undergone a generation cycle of approximately 10 years, continuing its evolution in the direction of increasing speed and volume.

(2) Progress in data distribution and digital services

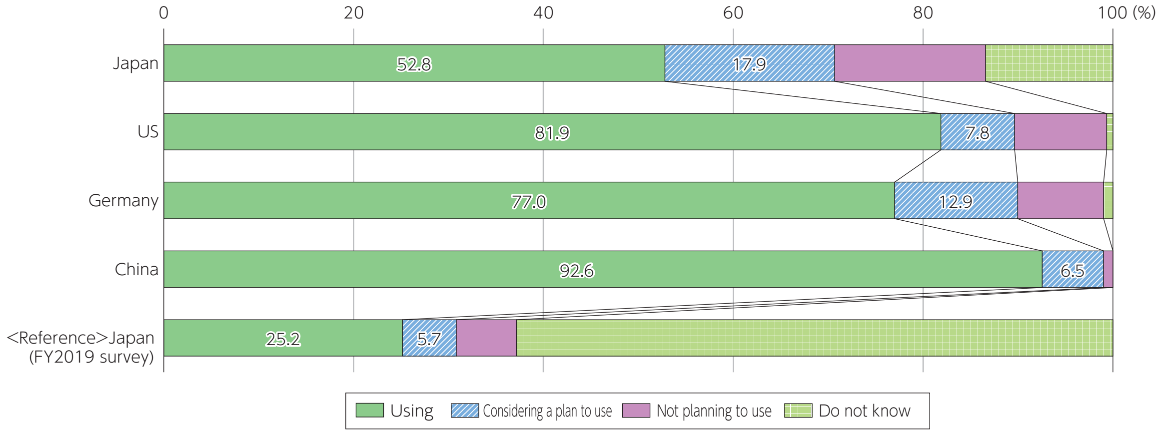
- Since the launch of Windows 95 in 1995, the Internet spread rapidly in Japan, and data distribution and utilization evolved through several stages
- In the early days of the spread of the Internet (from the mid-1990s to the mid-2000s), the Internet was called **Web 1.0**, and it mainly distributed information and data in one direction, such as through the browsing of websites and the sending of messages via e-mail.
- With the advent of **social media and video posting websites, etc**. around 2005 and **the rapid spread of smartphones**, users shifted to the role of disseminating information themselves. This period of two-way information flows between unspecified numbers of users is referred to as **Web 2.0**.

Chapter 2 Current situation and challenges of data flows and use

(1) Data distribution and data utilization continue to accelerate

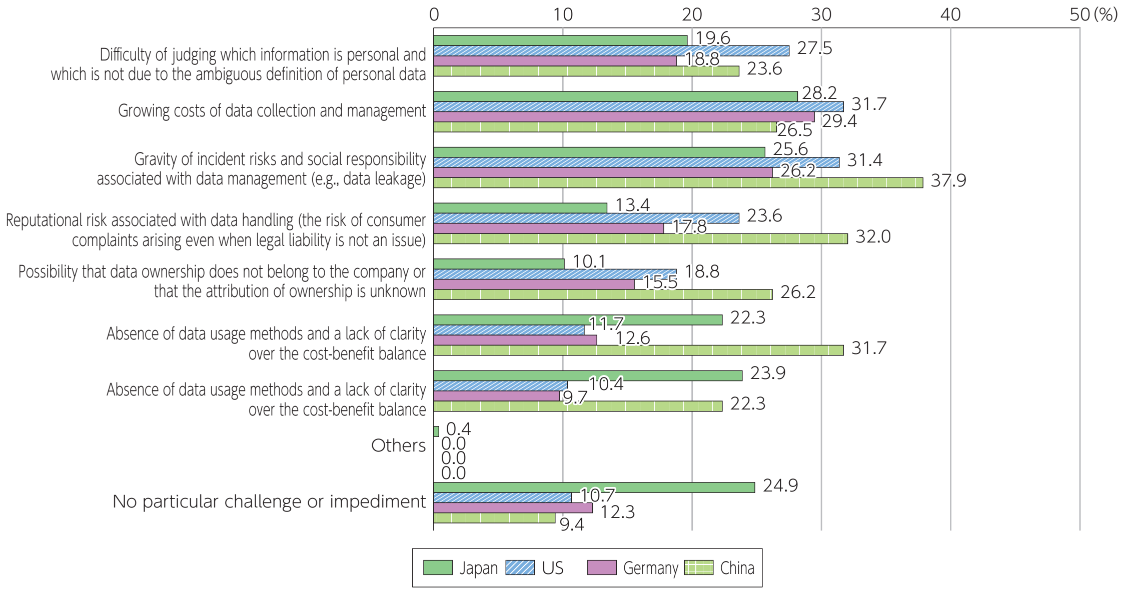
- While Japanese companies' data utilization is progressing, the rate of its utilization is comparatively low compared with that in the U.S.
- Many Japanese companies cite **"costs of data collection and management"** and the **"gravity of risks and social responsibility associated with data management"** as challenges and impediments to data usage.

Companies' use of personal data



(Source) Prepared from MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad" and MIC (2020) "Survey Research on Consumers' Awareness about Data Flow Environments, etc."

Challenges and impediments for use of personal data

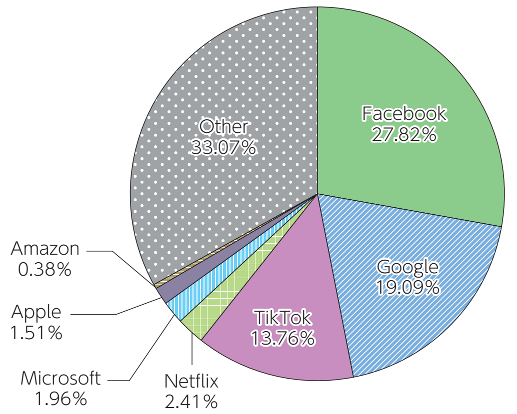


(Source) Prepared from MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

(2) Concentrating data with platform providers

- Services provided by platform providers **(platformers)**, such as social media, e-Commerce, and search functions, make **our lives more convenient**.
- However, through the provision of services, platformers **collect and store vast amounts of digital data**, and they have **established a strong economic position in the digital-related market** through advertising and other activities utilizing such data.

Percentage of mobile data traffic by application



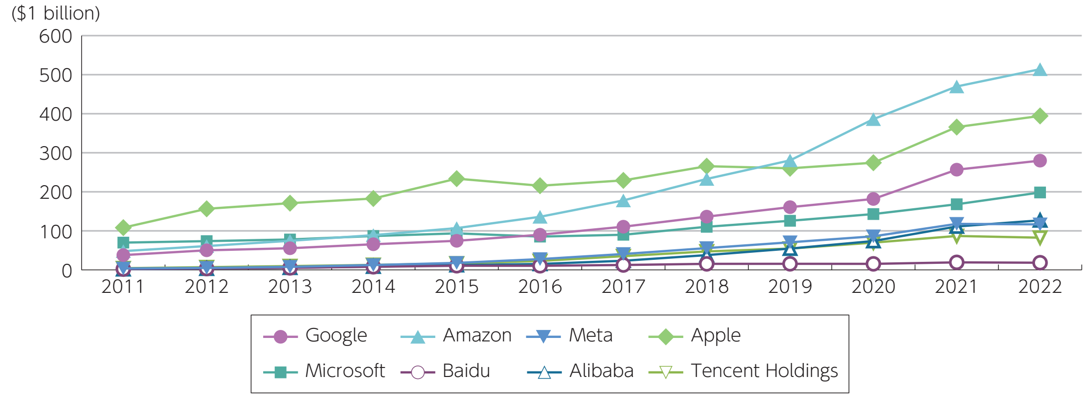
(Source) Based on SANDVNE "PHENOMENA (THE GLOBAL INTERNET PHENOMENA REPORT JANUARY 2023)"

Data items acquired by the platformers

Data item	Platform			
	Google	Facebook	Amazon	Apple
Name	○	○	○	○
User name	–	–	○	–
IP address	○	○	○	○
Search word	○	–	○	○
Details of content	–	○	–	–
Link between content and displayed ads	○	○	–	–
Time, frequency, and duration of activity	○	○	–	○
Buying activity	○	–	○	–
Persons with whom you communicated	○	○	–	–
Activity in third-party apps	○	–	–	–
Browsing history	○	–	○	–

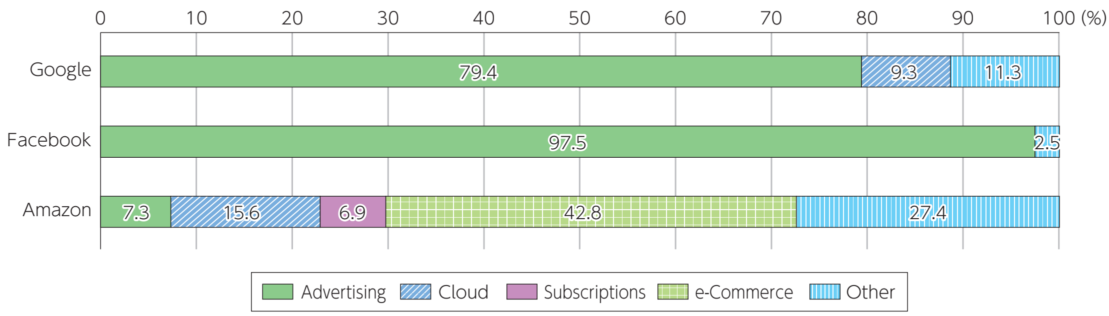
(Source) Extracted from Security.org "The Data Big Tech Companies Have On You"

Change in the sales of major platformers



(Source) Based on data from Statista

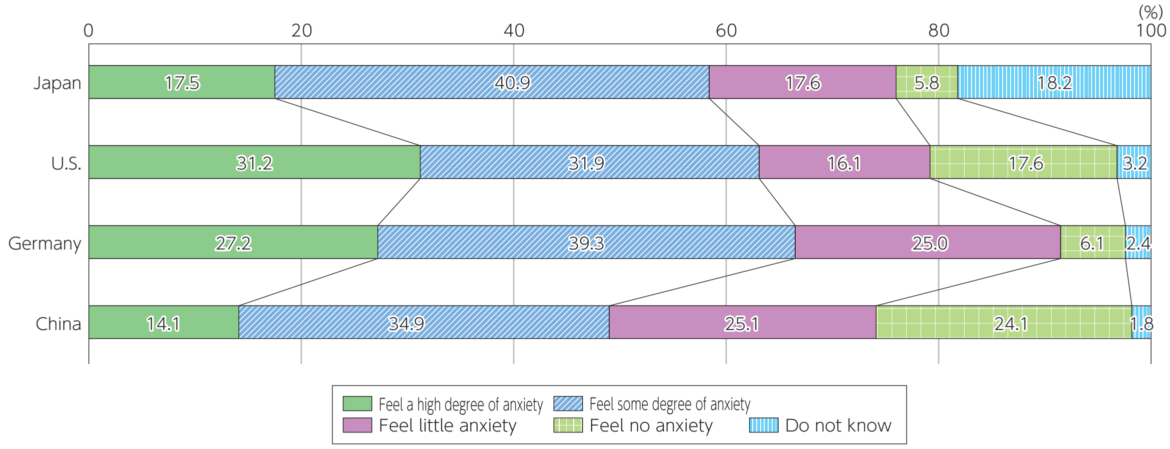
Details of sales (2022)



(Source) Based on the published data of each company

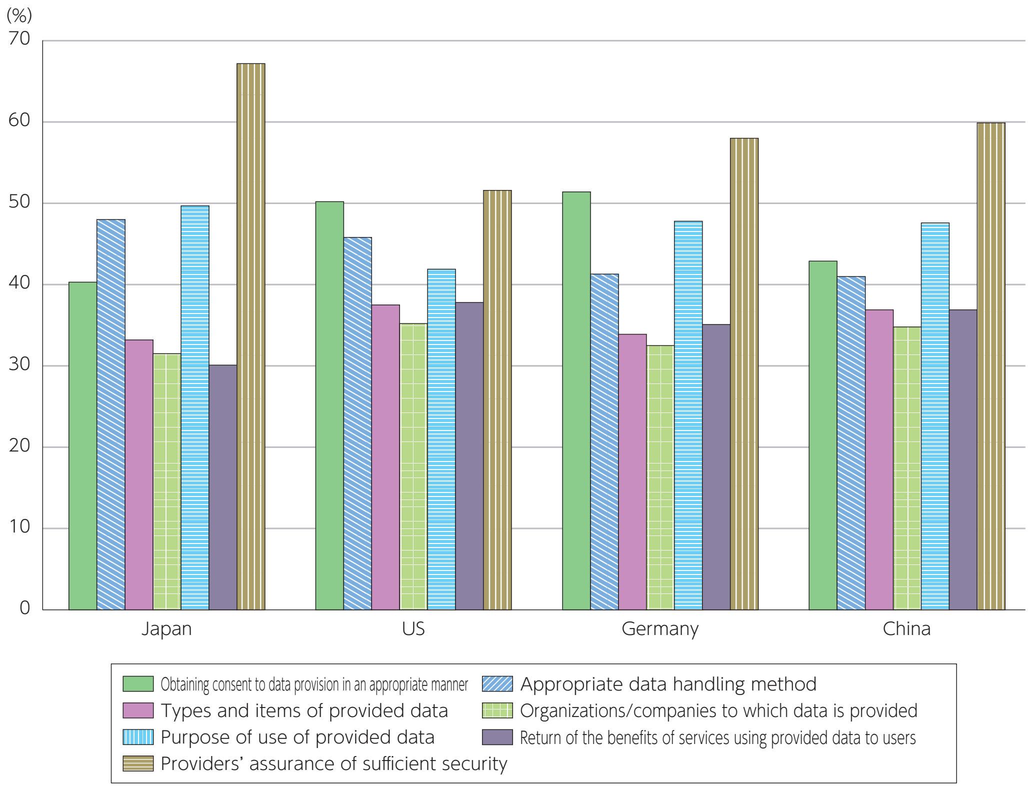
- While digital services provided by platformers, such as SNS and search engines, make our everyday lives more convenient, some users **feel anxiety about providing personal data to platformers** when using their services.
- In Japan, many users cite **“assurance of sufficient security,” “purpose of data usage,” and “appropriate data handling methods”** as important points of consideration when providing personal data to platformers.

The presence or absence of anxiety about providing personal data



(Source) MIC (2023) “Survey Research on Advancement of ICT Infrastructure and Flow of Digital Data and Information”

Items and conditions that users consider important when providing personal data

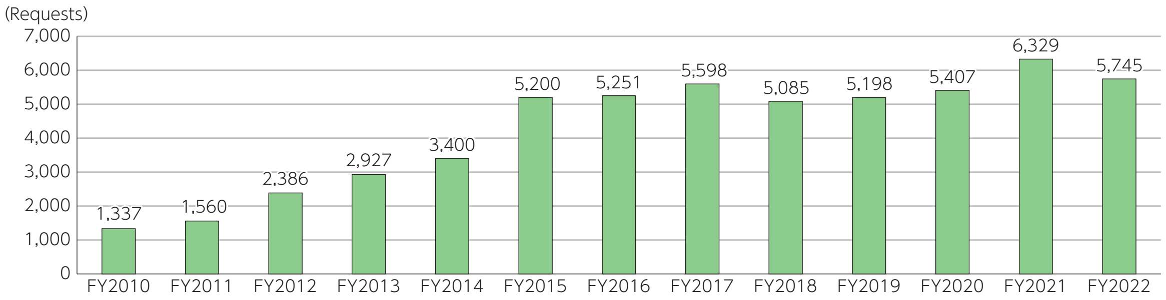


(Source) MIC (2023) “Survey Research on Advancement of ICT Infrastructure and Flow of Digital Data and Information”

(3) The spreading of false information and misinformation on the Internet, etc.

- On platform services including SNS, **information tends to become biased** (e.g., an **echo chamber** where users only see opinions similar to theirs and a **filter bubble** where information other than that favored by the user is automatically excluded) due to the characteristics of the services **(e.g., the attention economy and algorithms)**.
- With the spread of SNS, etc., users can easily obtain and send various kinds of information, but the problem of **distribution and diffusion of slander, defamation, and disinformation** has come to the surface. The spread of **AI Deep Fakes is** likely to accelerate the diffusion of fake images and videos.

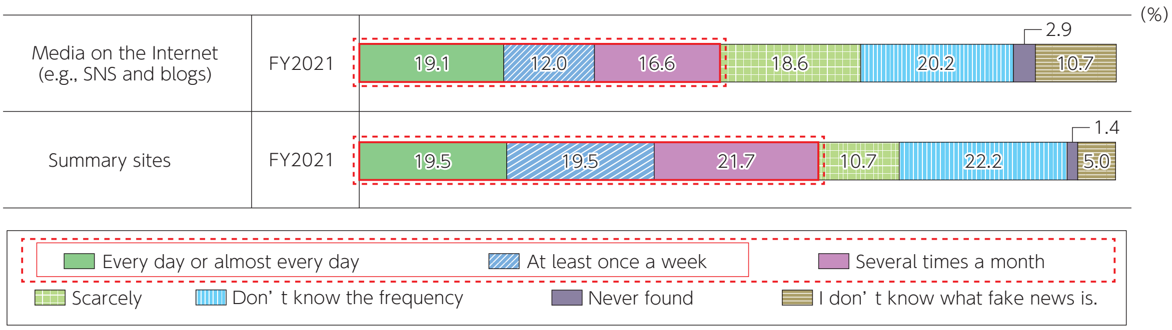
Changes in the number of requests for consultation submitted to the Illegal Harmful Hotline



(Source) MIC "FY2022 Report on contract works, including consultation services concerning illegal/harmful information on the Internet (summary)"

The frequency of contact with disinformation and misinformation on the Internet

How frequently have you found fake news* in the following media during the past month?
*The term refers to false or misleading information/news

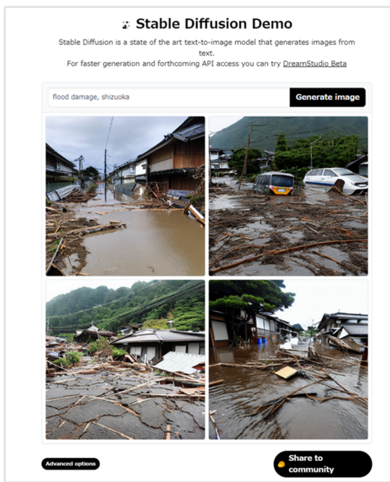


(Source) MIC (2023) "Survey Research on Advancement of ICT Infrastructure and Flow of Digital Data and Information"

Cases of disinformation / misinformation

Year	Area	Details
2021	Europe	European lawmakers conducted video conference calls unaware that the video of Russian lawmakers was a deepfake video.
2022	Japan	Stable Diffusion was used to create a hoax image of flooding from a typhoon in Shizuoka Prefecture, which was posted on Twitter.
2023	U.S.	A political activist created a video of President Biden announcing the start of World War III. The creator explained that it was created with AI, but many people shared the video without this explanation.
	U.S.	The founder of Bellingcat used Midjourney to create and publish a fake image of former President Trump being arrested that went viral on Twitter.

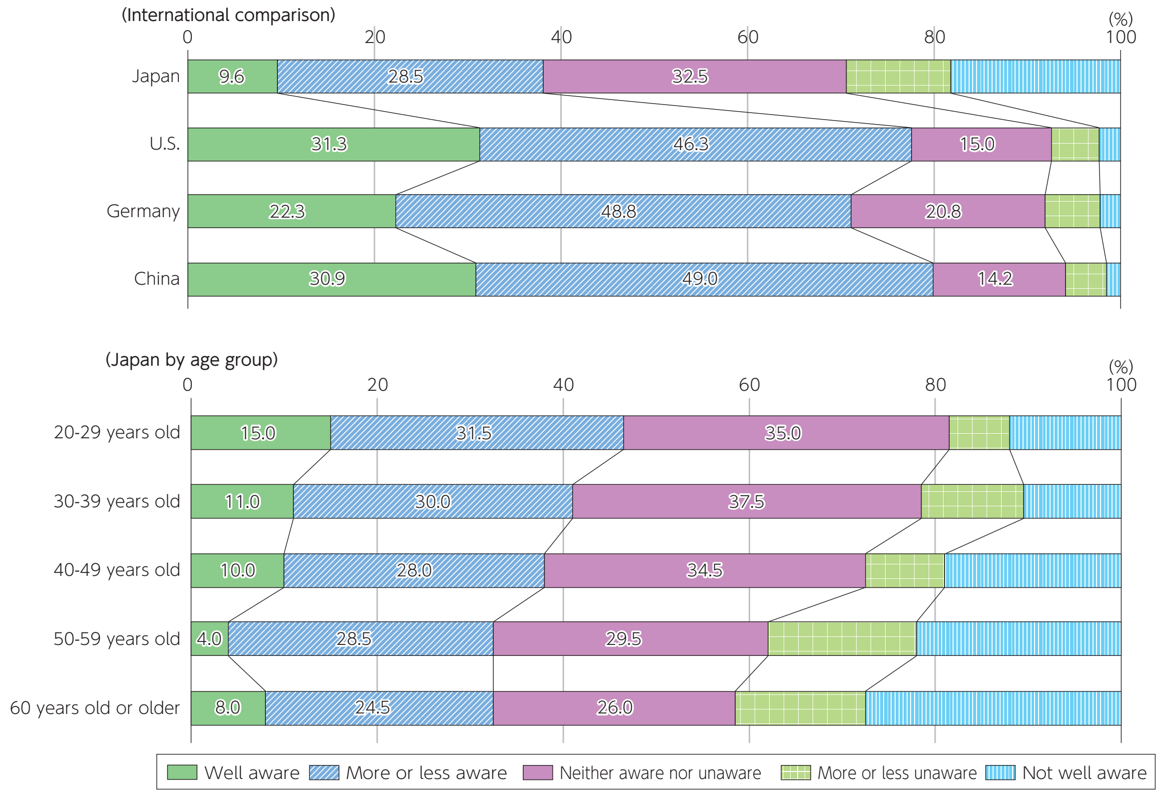
(Source) Based on various websites



(Source) Spectee, "Shizuoka disaster rumor — New age brought about a rapid evolution of image generation AI" (September 28, 2022)

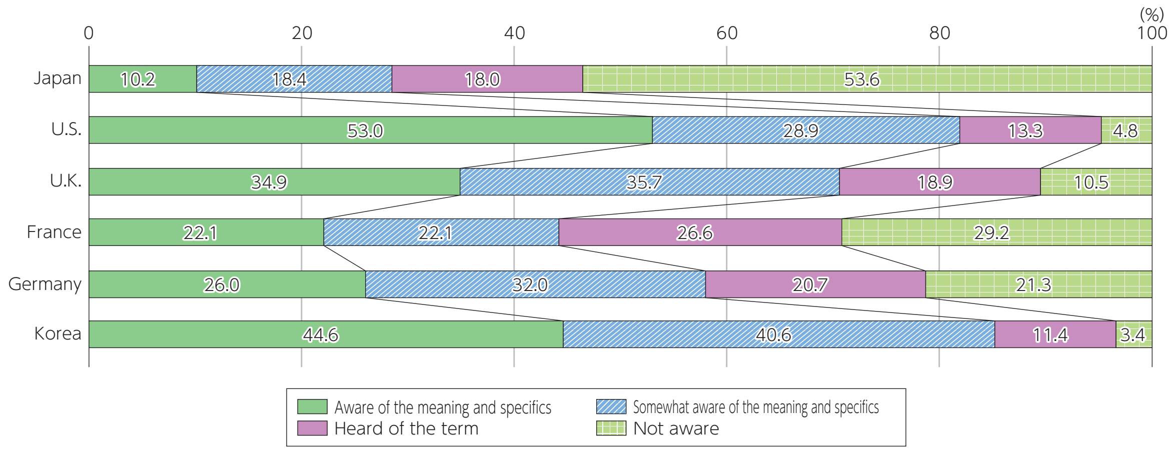
- The percentage of those who replied that they were **aware** (those who replied that they were "well aware" or "more or less aware") of the tendency of SNS **to expose users disproportionately to opinions and thoughts similar to their own** (the echo chamber effect) was **low compared with the percentages in the United States and Europe**. In Japan, by age group, **the percentage of those who replied that they were aware of that tendency was low among respondents in their 50s and 60s compared with other age groups**.
- **The level of awareness of activities to counter false information and misinformation, such as fact-checking, is also low in Japan compared with other countries.**

Awareness of the echo chamber effect



(Source) MIC (2023) "Survey Research on Advancement of ICT Infrastructure and Flow of Digital Data and Information"

Level of awareness of fact checking



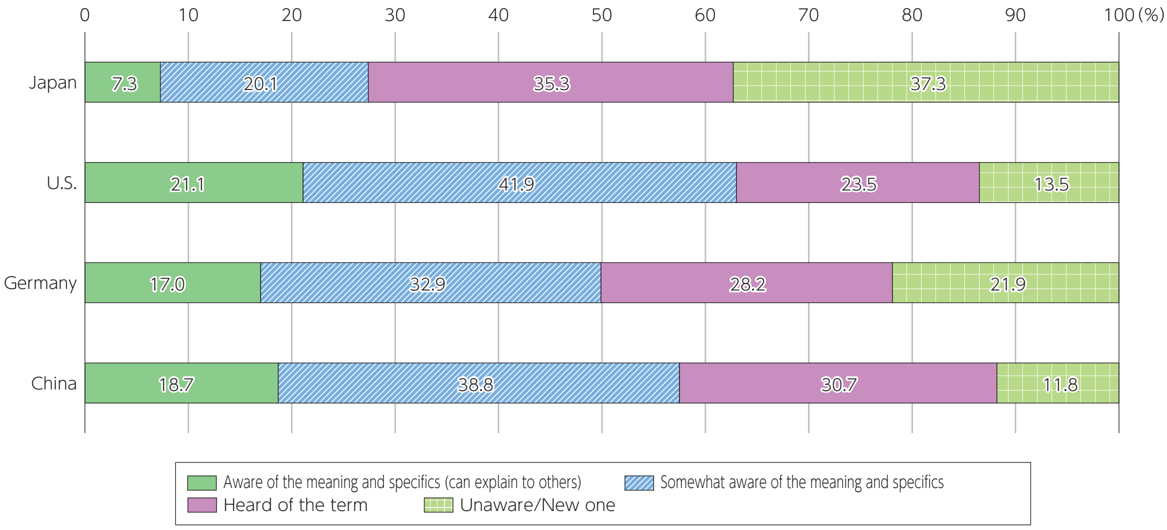
(Source) MIC "2021 Survey on Awareness about False Information in Japan and Abroad"

Chapter 3 Toward realizing a resilient and sound data flow society

(1) New trends in data distribution and utilization

- A new trend in data distribution is the emergence of **Web 3**, based on data distribution and distribution management using blockchain, and its applied technologies (e.g., distributed autonomous organizations).
- With the advancement of communications networks and XR technology, etc., new services that utilize **the Metaverse and digital twins** have emerged, and public awareness in Japan is improving. These services are **utilized** not only for entertainment but also for **education, regional revitalization, infrastructure management, disaster prevention, agriculture, etc.**
- Rapidly evolving **generative AI** includes Chat GPT, an interactive language model, and prompt-based image generation AI that generates images when you type text.

Awareness level of the Metaverse (international comparison)



(Source) MIC (2023) "Survey Research on Advancement of ICT Infrastructure and Flow of Digital Data and Information"

An example of a metaverse application

Metaverse School of Engineering, the University of Tokyo

(Source) The University of Tokyo

Digital twin application example

Virtual Shizuoka

(Source) Shizuoka Prefecture

(2) Toward realizing a prosperous data distribution society

- **Diverse digital services using data** have penetrated deep into our lives. Application technologies related to Web 3 and **new services, such as the Metaverse**, are also attracting attention, and there are expectations that those services **will contribute to resolving various social and economic challenges** faced by Japan, including regional revitalization and disaster risk management.
- It is important to promote efforts to **realize a society in which everyone can enjoy the benefits of data usage by promoting safe and appropriate data flows**

Initiatives for data distribution and utilization

Resilient communications networks underpinning data flows

- **Develop communications networks resilient against disasters and secure alternative means of communication** (e.g., intercarrier roaming and the use of non-terrestrial networks) in order to realize an environment conducive to the continuous use of digital services in emergencies.
- Promote **geographical diversification of data centers and submarine cables** from the viewpoint of enhancing resilience against disasters.
- **Strengthen cybersecurity and the response to supply chain risks** from the viewpoint of **economic security** amid the increasingly complex international situation.

Early realization of Beyond 5G to underpin ultra-high-speed, ultra-high-capacity data flows

- Strengthen and accelerate efforts to develop **Beyond 5G (6G), which enables ultra-high-speed, ultra-high-capacity data flows with ultra-low delays** in order to spread new services, including the Metaverse, and realize the data-driven Society 5.0.
- Amid the deepening of environmental problems, including global warming, it is necessary to realize at an early time **Beyond 5G, which enables data flows with ultra-low electricity consumption.**

Contributions to standardization and the development of international rules

- In borderless digital spaces, it is important **to promote standardization and develop rules in cooperation with the international community**.
- Regarding **AI**, which is spreading and evolving at a remarkable pace, promote the **development of an AI usage environment** in cooperation with other countries based on the **Hiroshima AI Process**, which was launched at the **G7 Hiroshima Summit**, and the **action plan agreed on at the G7 Digital and Tech Ministers' Meeting**.
- Regarding the **Metaverse**, promote efforts to realize **interoperability** between different metaverse platforms, and **develop international standardization concerning relevant technologies**.

Realization of a diverse and sound information space

- **Improve literacy** so that **individuals** can **appropriately receive and disseminate information** and **make correct use of new tools and services**, including AI, in internet spaces where various sorts of data and information flow.
- Encourage **a broad range of stakeholders**, including platformers that provide information, to make voluntary efforts (e.g., fact-checking and research and development) on the condition that consideration be given to freedom of expression and that transparency is ensured.

Chapter 4 Trends in the ICT market

Item	Year	Total	YoY
ICT market size (expenditure)	2022	27.2 trillion yen	+ 5.2%
Domestic value of ICT industry (nominal)	2021	52.7 trillion yen	+ 0.8%
ICT investment	2021	15.5 trillion yen	▲0.4%
Importvalue of ICT goods and services (nominal)	2021	19.2 trillion yen	+ 14.6%
Export value of ICT goods and services (nominal)	2021	12 trillion yen	+ 13.3%
Research spending on ICT	2021	3.4 trillion yen	▲1.6%
Researchers in ICT industry	2021	157,000	▲6.0%
Population coverage rate of 5G	2021	93.2%	—
Internet traffic	2022	29.2 Tbps	+ 23.7%
Fixed-line broadband services subscriptions	2021	43.83 million	+ 2.7%
Sales of all broadcasters	2021	3.7 trillion yen	+ 4.6%
Subscribers to broadcasting services	2021	81.613 million	▲0.2%
Size of the digital advertising market	2022	3.1 trillion yen	+ 13.7%
Number of 5G-compatible smartphone shipments	2021	17.53 million units	+ 67.7%
Market size of 5G base stations (shipment value)	2022	303.5 billion yen	+ 6.2%
Size of video streaming market	2022	530.5 billion yen	+ 15.0%
Size of metaverse market (sales)	2022	182.5 billion yen	+ 145.3%
Size of data center service market	2022	2.0 trillion yen	+ 15.3%
Size of cloud service market (sales)	2022	2.2 trillion yen	+ 29.8%
Number of cyber-attack-related communications detected by NICTER	2022	About 526.6 billion	+ 0.9%
Internet usage rate (individuals)	2022	84.9%	82.9%*
Smartphones ownership rate (individuals)	2022	77.3%	74.3%*
Telework use situation	2022	51.7%	51.9%*
State of introduction of IoT/AI	2022	13.5%	14.9%*

*Indicates the percentage of the previous year, not the year-on-year change

Chapter 5 Status of the ICT policy at the MIC

Promotion of a comprehensive ICT policy

Promotion of the Vision for a Digital Carden City Nation

- Toward realization of the vision, the MIC is accelerating the "development of hard and soft digital infrastructure," "development and securing of digital human resources," "initiatives to prevent leaving anyone behind," and other initiatives.
- **Vigorously promoting the development of digital infrastructure including optical fiber and 5G based on the Infrastructure Development Plan for a Digital Garden City Nation (revised version)**

A deliberation on the information and communications policies with a view to 2030

- The General Policy Committee, the Information and Communications Policy Section of the Information and Communication Council, **backcast** the international competitiveness of Japan's information and communications industry and the safe and secure utilization environment **from the projected future situation in 2030,** and it discussed the ideal direction of the information and communication policies in 10 years. The committee compiled and published its **final report, "Information and communications policies with a view to 2030"** in June 2023.

Telecommunications business policy

Developing and maintaining digital infrastructure and securing its security and reliability

- Develop optical fiber toward achieving the goal (a household coverage rate for optical fiber of 99.9% at the end of fiscal 2027) of the **Infrastructure Development Plan for a Digital Garden City Nation, and support the decentralization of datacenters and submarine cables by using the Digital Infrastructure Development Fund**. Hold the **Study Group on Intercarrier Roaming in Emergency Situations** to discuss the mutual use of networks among carriers in emergencies.

Development of a safe and secure utilization environment

- Promote the development of consumer protection rules, and **respond to illegal/harmful information and dis/misinformation** on the Internet and other efforts.

Radio policy

Spread and dissemination of 5G

- Work toward achieving the goal (a population coverage rate for 5G of 97% nationwide at the end of fiscal 2025) of the **Infrastructure Development Plan for a Digital Garden City Nation**; promote the spread of 5G by providing subsidies and tax benefits; and implement initiatives to promote infrastructure sharing.

Broadcasting policy

Deliberation on the vision of future broadcasting and the ideal broadcasting system

- Based on the recommendations, etc. of the **Study Group on the Ideal Broadcasting System in the Digital Age**, the MIC is promoting the shared use of equipment, reviewing the principle of decentralization of media, and developing systems to enable identification of broadcasting programs in multiple regions

Improving the resilience of broadcast networks and enhancing disaster resistance

- Promote the development of an environment for the sure delivery of information in times of disaster by enhancing the disaster resilience of the broadcast network through the conversion of cable television to fiber optics

Cybersecurity policy

Securing the safety and reliability of information and communications networks

- In order to create an environment for citizens to use ICT with security, the MIC promotes activities to ensure the security of IoT devices and initiatives by telecommunications carriers to detect C&C servers and to address supply chain risks.

Developing cybersecurity human resources

- Promote the development of cybersecurity human resources through NICT National Cyber Training Center (e.g., CYDER).

Promotion of ICT

Promoting the use of ICT that contribute to solving social/economic issues

- Promote **Local 5G** and the spread of telework and ICT utilization in education, medical care, and other fields.

Creating an environment where everyone can enjoy the convenience of ICT

- **Promote initiatives to bridge the digital divide toward digitalization that leave no one behind** (e.g., support for the elderly to use digital technology and support for barrier-free information) and **consideration/efforts to improve ICT literacy.**

ICT technology policy

R&D implementation and international standardization toward Beyond 5G

- Toward the realization of Beyond 5G (6G), which is the next-generation information and communications infrastructure, the ministry **vigorously promotes R&D aimed at social implementation and overseas expansion with a focus on the technology fields where Japan has strengths** while promoting the **international standardization** of Beyond 5G through collaborations between industry, government, and academia.

Global strategy for ICT

Contribute to strengthening Japan's international competitiveness in the ICT sector and solving global social issues

- In order to contribute to strengthening Japan's international competitiveness in the ICT sector and solving global social issues, the MIC promotes the **overseas expansion of digital infrastructure, etc.** and **bilateral and multilateral collaborations in digitalization** (e.g., Japan-US, Japan-EU, QUAD, G7 and IGF)
- At the **G7 Digital and Tech Ministers' Meeting** in April 2023, participants discussed six themes, such as "Secure and resilient digital infrastructure," "Maintaining and promoting a free and open Internet," and "Promotion of Responsible AI and Global AI Governance." As a result of the meeting, the ministers **adopted the "G7 Digital and Tech Ministers' Declaration."**

Postal service administration

Reviewing regional contributions by post offices in a digital society

- Discuss measures for the spread and utilization of personal number cards in post offices; promote the utilization of post offices as a counter for administrative services; and implement demonstration projects for collaborations between post offices and public infrastructure in the region.

2023 White Paper on Information and Communications in Japan

Table of Contents

Part 1
Special Topic Toward Realizing the Resilient and Sound Data Flow Society for the New Era

Part 2
Current Status and Issues in the Information and Communications Field

Chapter 4

Appendix

Part 1
Special Topic Toward Realizing the Resilient and Sound Data Flow Society for the New Era

Chapter 1

Progress in data flows

Due to progress in digitalization, advancement of networks, and the miniaturization and cost reduction of smartphones and IoT-related devices, such as sensors, a huge amount of data, such as information on people's locations, activity histories, and internet viewing and consumption activities, are distributed via networks, and various digital services that utilize and share such data have emerged.

This chapter provides an overview of advances in telecommunications infrastructure and progress in the distribution and utilization of data over networks.

Section 1 Advances in telecommunications infrastructure to support data flows

1. Fixed communications

In the late 1980s and early 1990s, before the spread of the Internet, many people used personal computer communications in which their computer connected to a telecom provider's computer via a telephone line or ISDN to send and receive information[1]. Personal computer communications paved the way for data communications in addition to the existing voice informationcommunications, and although such data communications were mainly text-based services, such as e-mail, message boards, and chats, they steadily became popular.

After that, commercial use of the Internet also started in Japan, and the spread of the Internet to ordinary households rapidly progressed with the release of Windows 95 in 1995.

In the late 1990s, when the Internet began to spread, the mainstream telecommunication environment was dial-up connections via telephone lines, and there were problems such as insufficient communication speeds, pay-as-you-go services, and the inability to make telephone calls while connected to the Internet.

In 1999, a commercial ADSL service was launched. Because ADSL used a different bandwidth for data communications than for telephone calls, it was possible to make telephone calls and connect to the Internet at the same time. It was also provided for a flat fee, and it had a constant connection. In 2001, new providers of low-cost ADSL services, such as Yahoo! BB, led to increased competition among providers and reduced prices, including NTT EAST, which had been offering the service since its inception. In addition, the number of subscribers expanded rapidly as the line speed increased from a maximum of 1.5 Mbps download speed at the beginning to 50 Mbps in 2004.[2]

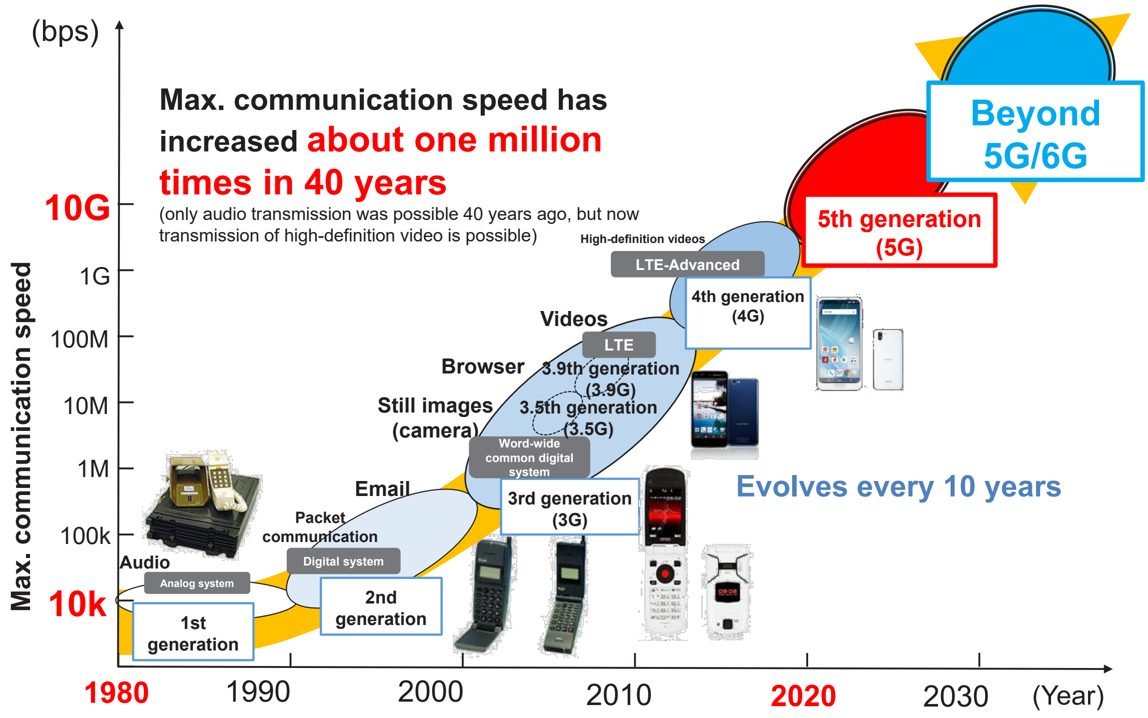
While the price of ADSL continued to decline and its speed increase, in 2001, fiber to the home (FTTH) services that utilized optical fiber were launched for general users, and in the late 2000s, people started switching from ADSL to higher-speed FTTH. FTTH surpassed DSL in terms of total subscriptions in 2008, and FTTH still form the bulk of broadband services.

2. Mobile communications

Since the launch of the first generation of Japan's mobile communications network in 1979, the network has undergone a generational change approximately every 10 years up to the fifth generation, which was launched in 2020, and it has continued to evolve in the direction of increasing speed and volume. Accordingly, mobile communication services have diversified and become more sophisticated **(Figure 1-1-2-1)**.

[1] The number of users of personal computer communications increased from 1.15 million in 1991 to 5.73 million in 1996.
[2] In 2003, the number of subscribers exceeded 10 million.

Figure 1-1-2-1 Evolution of mobile communications systems



(Source) Material created by MIC

In 1979, Nippon Telegraph and Telephone Public Corporation began offering the first generation analog automobile telephone service. In 1985, shoulder-type terminals were introduced that could make calls from outside automobiles. In 1987, NTT began a mobile phone service using smaller and lighter terminals.

From 1993, the second generation mobile communication system 2G, which was a digital system, was launched to replace the analog system. With the realization of communications using 2G packet switching technology, data communications services started to be launched in earnest in addition to the transmission of voice calls, and internet connection services for mobile phones were launched by all companies. [3]

In 2001, the world's first service using the third generation mobile communication system 3G was launched. The feature of 3G was the use of code-division multiple access (CDMA) as its access method. With this, users were identified by a code called a spreading code, making it possible for many users to share the same frequency at the same time. Furthermore, the adoption of CDMA, which is a type of frequency spreading technology, enabled wide-band communications, thus realizing high-speed and high-volume communications when compared to 2G. In addition, around the time of the introduction of 3G, the multifunctionality of mobile phone devices progressed further, and full-fledged services that enabled users to access sites dedicated to mobile phones began to appear, enabling users to enjoy a variety of content, such as games and music on mobile phone terminals.

As the need to use various types of content on mobile phone devices increased, the communication speed of 3G became inadequate. In 2003, services using the 3.5th generation mobile communication system (3.5G),[4] which was evolved 3G that specialized in high-speed data communications, were launched.

When Apple introduced the iPhone in the U.S. in 2007, its design and ease of use resulted in it gaining popularity, and the shift from feature phones to smartphones began worldwide.

The fourth generation mobile communication system (4G) was launched commercially under these circumstances. Initially, services using the 3.9th generation mobile communications system (3.9G) (Long Term Evolution (LTE)) were launched in 2010. With the arrival of the smartphone era, the need for high-speed, high-volume communications grew even more, and LTE achieved even higher speeds by increasing the efficiency of spectrum use to enable a much wider bandwidth than 3G. In 2015, the fourth generation mobile communications system (4G, LTE-Advanced), which made LTE

[3] NTT DOCOMO launched the DoPa and i-mode Internet connection services for mobile phones in 1997 and 1999, respectively. The Cellular Group and IDO launched EZweb and EZaccess in 1999, and J-Phone (the company name changed from Digital Phone and Digital Tu-Ka companies) launched J-SKY in 1999.

[4] While it took 27 to 30 hours to download a single DVD with 3G, it took 45 minutes to 1 hour with 3.5G. This improved speed allowed users to smoothly browse websites and videos, including images, and it enriched the user experience of the Internet on mobile phones.

even faster, was launched and the communication speed evolved from mega-level to giga-level.

In March 2020, about 10 years after the commercial launch of 4G,[5] commercial services of the fifth generation mobile communication system (5G) were launched. 5G is expected to become the foundation of life, the economy, and society in Japan, not only because of its ultra-high speed, which is more than 100 times faster than 4G, but also because it provides features such as ultra-low latency, which enables operation of robots etc. to be performed smoothly even in remote areas, and because it allows many simultaneous connections, enabling many devices to a network simultaneously. Initiatives to achieve wide-area coverage with 5G quickly and accelerate the utilization of 5G in various industries are being carried out actively,[6] and as of the end of March 2022, the national 5G-population coverage rate exceeded 93.2% while the prefectural 5G-population coverage rate exceeded 70% in all prefectures.

[5] The collective name of the 3.9th generation mobile communication system (LTE) and the 4th generation mobile communications system (LTE-Advanced)
[6] For details, see Section 3. "Radio Policy Trends" in Chapter 5 of Part 2.

Section 2 Progress in data flows and digital services

1. One-way data transmission (Web 1.0 era: 1990s to early 2000s)

With the launch of Windows 95 in 1995, the Internet rapidly spread in Japan, and since then data distribution and utilization has evolved through several stages.

In the early days of the Internet, websites were mostly text only and were built using html, with few images and videos. In addition, the senders and receivers of information were fixed, and usage was centered on the one-way distribution of information and data from the provider to the user/receiver, such as users viewing websites created by companies and individuals and sending messages by e-mail, etc.

The period from the 1990s to the mid-2000s, when the distribution of information and data was static and one-way, is called Web 1.0.

2. Two-way data sharing (Web 2.0 era: late 2000s onward)

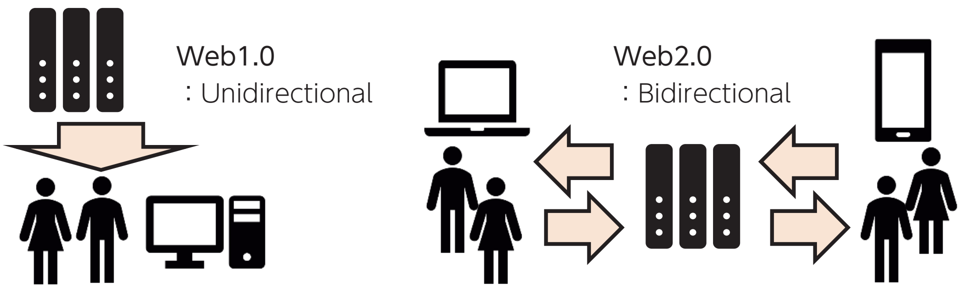
In the 2000s, the spread of high-speed, fixed-rate, constant connection brought about a serious change in the way people used the Internet, and the types of services provided on the Internet also diversified.

In the early days of the Internet, many portal websites were set up to consolidate information in one place. While information had continued to be consolidated on portal websites, from around 2005, against the background of an internet environment offering flat-rate fees and constant connection, communication services, such as blogs and social media[1] as well as video posting and sharing sites,[2] appeared one after another, creating a trend of "bidirectional" flow of information and data. In addition, after the launch of the iPhone in the U.S. in 2007, smartphones also spread rapidly in Japan, and the use of social media, video websites, and online social games, etc. on mobile devices increased rapidly.

In this way, users began to post information on social media and video websites themselves. This period is called Web 2.0 in which the two-way flow of information between unspecified numbers of users advanced **(Figure 1-2-2-1)**.

"Web2.0" is a term proposed by Tim O'Reilly in the United States in 2005. The "2.0" in this term refers to a new type of web, which is not an extension of the traditional websites that have been popularized and developed since around the mid-1990s. A common feature of many websites and services is that users without technical knowledge can easily transmit information, and the knowledge and information of various transmitters combine to form the "wisdom of crowds."

Figure 1-2-2-1 Changes from Web 1.0 to Web 2.0



	Web1.0	Web2.0
Flow of data and information	Unidirectional (Information disseminating centered on single websites)	Bidirectional (Information sharing centered on social media)
Devices	Computers	+ smartphones
Main services	Websites, email, etc.	+ social media, e-commerce, etc.

(Source) Based on Document 1-2 from the first meeting of the MIC Study Group on the Utilization of Metaverse Toward Web 3 Era

[1] In Japan, the blogging services cocolog and Ameba Blog were launched in 2003 and 2004, respectively, and by mid-2004, they had about one million contributors. Regarding social media services, mixi and GREE launched in 2004, and Facebook and Twitter launched in Japan in 2008.
[2] For example, niconico video was launched in 2006, and the Japanese version of YouTube was launched in 2007.

Chapter 2

The Current Status and Issues of Data Distribution and Utilization

With the advancement of telecommunications infrastructure, the volume of data distribution has exploded, and various businesses and services utilizing data have emerged. While such services offer improved convenience for users, various issues have become apparent in the distribution and utilization of data on the Internet.

This chapter summarizes the status and issues of accelerating data distribution and utilization, and analyzes the status of each country's initiatives.

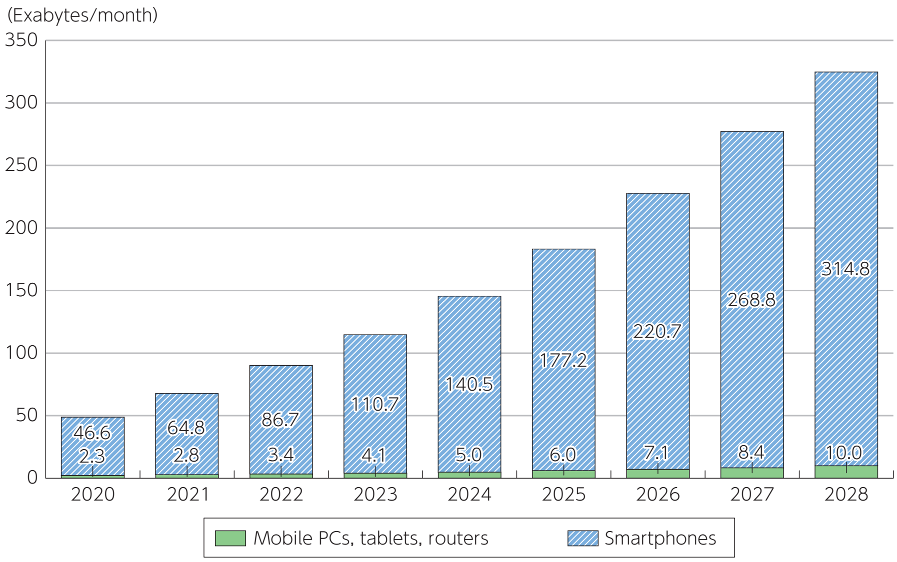
Section 1 The Continuing Acceleration of Data Distribution and Data Utilization

1. The explosive increase in data distribution

With the advancement of telecommunications infrastructure and the spread and diversification of digital services, the volume of data distribution on networks in Japan has increased exponentially. Since the COVID-19 pandemic, digitization has progressed, enabling people to live non-contact and work non-face-to-face. As of November 2022, the total download traffic of fixed-line broadband service subscribers increased by 23.7% year on year, and that of mobile communications subscribers as of September 2022 increased by 23.4% year on year.[1]

Globally, the volumes of data traffic and data distribution, especially through mobile terminals, have increased significantly and are expected to increase further. For example, the Ericsson Mobility Report published by Ericsson (Sweden) in November 2022 shows that worldwide data traffic via mobile devices (excluding FWAs) has increased significantly, reaching approximately 90 exabytes per month by the end of 2022, and it is expected to reach approximately 325 exabytes per month by 2028 **(Figure 2-1-1-1)**. Also, the percentage of 5G in mobile data traffic is expected to be about 17% by the end of 2022 and is expected to be 69% by 2028.

Figure 2-1-1-1 Predicted global mobile data traffic by device



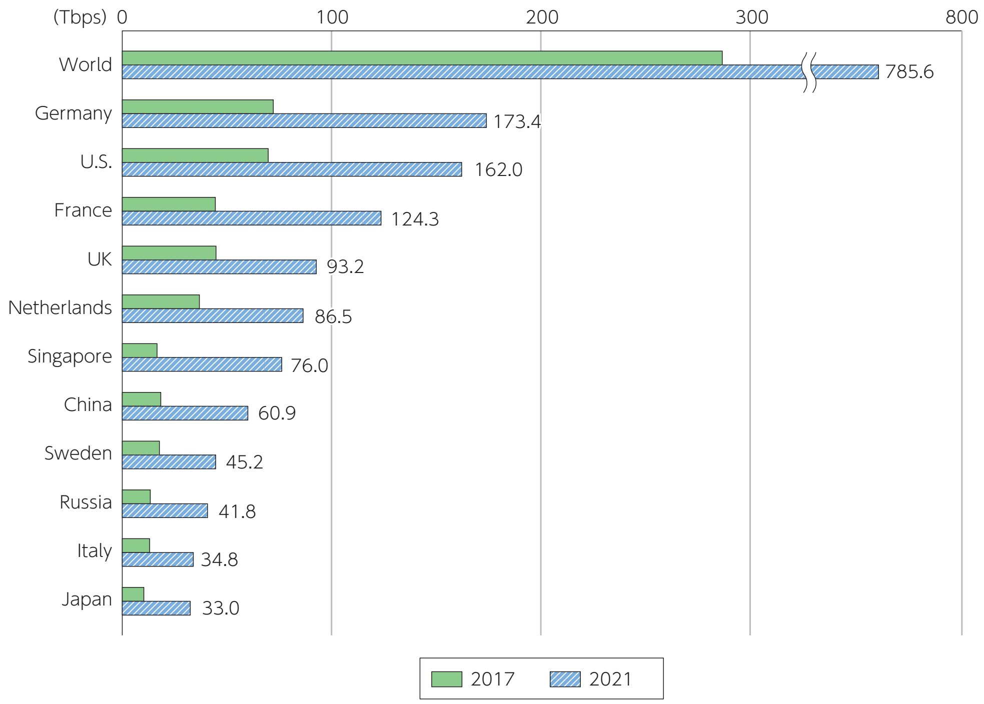
(Source) Prepared based on "Ericsson Mobility Visualizer by Ericsson"[2]

Figure (related data) Global mobile data traffic forecast (5G and Non-5G)
Source: Prepared based on "Ericsson Mobility Visualizer by Ericsson"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00004
(Data collection)

[1] https://www.soumu.go.jp/main_content/000861552.pdf
[2] https://www.ericsson.com/en/mobility-report/mobility-visualizer

Furthermore, in recent years, globalization of corporate activities and the normalization of the provision of international services via the Internet have led to the active distribution of data beyond national borders. According to TeleGeography (U.S.), the volume of cross-border data distribution has grown rapidly since the COVID-19 pandemic, as the use of online shopping and video distribution services, etc. increased due to measures such as national lockdowns and emergency declarations. In 2021, for example, the volume of cross-border data distribution reached 785.6 terabits per second (Tbps), an increase of about 2.7 times from 2017. Looking at countries and regions, Germany came in first followed by the U.S. and France, with Japan ranking 11th at 33 Tbps **(Figure 2-1-1-2)**.

Figure 2-1-1-2 Cross-border Internet bandwidth by top countries and regions



* The classification of regions is based on TeleGeography's definition, and the regional totals are the sums of the countries for which data is available.

(Source) Japan External Trade Organization (JETRO) (Aug. 2, 2022) "The data environment is now (worldwide) - A look at cross-border data flows, investment and trade rules"

2. The awareness of companies and consumers regarding the provision and utilization of data

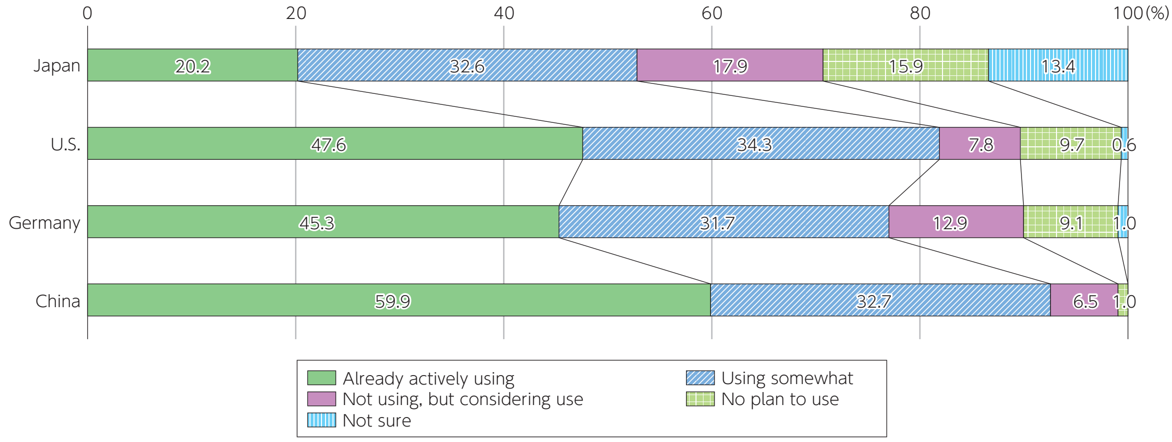
As the volume of data distribution within countries and across borders increases, we surveyed companies and consumers regarding their awareness of the provision and use of data in four countries: Japan, the U.S., Germany, and China.

(1) Corporate awareness

First, we asked companies in each country how they use personal data, such as basic customer information. The percentage of Japanese companies that responded they were able to utilize personal data (the sum of "already actively utilizing personal data" and "somewhat utilizing personal data") was 52.8%, which was higher than the results of the survey conducted in fiscal 2019[3] but lower than that of foreign companies **(Figure 2-1-2-1)**. The percentage of Japanese companies that can utilize data other than personal data (51.8%) was low compared to other countries.

[3] MIC (2020) "Survey Research on Consumer Awareness of the Data Distribution Environment"

Figure 2-1-2-1　Utilization of personal data by companies in each country

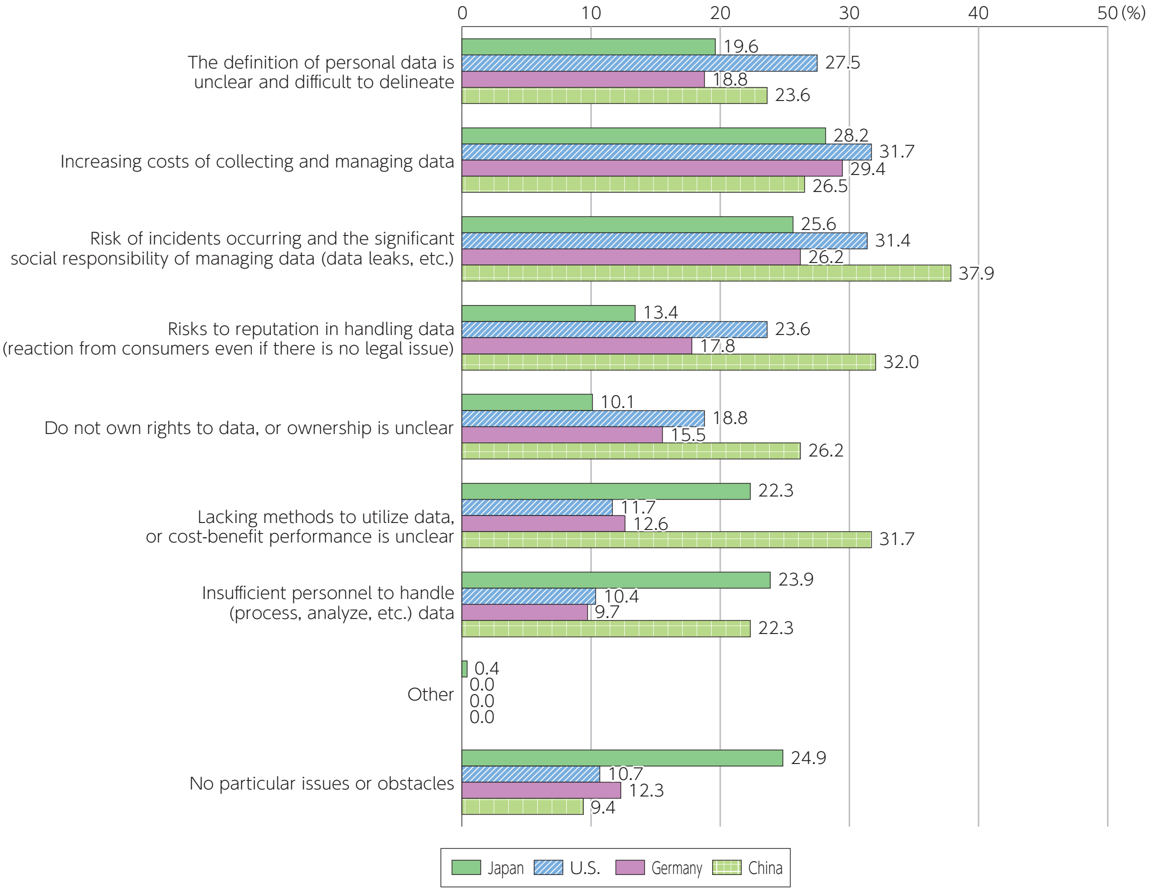


(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

Figure (related data) Utilization of data other than personal data
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00007
(Data collection)

When asked about issues and barriers to handling and utilizing data, many Japanese companies cited "Lack of methods for utilizing data," "Unclear cost-effectiveness and a lack of human resources for handling data (processing and analysis, etc.)." However, companies in the other surveyed countries frequently cited "Risk to company's reputation associated with handling data (consumer backlash, etc. even when there are no legal issues)," and "Fact that the data does not belong to the company, or it is unclear who the owner is" as issues and barriers **(Figure 2-1-2-2)**.

Figure 2-1-2-2 Issues and barriers envisaged in the handling and use of personal data



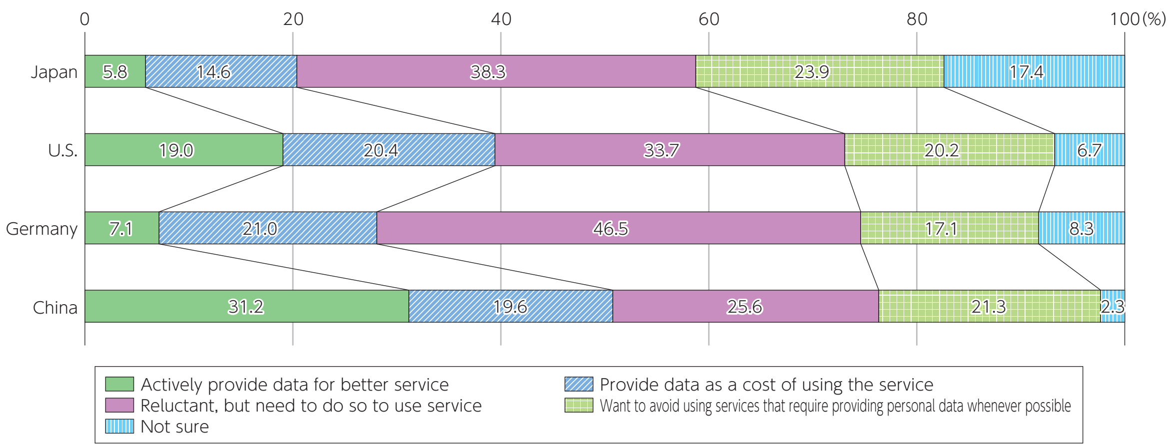
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

(2) Consumer awareness

When consumers in the four target countries were asked how they felt about providing personal data to companies in order to use services, 58.7% of respondents in Japan answered that they would provide personal data (the sum of respondents who answered "I will actively provide personal data in order to receive better service," or "It is only fair to provide personal information in order to use a service," or "I feel some reluctance to providing personal data but I will to use a service"), which was about 15% lower than in other countries **(Figure 2-1-2-3)**.

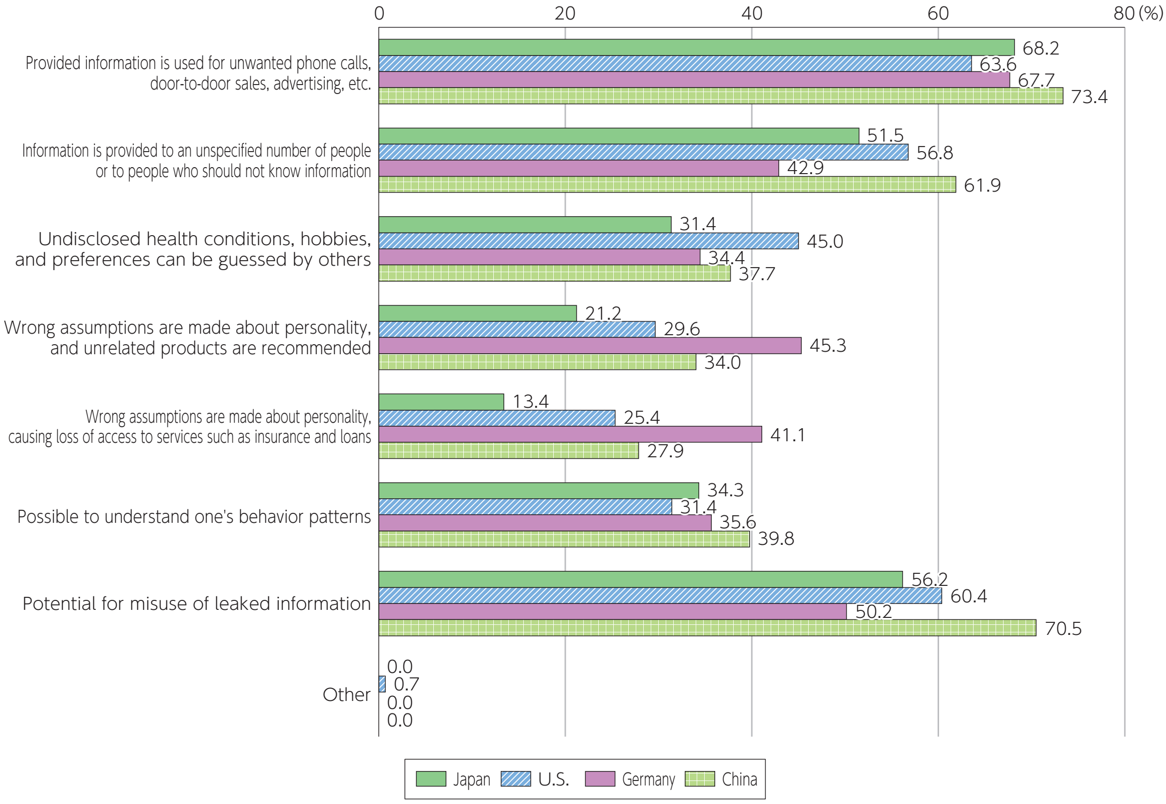
In all four countries, the most common reasons for concern and reluctance in providing personal data to companies were "Unintentional information leaks and that information may be used in undesired ways" **(Figure 2-1-2-4)**.

Figure 2-1-2-3 Intent regarding using services that require the provision of personal data



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

Figure 2-1-2-4 Reasons for reluctance to provide personal data when using services



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

Furthermore, when asked about the conditions for providing personal data to companies, the most common answer in all four countries was "To receive an economic benefit" followed by "To improve the service for me," showing that the more obvious the advantage was to the personal data provider, the greater the intention was to provide personal data.

Figure (related data) Conditions for providing personal data to companies
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00011
(Data collection)

3. Initiatives by country for promoting data utilization (national strategies, etc.)

Against the backdrop of increasingly higher volumes of data distribution through the advancement of digitalization, the promotion of innovation, and the enhancement of the economic value of data, countries around the world, including Japan, have formulated comprehensive and specific data strategies, and they are actively promoting measures in line with them with the recognition that data is the foundation for national wealth and international competitiveness in the digital society.

(1) Japan

In June 2019 the Cabinet approved the Declaration to be "The World's Most Advanced IT Nation — the Basic Plan on the Advancement of Public and Private Sector Data Utilization" with the aim of creating the world's most advanced IT nation. The plan calls for the use of data to realize benefits to people's lives as a priority item, and the thorough use of data in the public and private sectors is one of the initiatives for realizing the plan.

Furthermore, in June 2021, the Cabinet approved the National Data Strategy. This strategy presents the following principles of data utilization: (1) data is connected and can be used anytime anywhere; (2) the use of data is controlled so it can be used safely; and (3) everyone cooperates to create new value. These are action guidelines common for both the public and private sectors in order to realize a citizen-centric society that combines economic development and solving social issues (creation of new value) based on a system (a digital twin) that highly integrates physical space (real space) and cyberspace (virtual space). The strategy summarizes issues and measures on seven levels. The issues that each level should focus on in particular are "Trust[4]" in level 5 (Rules), "Platform" in level 3 (Tools) and level 4 (Service Platform), "Development of base data" in level 2 (Data), and "Development and expansion of digital infrastructure" in level 1 (Infrastructure). The National Data Strategy will be carried over to the revised Priority Policy Program in 2023, and the Government will continue to promote measures that should be prioritized.

(2) The European Union (EU)

In February 2020, the European Commission published its European Data Strategy with the aim of creating a single market for data to enhance Europe's international competitiveness and data sovereignty. The strategy describes the aim of creating the European Data Space, which is a single market for data in order to ensure Europe's competitiveness and data sovereignty around the world and to make more data available for socioeconomic activities while maintaining an environment where companies and individuals can manage the data they generate.

In November 2020, the European Commission introduced the European Data Governance Act to promote the sharing of trustworthy data within Europe. The act stipulates the promotion of the reuse of certain data held by the public sector, improved trustworthiness and neutrality in data sharing, and a mechanism for managing the use of data generated by companies and individuals, etc. In May 2022, the act became law, and it will begin to apply 15 months after coming into force.

In addition, the Gaia-X European Association for Data and Cloud AISBL (hereinafter referred to as Gaia-X) was established in 2021 as an international non-profit organization for information infrastructure that links industrial data in nine fields: industry (manufacturing), the green deal, mobility, healthcare, finance, energy, agriculture, the government, and skills. Gaia-X aims to build an ecosystem in which data can be shared and used in a trusted environment and to incorporate key European values, such as interoperability, reversibility, transparency, and cybersecurity into the cloud infrastructure. As of the end of January 2023, 357 companies from within and outside the EU[5] are participants. At Gaia-X, a consortium called IDS, which is differentiated and organized by industry, is examining use cases, such as areas of application and business processes. For example, in the automotive industry, Catena-X, an alliance centered in Germany for sharing data across the automotive value chain, has been established with the aim of enhancing the competitiveness of the automotive industry and reducing CO2 emissions, etc., and it is studying use cases, such as business partner data management, traceability, and quality control.

(3) The U.K.

In September 2020, the Department for Digital, Culture, Media and Sport formulated the UK National Data Strategy. The strategy positions data as a driving force in the economy and trade, and it sets forth various measures to build the world's most advanced data economy while gaining public trust in the utilization of data. Priority issues include: (1) unlocking the value of data across the economy, (2) promoting growth and ensuring trustworthy data systems, (3) transforming government data use to increase efficiency and improve public services, (4) ensuring the security and resilience of the infrastructure on which data depends, and (5) promoting international data flows. The four pillars of efficient data utilization are (1) data foundations, (2) data skills, (3) data availability, and (4) data responsibility.

(4) The U.S.

In the U.S., home to many of the world's largest IT companies, the government has not intervened strongly to promote the use of data in the private sector, but in the public sector, both federal and state level governments are actively undertaking initiatives.

At the federal level, the Federal Data Strategy (FDS), a 10-year vision for the use of federal government data, was formulated and published in February 2019. It is a vision for the integrated use of data security, privacy, and confidentiality by all federal government agencies to serve the public and manage resources. It consists of a mission, 10 principles, 40 best practices, and 20 annual action plans. The principles and best practices guide the management and use of data from the federal government to individual agencies. In addition, the best practices are divided into three categories: "building a culture that values data and promotes public use," "data management and protection," and "promoting the efficient and appropriate use of data." To promote the strategy under strong leadership, a Chief Data Officer (CDO) has been established at each agency, and a Federal Chief Data Officers Council has been established to focus on data sharing between agencies.

[4] "Trust" refers to the trustworthiness of data itself in cyberspace and the trustworthiness of the attributes and sources of data, and it has been pointed out that there is a need for a mechanism that ensures trust when exchanging physical space information.
[5] Four Japanese companies and organizations, EY Consulting & Strategy, NTT Communications, NEC, and the Robot Revolution and Industrial IoT Initiative, are participants as of the end of January 2023.

4. Advanced Initiatives for Data Utilization

Initiatives to promote the use of data in various fields are being carried out in numerous countries, and in Japan progress is being made on examination of the appropriate and efficient use of personal data in education, medicine, etc. and the provision of advanced services by private companies.

(1) Education

The GIGA School Program was launched in December 2019 with the aim of creating an educational environment that is fairly and individually optimized to enable the further development of the qualities and abilities of diverse children without leaving anyone behind by integrating one terminal per person with a high-speed, large-capacity communications network. Due to the COVID-19 pandemic starting in 2020, the development of one terminal per person has been accelerated, and the introduction of the system is expected to be completed in 1,769 municipalities (97.6% of all municipalities) by the end of fiscal 2020.[6] In addition, from the viewpoint of improving individual learning and teacher guidance and support by utilizing educational data, studies on the use of educational data were promoted, and the Roadmap on the Utilization of Data in Education was published in January 2022.

Under such circumstances, various services that strive to utilize data efficiently in educational settings are also being provided by business operators. For example, Google Workspace for Education from Google Inc. is used by more than 170 million students and educators worldwide.[7] In November 2022, Google launched the Google for Education DX Package, which supports DX (digital transformation) in school settings, including elementary schools and junior and senior high schools. Learning logs and other information are centrally managed in the cloud to support analyzing the trajectory of learning and provide learning guidance, etc.

Microsoft also offers Microsoft 365 Education, which is a learning platform that promotes visualization of the education field using data. In addition to the data from Microsoft 365 Education, data from other learning and school affairs systems can be stored, analyzed, and visualized in combination according to the purpose of utilization of the educational data.[8]

An example of the utilization of educational data by local governments is the Shibuya City Board of Education, which has been building an "educational dashboard" that aims to improve school satisfaction through guidance, based on each teacher's understanding of their students, with the aim of realizing the happiness (well-being) for each child. Units such as "whole school," "class," and "individual students" are used to ascertain information from multiple sources.

In addition, initiatives by private cram schools and preparatory schools are progressing to utilize AI to analyze the data they have accumulated and then provide each student with the customized shortest route for learning. For example, the AI tool atama+ was provided to more than 3,100 cram schools and preparatory schools nationwide as of the end of May 2022, and the cumulative number of answers has exceeded 300 million.[9] To realize individualized optimal learning, educational materials are being improved, and the accuracy of recommendations is becoming more precise on a daily basis through the analysis of large amounts of accumulated learning data. By accumulating data on the platform in this way, education is being realized according to the needs of each student.

(2) Medication

In the medical field, the concept of a national medical information platform is being examined for the realization of medical DX. It is expected that the realization of such a platform will lead to the provision of better quality medical care as medical information currently stored and managed individually will be consolidated onto a single platform.

The MDV Data Platform Service is an example of the utilization of medical data as a service for supporting hospital management. It integrates data scattered throughout a hospital, including electronic medical records, medical systems, and other systems, and it enables data analysis from the perspectives of "increased revenue," "work style reform," "quality of medical care," and "improved patient satisfaction."[10] The service is powered by Amazon's AWS cloud service.[11]

Many applications for promoting the health of users are also being provided. Smartwatches, such as Apple's Apple Watch and those offered by Fitbit, which was acquired by Google, can capture the wearer's heart rate, hours slept, physical activity, and other data and store it in the cloud. By linking apps, such as Pep Up, it is possible to integrate and analyze not only the data obtained by a smartwatch but also medical data to promote a person's health.

---

[6] MEXT https://www.mext.go.jp/a_menu/other/index_00001.htm
[7] https://edu.google.com/intl/ALL_jp/workspace-for-education/editions/overview/
[8] https://news.microsoft.com/ja-jp/2022/12/21/221231-introducing-case-studies-and-technologies-for-utilizing-educational-data-to-advance-the-giga-school-initiative/
[9] https://corp.atama.plus/news/2416/
[10] https://www.mdv.co.jp/solution/medical/hospital/mdv_dps/
[11] https://d1.awsstatic.com/local/health/20220324%20MDV%20session%203.pdf

Section 2 Concentrating Data with Platform Providers

In line with increasing volumes of data distribution and advances in data utilization, data is becoming concentrated with some platform providers.

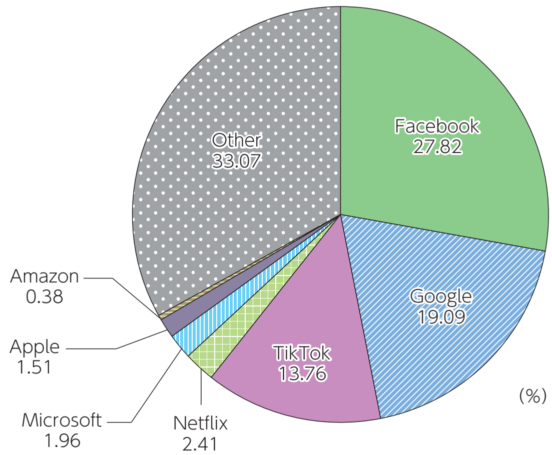
This section provides an overview of the current state and background of data acquisition and storage by platform providers. It also addresses two issues caused by the concentration of data with platform providers, which are "harm to a fair competitive environment" and "concerns about transparency and fairness in the handling of acquired and stored data," and it examines each country's response to these issues.

1. Data Acquisition and Storage by Platform Providers

As information and communications technology have advanced and massive amounts of data have been generated, platform providers have grown rapidly as innovators that continue to generate innovative businesses and markets. Currently, various services offered by platform providers have penetrated deeply into our lives. Using search services to find things what we want to know, communicating on social media and watching videos on the Internet are all part of everyday life for many people.

According to SANDVINE (Canada),[1] Facebook has the largest share of mobile internet traffic by application (company) in the world at 27.82% followed by Google at 19.09%, Tiktok at 13.76%, and Netflix at 2.41% **(Figure 2-2-1-1)**.

Figure 2-2-1-1 Mobile Internet traffic by application (first half of 2022)



(Source) Prepared based on "PHENOMENA (THE GLOBAL INTERNET PHENOMENA REPORT JANUARY 2023)" by SANDVINE.

Furthermore, according to a study by Statista, all five GAFAM (an acronym for Google, Apple, Facebook, Amazon, and Microsoft) companies were included in the top 10 platforms with the most monthly users in the U.S. as of July 2022.

Figure (related data) Platforms with the most monthly unique users in the U.S. (July 2022)
(Source) Statista "Most popular multi-platform web properties in the United States in July 2022, based on number of unique visitors"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00014
(Data collection)

[1] "The Global Internet Phenomena Report January 2023" was compiled by SANDVINE, which collected data from more than 2.5 billion subscribers using more than 500 fixed and mobile telecom operators worldwide. It is important to note that the report covers North America, South America, Europe, Asia, and the Middle East but does not include data from China or India.

Through the provision of various services, platform providers acquire attribute data, such as names, user names, and IP addresses, and various activity data, such as purchasing activities and communications **(Figure 2-2-1-2)**. Considering the large number of users using their services, it is assumed that these platform providers acquire and accumulate huge amounts of data.

Figure 2-2-1-2 Example of data items collected by platform providers

Data item	Platform			
	Google	Facebook	Amazon	Apple
Name	○	○	○	○
User name	–	–	○	–
IP address	○	○	○	○
Search word	○	–	○	○
Content	–	○	–	–
Link between content and displayed ads	○	○	–	–
Time, frequency, and duration of activity	○	○	–	○
Purchasing activity	○	–	○	–
Persons with whom you communicated	○	○	–	–
Activity in third-party apps	○	–	–	–
Browsing history	○	–	○	–

(Source) Prepared using an extract from "The Data Big Tech Companies Have On You" by Security.org

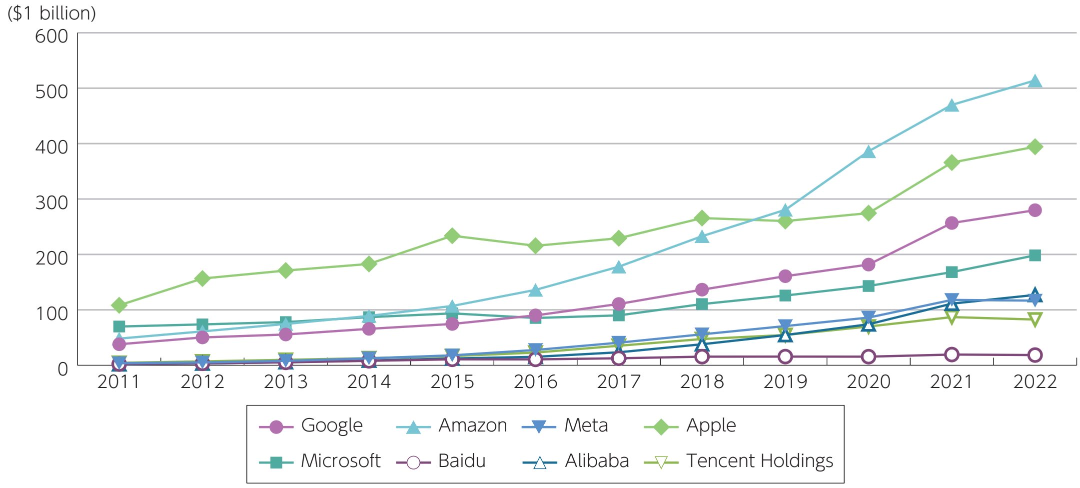
2. Issue (1): Impediments to a Fair Competitive Environment due to Platform Providers Having an Oligopoly on Data

(1) The current status and background

In recent years, GAFAM and other platform providers have established a strong economic position in the digital-related market by utilizing the vast amount of collected data for businesses, etc., and their market dominance has further increased.

As of the end of March 2023, GAFAM were in the top 15 companies by market capitalization in the global digital-related market, with Tencent (7th) and Alibaba (13th) also making the list.[2] Looking at the sales trends of these companies, it can be seen that they have all been expanding sales at a high rate **(Figure 2-2-2-1)**.

Figure 2-2-2-1 Sales trends of major platform providers



(Source) MIC (2023) "Survey Research on ICT Market Trends in Japan and Abroad"

The services provided by platform providers have a network effect,[3] where the more participants a network has the more valuable the network becomes and the more participants it attracts. As a result, services with large numbers of users tend to be able to gain more users and grow in size. This concentration of data with plat-

[2] See Part 2, Chapter 4, Section 6. Platform trends.

[3] The effect of a person joining a network and not only increasing the utility to that person but also increasing the utility to other subscribers is called the "network effect." The network effect can be divided into direct and indirect effects. The "direct effect" is when the utility to subscribers of a network increases as their number increases. The "indirect effect" is when an item (e.g., a hardware device) and its complementary item (e.g., software) are closely related, and as the item is used more, more complementary items corresponding to it are supplied, thereby increasing its utility.

form providers through the network effect and economies of scale, etc. increases the utility to users. And as the platform providers integrate and utilize the data and build business models based on the data, it creates a cycle in which the platform providers further accumulate and utilize data, resulting in them maintaining and strengthening their competitive advantage.[4]

In addition, the services offered by platform providers are said to have high switching costs.[5,6] When the switching cost is high, users are hesitant to switch even if there are other cheaper, higher-quality alternatives. In particular, when a platform provider provides various services that are interlocked, the switching cost becomes higher. As a result, the user is locked in to the service provider, reducing the competition between services.

Concerns about the strengthening of the market dominance of platform providers and the data oligopoly have also been raised in other countries. For example, the U.S. House Committee on the Judiciary conducted a study on digital market competition titled "Investigation of competition in digital markets," and it identified the following as the main issues with respect to platform provider oligopolies:

(1) There is a winner-takes-all market structure because the more users there are due to the network effect, the stronger the ability to attract other users
(2) Platform providers may act as gatekeepers to other business operators entering the market
(3) There are high switching costs when users switch to another service
(4) Online services have structures that make it easy to retrieve and concentrate data

As the market dominance of platform providers increases, there is a risk that other companies may be prevented from entering the business, and competition between companies may be hindered. Platform providers are also in a position to operate and manage their platforms and conduct transactions that disadvantage business operators using their platforms. Currently, a considerable amount of data, such as internet activity history, communication history, and location information, has already been accumulated by some platform operators, and the utilization of such data can provide highly convenient services to users. However, because of the lock-in effect, it is possible that diverse competition utilizing data will not be ensured, and high-quality services will not be provided to users in the medium to long term.

In order to promote the appropriate distribution and utilization of data and create diverse businesses and services utilizing data, it is important to prevent excessive enclosure of data by some business operators and ensure a transparent and sound competitive environment.

(2) Initiatives by each country to ensure a fair and appropriate market environment

In order to ensure a competitive environment in the market, countries are taking measures to strengthen regulations and promote transparency with respect to platform providers and others that are expanding their market dominance.

a Japan

In Japan, the Japan Fair Trade Commission is conducting investigations based on the provisions of the Antimonopoly Act. For example, in 2016, they investigated Apple[7] because it was suspected that while operating the App Store, which lists applications for the iPhone, Apple was restricting the business activities of business operators that provide applications with respect to sales of digital content.[8] In February 2023, the Japan Fair Trade Commission released its “Market Study Report on Mobile OS and Mobile App Distribution” in which it assessed that there was not enough competition in smartphone operating systems and app stores, where the market is split between Apple and Google and that a healthy competitive environment needs to be created.

In addition, in order to improve the transparency and fairness of transactions on digital platforms, the Act on Improving Transparency and Fairness of Digital Platforms (Act No. 38 of 2020) came into force in February 2021. Under the act, companies that provide digital platforms with a particularly high need to enhance transparency and fairness in transactions are designated as "specified digital platform providers.”[9] They are required to report their operational status to users, including advance notice of disclosures and changes to transaction conditions, to ensure fairness in operations and the status of complaint handling and information disclosures.

4 https://www.jftc.go.jp/dk/guideline/unyoukijun/dpfgl.html
5 The switching cost is the financial, procedural, and psychological burden incurred by an individual to switch from the product or service the individual is currently using to another alternative product or service.
6 The Ministry of Economy, Trade and Industry, the Japan Fair Trade Commission, and the Ministry of Internal Affairs and Communications (2018) "Summary of interim issues concerning the development of a trading environment for digital platform providers"
7 Apple submitted an improvement measures offer, such as revising the provisions of the related guidelines. The Japan Fair Trade Commission examined the offer and found that the above issue would be resolved. Therefore, the review was concluded after confirming that Apple would implement improvement measures in the future. https://www.jftc.go.jp/houdou/pressrelease/2021/sep/210902.html
8 Suspected violation of the provisions of Article 3 (Private Monopolization) or Article 19 (Unfair Trade Practices, Paragraph 12 [Trade Subject to Constraints], etc.) of the Antimonopoly Act
9 As of October 2022, in the comprehensive online retail mall category, three companies, Amazon, Rakuten, and Yahoo, were subject to restrictions. In the app store category, two companies, Apple/iTunes and Google LLC, were subject to restrictions, and in the online advertising category, three companies, Google, Meta Platforms, and Yahoo, were subject to restrictions.

b The U.S.

In the U.S., there has not been much movement to regulate companies, including platform providers, which are private companies, but in recent years there have been moves to strengthen regulations on platform providers from the perspective of competition policy. In July 2019, the Department of Justice (DoJ) announced a major antimonopoly investigation of GAFA (an acronym of Google, Apple, Facebook, and Amazon), and a hearing on antitrust laws with respect to GAFA was held before the U.S. House Committee on the Judiciary in July 2020.

In October 2020, the DoJ filed an antitrust lawsuit against Google, alleging that its search service had a market monopoly, which violated antitrust laws. In January 2023, the DoJ and eight states filed a lawsuit against Google's internet advertising business for alleged partial antitrust violations and sought a partial separation of its advertising business.

c The EU

In Europe, the Digital Market Act (DMA) and the Digital Service Act (DSA) have been developed as the Digital Service Act Package to solve various online issues, such as the significant evolution of platform services, increasing concentration and power imbalances, and new problems, such as disinformation.

The DMA,[10] which aims to create an open digital marketplace, imposes obligations on providers of large core platform services identified by the European Commission as gatekeepers[11] to prohibit unfair service delivery and data handling. It stipulates that gatekeepers should do specific things, these include: (1) allow third-party services to interoperate with gatekeeper services under certain conditions; (2) allow business users to access data generated using the gatekeeper platform; and (3) allow business users to enter into contracts with customers outside the gatekeeper platform. It also stipulates that gatekeepers should not do specific things, these include: (1) display their own services and products in preference to other services on the platform; (2) prevent users from linking to companies outside the platform; and (3) track users on services other than the gatekeeper's platform services for targeted advertising purposes without obtaining valid consent. If a gatekeeper violates these obligations or prohibitions, the European Commission can impose a fine equivalent to up to 10% of the previous fiscal year's global sales.

d China

In August 2022, the Anti-Monopoly Law was amended to include measures aimed at platform operators that prohibit operators with a dominant market position from abusing their position by using data, algorithms, technology, platform rules, etc.

3. Issue (2): Concerns about transparency and appropriateness of data acquisition and utilization by platform providers

(1) The current status and background

As mentioned above, through the provision of services, platform providers have acquired a range of data from a huge number of users, and they have used that data to grow their businesses. One example is its use in digital advertising.

The digital advertising market continues to grow at a high rate, and when we look at global advertising spending by medium, digital advertising is expected to reach \$394.4 billion in 2022 (up 13.7% year on year).[12] In Japan, of the 2,480.1 billion yen (115.0% year on year) spending on internet advertising media in 2022, search-linked advertising spending was 976.6 billion yen (122.2% year on year), video advertising spending was 592 billion yen (115.4% year on year), and social advertising spending, such as for social media and video sharing, was 859.5 billion yen (112.5% year on year); thus, spending in each area grew significantly.[13]

Google and Facebook, which offer advertising services that link with search engines and social media, earn more than 80% of their revenue from advertising by connecting their platforms, which serve as places for people to gather, with their advertising businesses. In 2022, Google's ad revenue was about \$224.5 billion (79.4% of total revenue), and Facebook's ad revenue was about \$113.6 billion (97.5% of total revenue). Together, the two companies made about \$338.1 billion (44,461.5 billion yen). Considering that the Japanese advertising market is 7,102.1 billion yen, we can see how huge this amount is **(Figure 2-2-3-1)**.

---

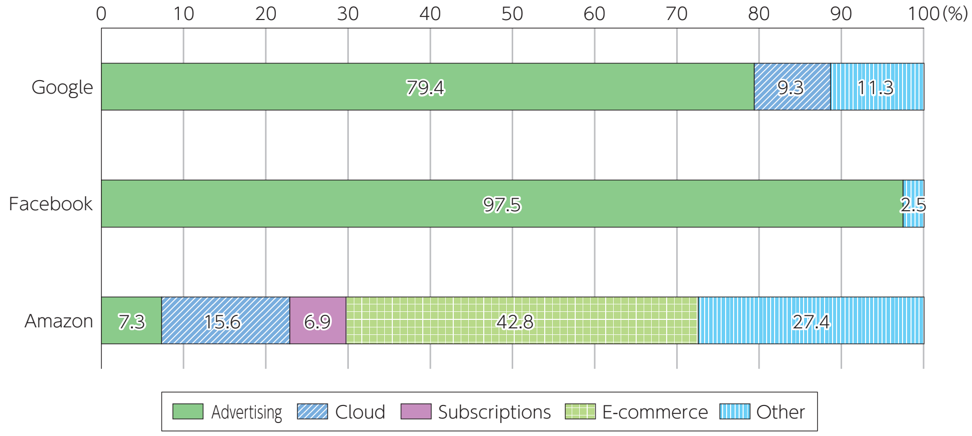
[10] The DMA came into effect on May 2, 2023, but with respect to preparatory work, including the adoption of enforcement rules and guidelines, the DMA actually began to apply from November 1, 2022.

[11] The European Commission's criteria for identifying gatekeepers include annual regional sales of at least €7.5 billion over the past three years or an average stock market capitalization of at least €75 billion in the previous fiscal year as well as at least 45 million monthly users of platform services in the region and at least 10,000 annual business users.

[12] "Global Ad Spend Forecast (2022 to 2025)" (Dentsu Group) https://www.group.dentsu.com/jp/news/release/000888.html

[13] "Detailed Analysis of Japan's Advertising Expenditures on Internet Advertising Media in 2022" (Dentsu Group) https://www.dentsu.co.jp/news/release/2023/0314-010594.html

Figure 2-2-3-1 Advertising spending as a percentage of platform provider sales (2022)



(Source) Prepared based on the published data of each company

Against this backdrop, countries are investigating and prosecuting the use of data by platform providers **(Figure 2-2-3-2)**.

Figure 2-2-3-2 Cases of investigation and prosecution of platform providers

Overview	Details
Use search data to lower search rankings of other companies' shopping sites (Google)	• In December 2017, the European Commission sued Google for using user search data to rank its Google Shopping service higher than other similar services. In November 2021, the European General Court upheld the European Commission's complaint. • In February 2022, Swedish price comparison service PriceRunnner sued Google for similar reasons.
Leverage data from third-party sellers who use Amazon to develop their own products (Amazon)	• In 2020, the Wall Street Journal reported that Amazon was using sales data for third-party products to develop its own products. • In April 2022, the U.S. Securities and Exchange Commission (SEC) began investigating the case.
Facebook linked to Facebook Marketplace (Meta)	• In December 2022, the European Commission linked Facebook to Facebook Marketplace, an advertising service for the sale of goods between individuals, and warned Meta for distorting competition in the market for similar services. • The European Commission also pointed out that Meta imposes adverse conditions on competing business operators that advertise on Facebook and Instagram, which allowed them to leverage data related to competing ads.

(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

(2) Consumer awareness

Major platform providers acquire and analyze personal data, such as end user attribute information, location information, purchase histories related to e-commerce, and viewing histories related to video and music distribution, and they provide value-added services, such as presenting advertisements and content according to the preferences of each end user. Meanwhile, there are also growing concerns about transparency and fairness in the acquisition and handling of such data by platform providers. The Ministry of Internal Affairs and Communications conducted a questionnaire survey of consumers in Japan, the U.S., Germany, and China in order to understand their attitudes toward the acquisition, accumulation, and use of data by major platform providers.

First, consumers in each country were asked about their experiences using internet services provided by major platform providers (multiple responses). Across all countries, Google Maps (66.5%), YouTube (63.8%), Amazon (online shopping) (61.3%), Gmail (56.1%), Google Search (55.3%), and Facebook (50.2%) were the most used. In Japan, the most used were YouTube (79.1%), Gmail (65.2%), and Google Maps (63.6%). In China, the percentage of user's using their own country's services was high, including WeChat (90.8%), WeChat Pay (88.6%), and Alipay (85.3%).

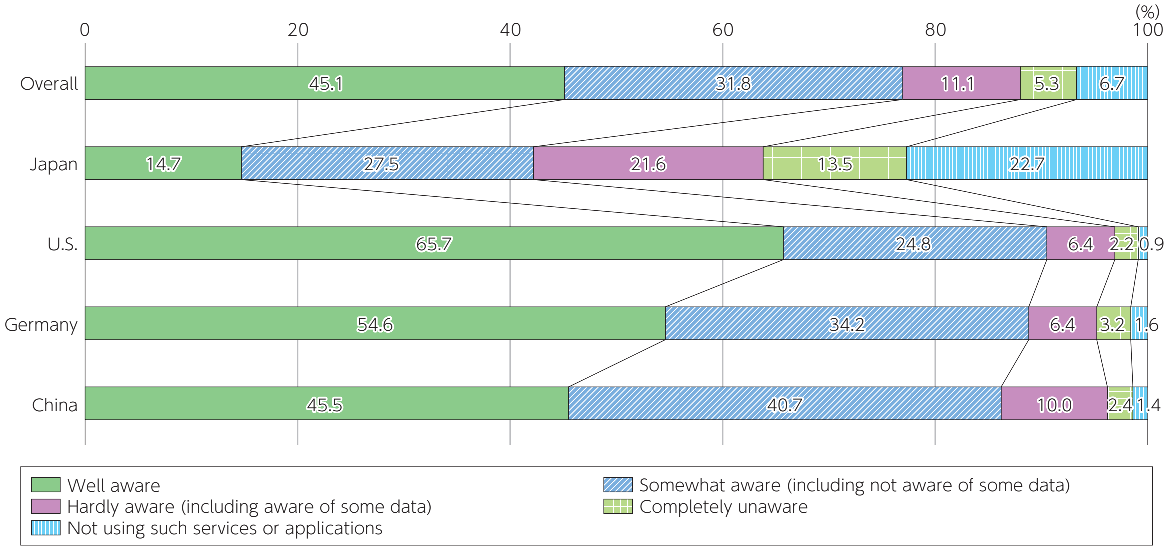
Figure (related data) Services that individuals have used (multiple responses)
Source: MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00020
(Data collection)

Next, when asked whether or not they were aware they were providing their personal data to platform providers when using these kinds of services and applications, the U.S. had the highest percentage of respondents who answered that they were aware (the sum of “Well aware” and “Somewhat aware”) at 90.5%. In Japan the percentage was 42.2% **(Figure 2-2-3-3)**.

Looking at the presence or absence of anxiety, Germany had the highest number of respondents who answered that they felt concerned (the sum of “Very concerned” and “Somewhat concerned”) at 66.5%. In Japan the percentage was 58.4% **(Figure 2-2-3-4)**.

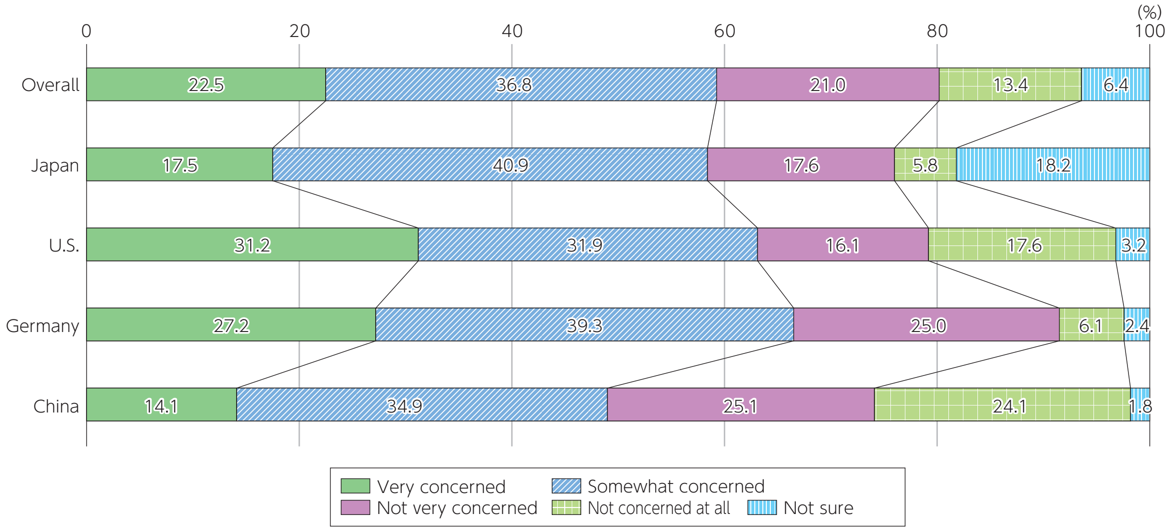
In all four countries, more than 50% said they felt concerned even when they were not aware they were providing personal data.

Figure 2-2-3-3 Awareness regarding the provision of personal data



(Source) MIC (2023) “Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information”

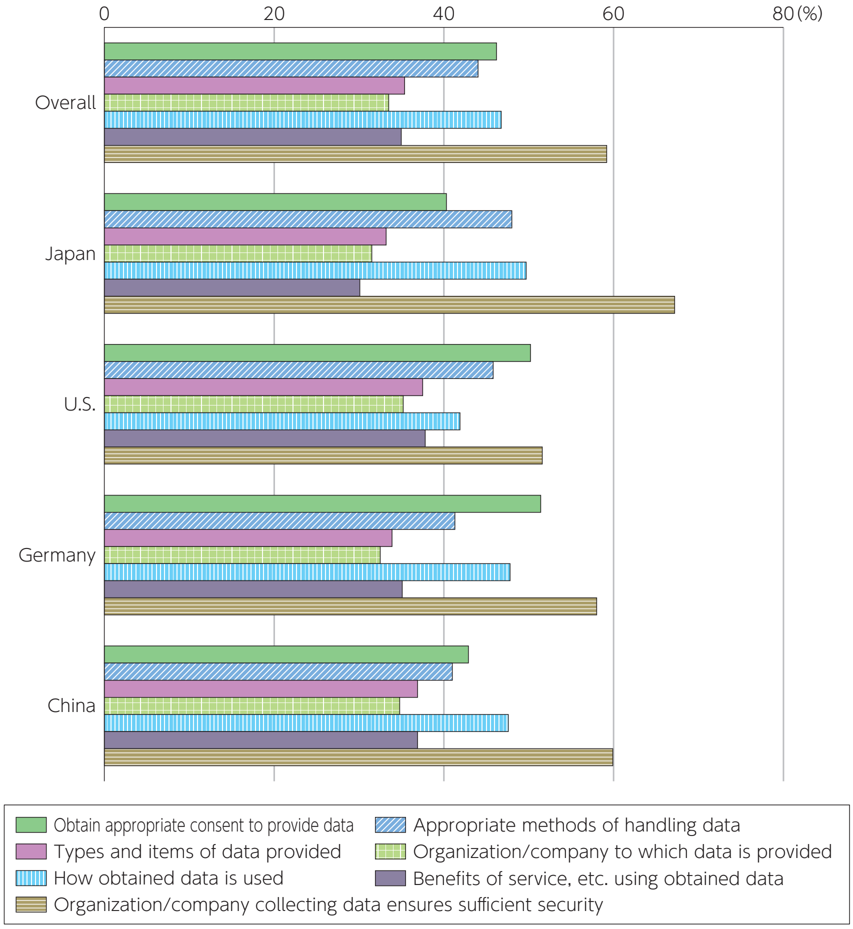
Figure 2-2-3-4 Concerns over the provision of personal data



(Source) MIC (2023) “Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information”

When asked to prioritize the most important aspects of providing personal data to platform providers, “Organization/company collecting data ensures sufficient security” was the highest in all four countries. Looking at the countries individually, in Japan, the most common responses were “Organization/company collecting data ensures sufficient security” (67.2%), “How obtained data is used” (49.7%), and “Appropriate methods of handling data” (48.0%). In the U.S. and Germany, "Obtain appropriate consent to provide data" was the second highest **(Figure 2-2-3-5)**.

Figure 2-2-3-5 Points to consider when providing personal data

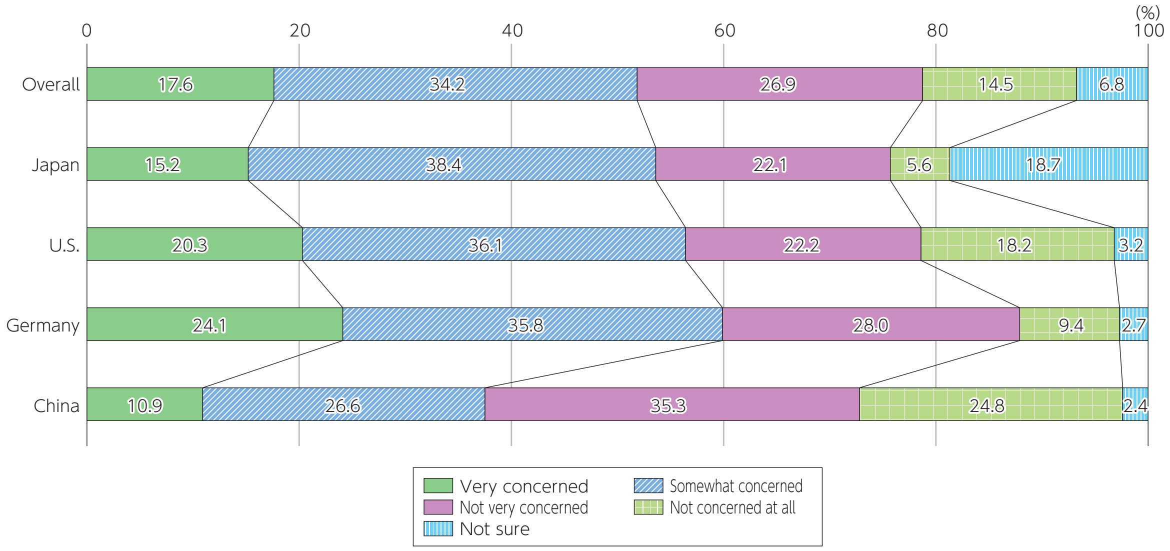


(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

In addition, when asked how they felt about seeing personalized (optimized) search results and advertisements associated with their use of such services, the percentage of respondents who answered that they feel concerned (the sum of "Very concerned" and "Somewhat concerned") exceeded 50% in all three countries except China, at 37.5% **(Figure 2-2-3-6)**.

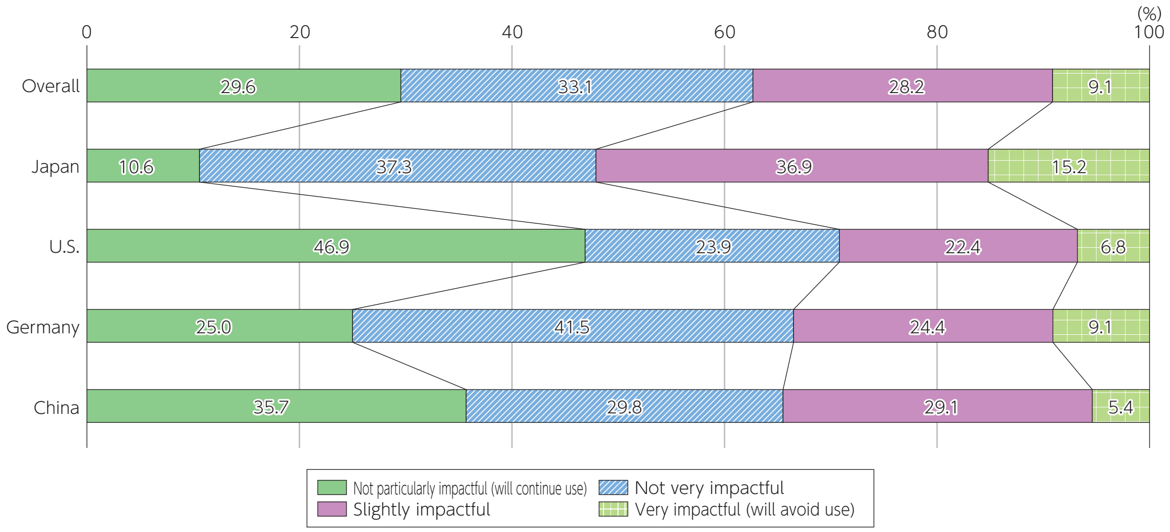
When asked whether the presentation of user-optimized advertisements had an impact on their use of the services and applications provided by major platform providers, approximately the same percentage of respondents in Japan that answered it was impactful (the sum of "Slightly impactful" and "Very impactful") also answered that it was not impactful (the sum of "Not particularly impactful" and "Not very impactful"). In the other three countries, 60 to 70% of respondents answered that it was not impactful **(Figure 2-2-3-7)**.

Figure 2-2-3-6 Concerns over the display of personalized search results and advertisements, etc.



(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

Figure 2-2-3-7 Impact of the display of personalized advertising on usage



(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

As platform providers provide a variety of services necessary for people's daily lives, they are now acquiring and accumulating more sensitive data. Widespread profiling of such data to provide recommendations has improved convenience for users, but it has also increased the likelihood that users can be unwittingly influenced by the results. In order to eliminate concerns about the handling of personal data and enable users to use individually optimized digital services with peace of mind, it is important to eliminate situations where users cannot see how data is collected and utilized and ensure data is handled appropriately.

(3) Initiatives by countries to ensure the transparency and appropriateness of data distribution and utilization

As part of the development of laws for the protection of personal information, each country is regulating and responding to privacy violations caused by the collection and analysis of digital data. In addition to regulations that impose penalties in the event of violations, other means also exist, such as users having the right to request that their information is deleted and a framework by which users can check the details of how their data is analyzed by platform providers.

In addition to legislation protecting personal information, some countries impose obligations on business operators, including platform providers, regarding the proper handling of user information.

a Japan

In Japan, the Act on the Protection of Personal Information was revised in 2020, and it came into full force in April 2022. In order to protect the rights and interests of individuals, the 2020 amendment of the act stipulates that individuals can request the suspension or erasure of their personal data when their rights or legitimate interests are likely to be harmed, and it allows individuals to request disclosure of records provided by third parties concerning the transfer of personal data. In addition, under the opt-out provision,[14] the scope of personal data that can be provided to third parties is limited, and (1) personal data that has been illegally obtained and (2) personal data provided under the opt-out provision are excluded. In addition, although it does not fall under the category of personal data at the source, regarding the provision of information to a third party that is considered to become personal data for the recipient, the recipient is required to confirm that the consent of the individual has been obtained.[15]

In June 2023, the Act Partially Amending the Telecommunications Business Act (Act No. 70 of 2022) came into force. The act requires telecom operators that provide telecommunications services that have a significant impact on the interests of users to submit regulations on the handling of specified user information and publish their information handling policies, etc. In addition, when such an operator transmits information about users to external parties from the user's device, it is obligated to provide an opportunity for confirmation by doing the following: (1) notify the user in advance or placing the information in a state so that the user can easily check it (notification and publication), (2) obtain the user's consent in advance (obtaining consent), or (3) take opt-out measures (opt-out).

b The U.S.

In the U.S., there is currently no comprehensive federal law on the protection of personal information, and states have different laws and regulations. In January 2020, California enacted the California Consumer Privacy Act (CCPA), the nation's first comprehensive privacy law. The law grants consumers eight privacy rights, including the right to request that their personal information be deleted.

Also, in November of the same year, the California Privacy Rights Act (CPRA), which builds on the CCPA, was passed. It made it mandatory to establish opt-out measures for cross-site tracking using third party cookies, etc. Since the enactment of the CCPA, other states, including Virginia and Colorado, have started to adopt laws modeled on the CCPA.[16]

Following on from this, in June 2022, a draft of the American Data Privacy and Protection Act (ADPPA) was published. The legislation would give consumers the right to access, modify, and delete their own data held by business operators, and it would prohibit business operators from collecting and using data for purposes other than those that fall under the 17 items specified in the act. If the act becomes law, it is expected to become the first comprehensive privacy protection law at the federal level.

c The EU

In the EU, the General Data Protection Regulation (GDPR) came into force on May 25, 2018. This regulation grants individuals various rights, including the right to request the deletion of data, the right to object to data profiling, and the right to data portability.[17] The establishment of such rights is expected to ensure the protection of personal data, promote competition by preventing personal data from being locked away, create innovation from the use of personal data, and improve user convenience by promoting sharing of personal data under the control of users. Business operators are required to obtain an individual's explicit consent to collect and use personal data and to implement appropriate security measures for the risks associated with data management and processing. Violations of the GDPR can result in fines of up to 4% of the violating business's global annual revenue (€20 million if the figure is below €20 million).[18]

In addition, the Digital Service Act (DSA),[19] which aims to define online safety and fundamental rights, stipulates that platform providers have an obligation to protect users in accordance with the size of the business operator. In addition to ensuring transparency in online advertising (the obligation to indicate that an advertisement is an advertisement and the advertiser and the main parameters used in the decision to display the advertisement) and obtaining consent for targeted advertising, very large platform providers[20] have additional obligations regarding transparency in online advertising and recommendation systems.

---

[14] It is a system that allows personal data to be provided to a third party without the consent of the person after the items of personal data to be provided are made public under the premise that use of the data will be subsequently discontinued if the individual requests that.

[15] https://www.ppc.go.jp/files/pdf/200612_gaiyou.pdf

[16] For example, in July 2021, Colorado passed the Colorado Privacy Act, which gives consumers the right to access, correct, or delete personal data collected by target business operators and the right to refuse not only the selling of but also the collection or use of personal data (opt-out) while also requiring target business operators to protect personal data and disclose clear, understandable, and transparent information to consumers about how they use the data. https://www.jetro.go.jp/biznews/2021/07/509ba52fe4ead2e9.html

[17] (1) The right to receive personal data that an individual has provided to a business operator, etc. in a form that is easy for the individual to reuse, and (2) the right to transfer personal data directly to another business operator, etc. if it is technically feasible to do so

[18] In Europe, there have been 1,591 cases of GDPR-related fines from when the GDPR came into force up to the end of February 2023, with the fines totaling €2.7 billion. The most common reasons for punishment were "Insufficient legal basis for data processing" at 32% followed by "Violation of general data processing principles" and "Insufficient technical or organizational measures to ensure information security." These top three reasons accounted for nearly 75% of the total.

[19] The effective date of the Digital Services Act is February 17, 2024, but some provisions were brought forward and became effective as of November 16, 2022.

[20] Those designated by the European Commission (including search engines) with an average of 45 million or more monthly active users in the EU

d China

In September 2021, China enacted the Data Security Law, which clearly defines the concept of data, establishes basic systems, such as data classification and grading protection, risk assessment, monitoring and early warning, and emergency responses. It also defines the obligations to be fulfilled when performing data handling activities.[21]

Furthermore, in November 2021, the Personal Information Protection Law, the first basic law regarding the protection of personal information in China, was enacted. The law stipulates obligations regarding collecting, processing, and transferring personal information for the handlers of personal information, the rights of individuals with respect to the handling of their personal information, and discriminatory pricing using algorithms and other means by internet platform providers regarding personal information.[22,23]

---

[21] https://www.pwc.com/jp/ja/services/digital-trust/privacy/china-security.html
[22] With regard to the Data Security Law and the Personal Information Protection Law, etc., there are many provisions in which the definitions of terms used in the provisions, specific issues, such as various evaluations and examinations, and the scope of regulations are unclear, and issues are still being pointed out from the perspective of transparency and predictability.
[23] https://www.jetro.go.jp/biznews/2021/08/68d3caa207694e4e.html

Section 3 Spreading Disinformation and Misinformation on the Internet

With the spread of various digital services, such as social media and video streaming and posting websites, all parties have become distributors of information, and vast amounts of information and data are distributed on the Internet, making it easy for anyone to obtain it. This section reviews what is happening on the Internet in relation to information and data distribution in the context of this information explosion, and it analyzes the responses of each country.

1. The current status

(1) The spread of the attention economy

In a society overloaded with information, as the attention or time we can afford becomes scarce compared to the growing volume of information, it gains economic value (the attention market).[1] This economic model is commonly referred to as the attention economy. Platform providers use data to predict what users will respond to most strongly in order to capture as much attention as possible for as long as possible, and the rise of platform providers has led to a growing attention economy on the Internet.

With a vast amount of information circulating on the Internet, extreme titles and content and non-factual articles created solely based speculation are generated on platforms in order to attract more attention and clicks from users, resulting in the attention economy being structured in a way that encourages the spread of disinformation and misinformation and flaming on the Internet.[2]

(2) Filter bubbles and echo chambers

People have a psychological trait called confirmation bias, which is a tendency for people to see what they want to see and believe what they want to believe. Platform operators combine and analyze (profile) collected data, such as the click history of individual users, and preferentially distribute information that users may be interested in, such as content recommendations and targeted advertisements. The algorithmic functions used by such platform operators enable users to obtain the information they desire from the vast amount of information and data on the Internet.

However, by continuing to receive information distributed by algorithmic functions, users tend to only gain information related to their own interests. This is called a "filter bubble" surrounded by a film of information. Many thoughts and opinions similar to their own are gathered inside this bubble, and opposing thoughts and opinions are eliminated (filtered out), making it difficult to notice the existence of such thoughts and opinions.

In addition, communication on social media and other websites that gather users with similar interests results in what is called an "echo chamber," where opinions similar to those a user has expressed are sent to them, resulting in specific opinions and ideas being amplified. By repeatedly hearing similar opinions, people tend to believe that they are correct and cannot be mistaken.

It has been pointed out that group polarization is occurring on the Internet due to filter bubbles and echo chambers.[3] People with extreme views and ideas tend to be unable to accept others who have different ideas and refuse to have discussions with them. Bias in opinions and ideas on the Internet caused by filter bubbles and echo chambers can lead to social divisions and endanger democracy.[4]

(3) The distribution of illegal and harmful information

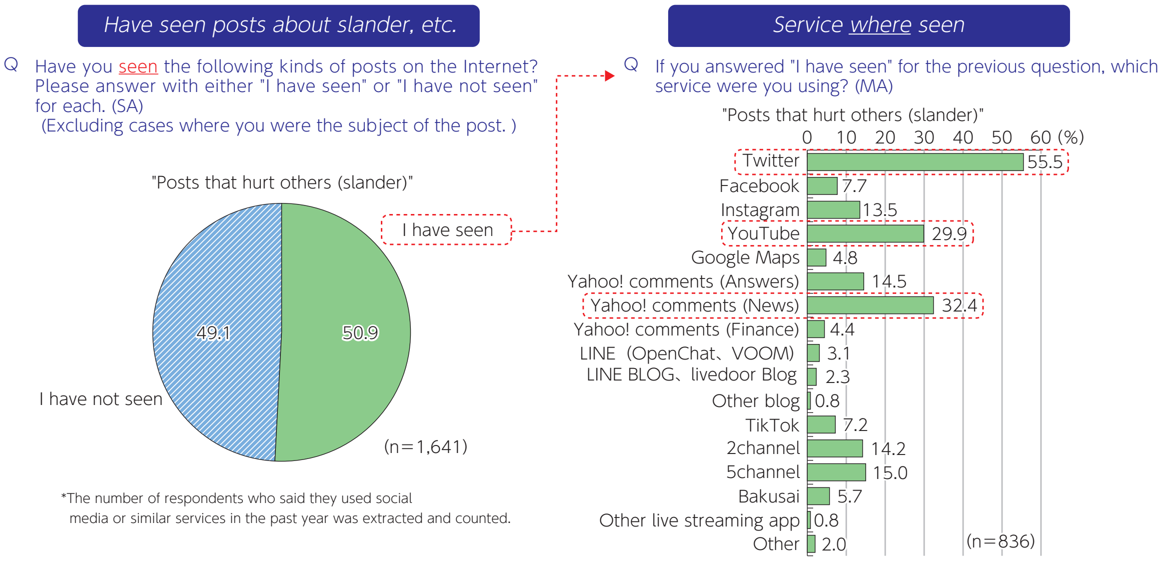
The number of consultations received by the Illegal and Harmful Information Consultation Center (Illegal Harmful Hotline), which is operated by the Ministry of Internal Affairs and Communications, continues to remain high, with 5,745 consultations in fiscal 2022.

In 2022, the human rights bodies of the Ministry of Justice started remedial procedures on 1,721 cases of information-related human rights violations on the Internet and completed the handling of 1,600 cases of human rights violations, with the numbers of both continuing to remain high.

According to a questionnaire survey[5] conducted on social media users, about half (50.9%) of respondents said they had seen hurtful posts on the Internet (slander) **(Figure 2-3-1-1)**. In addition, 8% of people who used social media in the past year said they had been the victim of hurtful posts (slander).

[1] "How to Face the Digital Space: Realizing Informational Health" by Fujio Toriumi and Tatsuhiko Yamamoto (Nikkei Premium Series)
[2] Joint proposal by Fujio Toriumi and Tatsuhiko Yamamoto, "Toward a Wholesome Platform for Speech - Digital Diet Statement Ver. 1.0"
[3] Cass R. Sunstein (2001) "Is the Internet the Enemy of Democracy?" Sunstein points out that group polarization occurs on the Internet since many individuals and groups make various choices on it that trap them in self-created echo chambers, where they repeatedly encounter radical opinions that they will come to believe if a large number of people support those opinions.
[4] Joint proposal by Fujio Toriumi and Tatsuhiko Yamamoto, "Toward a Sound Speech Platform - Digital Diet Statement Ver. 1.0"
[5] Material 2 for the 40th session of the MIC Platform Service Study Group, "Questionnaire survey on the distribution of illegal and harmful information on the Internet" by Mitsubishi Research Institute

Figure 2-3-1-1 Questionnaire survey of social media users (personal experience)



(Source) MIC Platform Service Study Group (40th meeting) - Material 2

(4) The spreading of disinformation and misinformation

In recent years, the chance of coming into contact with fake news and disinformation (hereinafter referred to as disinformation and misinformation) on the Internet has increased worldwide. After the COVID-19 pandemic started in 2020, disinformation and misinformation that included false rumors and conspiracy theories regarding the infectious disease flooded the Internet, prompting the World Health Organization (WHO) to call the phenomenon an infodemic[6] and warn the world.

According to the OECD, more than half of people living in Europe said they had been exposed to untrue or doubtful information or content on an internet news site or social media in 2021. Of those, 26% said they checked the veracity of online information.[7]

The problem of disinformation and misinformation spreading on the Internet is also growing in Japan. In a survey conducted by the Ministry of Internal Affairs and Communications in March 2022,[8] about 30% of people in Japan reported being exposed to disinformation at least once a week (the sum of "Every day or almost every day" and "At least once a week"). Regarding the media services where people saw disinformation, the highest was "Social media," which alone exceeded 50% of the total, followed by "Television" and "News distribution through portal sites and social media."

With platform services, such as social media, even ordinary users can easily transmit (write) information, so disinformation and misinformation tends to spread easily, and this is thought to be one of the reasons why people often encounter disinformation and misinformation on social media.

Figure (related data) Media services in which disinformation was seen
Source: MIC "Fiscal 2021 Survey on Awareness of Disinformation in Japan and Other Countries"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00027
(Data collection)

With the spread of the attention economy, much disinformation and misinformation is created to earn advertising revenue, and it is spread and amplified by bots. For example, in the 2016 U.S. presidential election, students in the Republic of North Macedonia spread a large amount of disinformation and misinformation to earn advertising revenue. In Japan too, there was a case of a website distributing xenophobic disinformation and misinformation under the guise of a news site, and the creator said in an interview that his aim was to earn revenue.[9]

In recent years, there have also been cases of intentional and unintentional spreading of fake images and videos created using deepfakes **(Figure 2-3-1-2)**. It has already become possible for anyone to easily create a fake image by simply entering a few words, and there are indications that deepfake technology is spreading.[10]

[6] Infodemic is a term coined by combining "information" and "pandemic" to describe the rapid spread of rumors of unknown authenticity and disinformation that affect society.
[7] OECD: https://www.oecd-ilibrary.org/docserver/07c3eb90-en.pdf?expires=1675066821&id=id&accname=guest&checksum=4A71EF2A7DBE53A8437167C071FEAFD4
[8] MIC "Fiscal 2021 Survey on Disinformation Awareness in Japan and Other Countries"
[9] Presentation material of Shinichi Yamaguchi, Associate Professor, Center for Global Communications (GLOCOM), International University of Japan at the 14th session of the Ministry of Internal Affairs General Policy Committee
[10] https://www.soumu.go.jp/main_content/000867454.pdf

Figure 2-3-1-2 Recent deepfake cases

Year	Area	Details
2021	U.S.	A mother was arrested for allegedly using deepfake technology to create obscene images and videos of her daughter's cheerleading teammates in order to get them removed from the team.
	Europe	European MPs conducted video conference calls with Russian MPs unaware that they were watching deepfakes.
2022	Global	A video of President Zelensky talking about surrendering to Russia was posted on YouTube.
	Japan	Stable Diffusion was used to create a hoax image of flooding in Shizuoka Prefecture caused by a typhoon, which was posted on Twitter.
	U.S.	The image generation AI called NovelAI Diffusion used images from the website Danbooru that may be reproducing other people's copyrighted works without permission for AI learning.
	UK	Pornographic videos of women campaigning against non-consensual deepfake pornography were created and published on Twitter.
2023	U.S.	A political activist created a video of President Biden announcing the start of World War III. The creator explained that it was created with AI, but many people shared the video without explanation.
	U.S.	The founder of Bellingcat used Midjourney to create and publish a fake image of former President Trump being arrested that went viral on Twitte.

(Source) Prepared based on various websites

The distribution and spread of disinformation and misinformation on the Internet makes it difficult for users to accurately understand and make appropriate decisions that are based on diverse sources of information, so there is a risk that users will not be able to use digital services with confidence and trust. It has also been pointed out that the distribution of disinformation and misinformation may lead to social divisions and consequently to crises in democratic societies.[11]

2. Consumer awareness of the characteristics of social media and other platform services

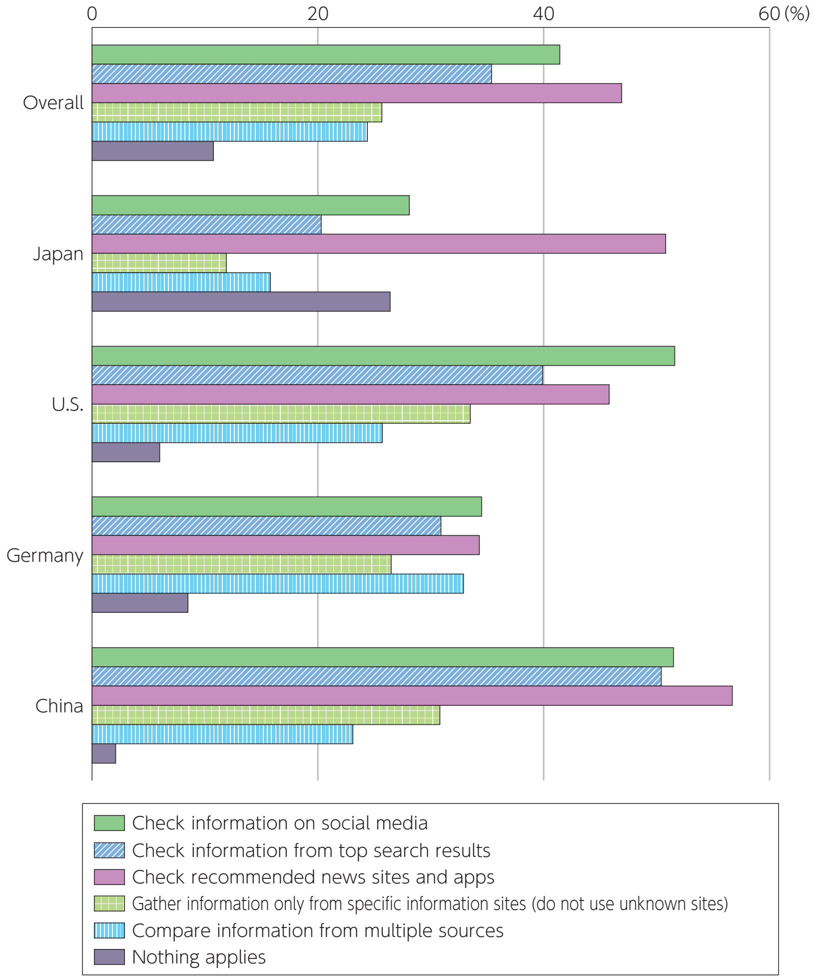
While the use of platform services, such as social media, has become common, their characteristics have exacerbated issues, such as the spread of slander, etc. on platforms, the spread of disinformation and misinformation, and the uneven distribution of information due to filter bubbles and echo chambers.

The Ministry of Internal Affairs and Communications conducted a questionnaire survey[12] of consumers in Japan, the U.S., Germany, and China in order to understand the actual state of their usage behavior and the characteristics of platform services, such as social media.

First, we asked people what they do when they want to get the latest news online. In all of the countries covered, the results from highest to lowest were: "See the information recommended to me by news sites and apps," "See information on social media," and "See information displayed at the top of search results" **(Figure 2-3-2-1)**. In Japan, the majority of respondents focused on "See the information recommended to me by news sites and apps," and the percentage of respondents who answered "Compare information from multiple sources" was lower than in other countries. Looking at Japan by age group, the percentage of respondents who answered "Compare information from multiple sources" increased with age.

[11] MIC "Second Summary of the Platform Service Study Group" (August 2022)
[12] Web survey of people living in Japan, the U.S., Germany, and China; age (20s, 30s, 40s, 50s, 60s, or older); sex (male and female); number of collected responses: 4,000 (Japan 1,000, the U.S. 1,000, Germany 1,000, and China 1,000); implemented in February 2023

Figure 2-3-2-1 What to do when you want the latest news online (Japan, U.S., Germany and China)



(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

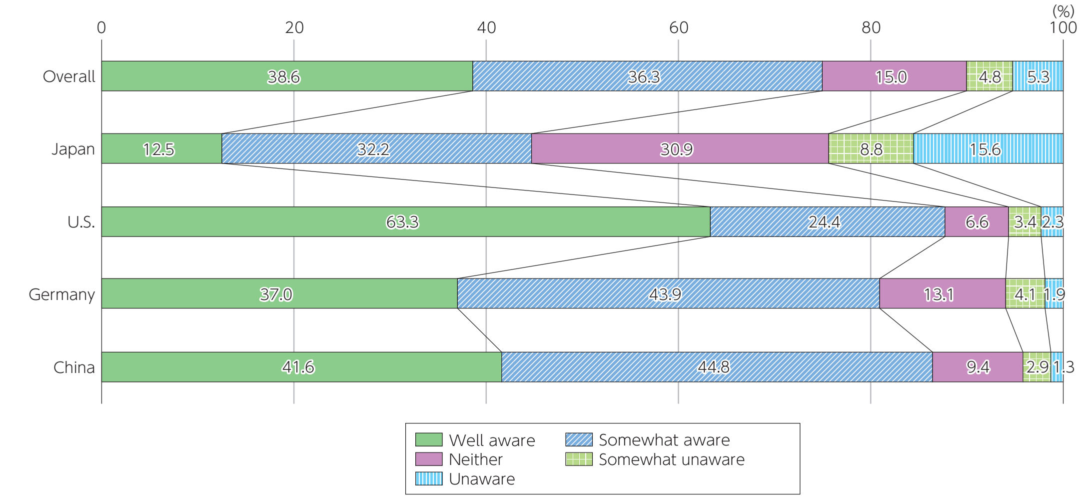
The questionnaire survey also asked questions regarding the characteristics of platform services, such as social media.

When asked whether they were aware that information displayed in search results and on social media is optimized (personalized) for the users, the percentage of respondents in Japan who answered they were aware (the sum of "Well aware" and "More or less aware") was lower (44.7%) than in the other surveyed countries (80% to 90%) **(Figure 2-3-2-2)**.

In Japan, when asked about the possibility that the accounts and content recommended on platform services, such as social media, are accounts and content that the service providers want the user to see, 38.1% of respondents in Japan answered that they were aware (the sum of "Well aware" and "More or less aware"), which is lower than in the other surveyed countries **(Figure 2-3-2-3)**.

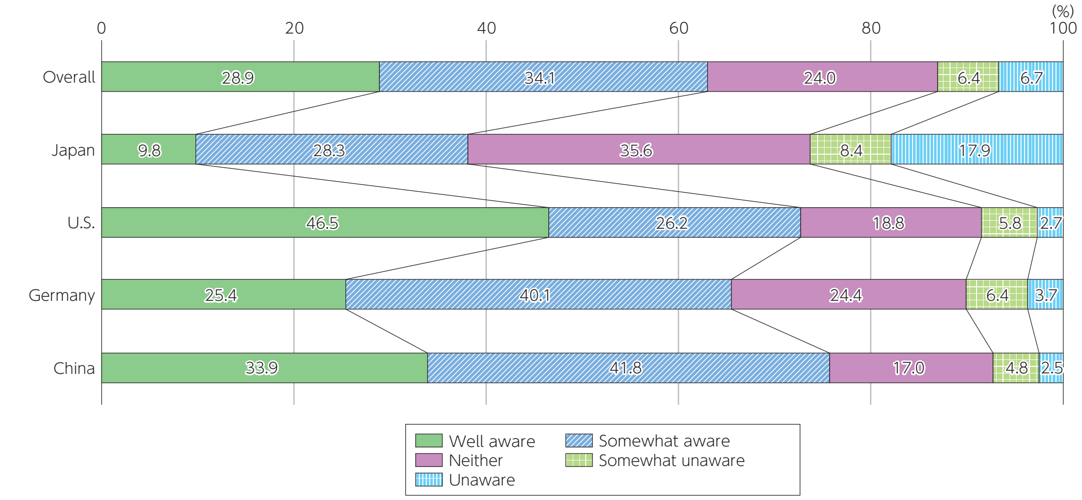
In addition, when asked about the likelihood of information that is close to their own opinions and way of thinking being displayed on social media, etc., 38.1% of respondents in Japan answered that they were aware (the sum of "Well aware" and "More or less aware"), which is lower than in the other three countries, where it was 70 to 80%. Looking at Japan by age group, those in their 50s and 60s or older were less likely than other generations to answer that they were aware **(Figure 2-3-2-4)**.

Figure 2-3-2-2 Awareness of whether or not the information displayed in search results, social media, etc. is personalized



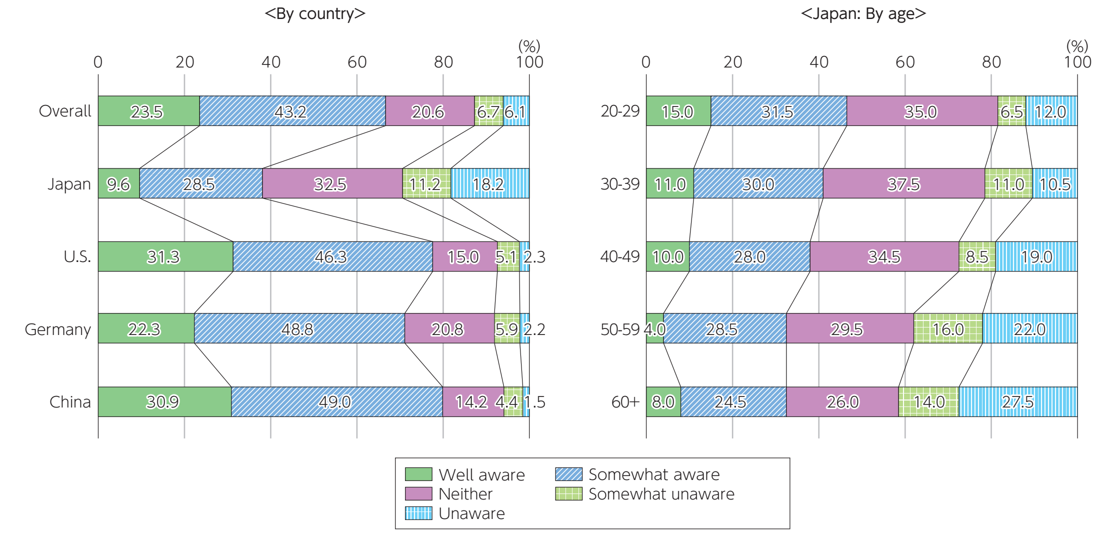
(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

Figure 2-3-2-3 Awareness of whether or not the service provider is presenting you with accounts or content they want you to see



(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

Figure 2-3-2-4 Awareness of the tendency for opinions and information close to your own views to be displayed in social media, etc.



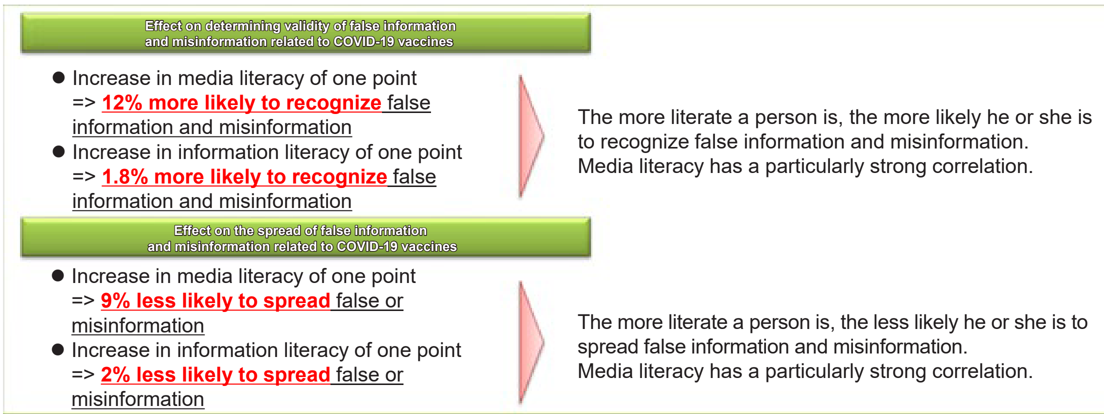
(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

3. Digital literacy

Improving digital literacy is very important in order to prevent being misled by illegal and harmful information or disinformation and misinformation and to prevent the spread of such information.

A field study on disinformation and misinformation in Japan[13] found that the higher the media literacy of an individual, the more likely they would recognize disinformation and misinformation and the less likely they were to spread disinformation and misinformation **(Figure 2-3-3-1)**.

Figure 2-3-3-1 Regression analysis of media literacy and information literacy and the behavior of judging and spreading disinformation and misinformation



(Source) Innovation Nippon Report (April 2022) "Understanding the Reality of Disinformation and Misinformation in Japan and Examining Social Countermeasures — Empirical Analysis of Disinformation and Misinformation Regarding Politics and Coronavirus Vaccines, etc."

Currently, various stakeholders in Japan, including the national government and private companies, have been engaged in activities to promote digital literacy, particularly for young people **(Figure 2-3-3-2)**. For example, as part of its awareness-raising activities about the issue of slander on social media, the Ministry of Internal Affairs and Communications, in collaboration with the Ministry of Justice and related organizations, set up a special website called "#NoHeartNoSNS (If it doesn't have any heart, it isn't social media!)[14]" to help people who experience problems during exchanges on social media. In June 2022, the Ministry of Internal Affairs and Communications with the participation of experts, developed and published an educational seminar for raising awareness regarding disinformation and misinformation titled "Facing the Internet: How to avoid being deceived by disinformation and misinformation."[15]

[13] Center for Global Communications (GLOCOM), International University of Japan "Innovation Nippon Report - Understanding the Reality of Disinformation and Misinformation in Japan and Examining Social Countermeasures"
[14] https://no-heart-no-sns.smaj.or.jp/
[15] https://www.soumu.go.jp/use_the_internet_wisely/special/nisegojouhou/

Figure 2-3-3-2 Initiatives for improving digital literacy in Japan

Entity	Example	Details
Government (MIC, etc.)	Collection of Internet problems	•Case summaries of various problems that occurred on the Internet
	Educational website "Use the Internet wisely! Guide to Using the Internet Safely and Securely"	•An educational site for all generations regarding safe and secure Internet use. Posted "Slander on Social Media, etc." as a special feature
	Educational material for raising awareness about disinformation and misinformation "Facing the Internet: How to avoid being deceived by disinformation and misinformation"	•Developed and published educational materials and guidelines for instructors in fiscal 2021 created with the aim of contributing to comprehensively promoting media information literacy
	Spring Anshin Net - Simultaneous Action for the New Semester	•Awareness-raising activities conducted intensively in line with the new semester and enrollment period.
Private rganizations and companies, etc.	Yahoo! Internet Common Sense Test, Yahoo! News Checkup	•Conducted the Internet Common Sense Skills Mock Exam in which one learns basic knowledge good to have when using the Internet and how to handle common Internet problems •Provided Yahoo! News Checkup to prevent readers being misled by uncertain information
	LINE MIRAI Foundation - Online visiting classes	•Carried out online visiting classes that provided information ethics training for children and parents at schools and local governments, etc. nationwide
	Google: First Media Literacy Course	•Online training to develop the ability to independently examine and use information
	Meta: Digital Classroom for All	•Provided visiting classes at schools, etc., online classes, and content on Instagram that anyone can learn from in order to help users acquire the skills required in the digital world and to build a global community of responsible digital citizens
	ByteDance	•Provided visiting classes at schools, etc. and awareness-raising seminars for parents and children •Raised awareness on safety and security together with video production experience
	Foundation for Multimedia Communications (FMMC) - e-Net Caravan	•Free on-site lectures held nationwide in school settings, etc. for students, parents/guardians, and teachers, etc.

(Source) Prepared by MIC based on various published materials

In the EU and the U.S., training and classes are also offered by a variety of organizations to improve the digital literacy of individuals. Teaching and training methods have been devised to educate the participants, such as text-based classes, workshops in which participants learn from each other by sharing their experiences, online self-study, and gamification in which students learn necessary knowledge and skills through game experiences **(Figure 2-3-3-3)**.

Figure 2-3-3-3 Precedents of media information literacy education in Europe and the U.S.

Entity	Case name	Details
State,international organization, etc.	EU: Spot and fight disinformation	Students learn about the risks of disinformation and misinformation and how to protect themselves through example exercises and group discussions, etc. Designed to be implemented within the school classroom framework
	UNESCO: Media and information literate citizens: think critically, click wisely!	Lectures in which one learns media information literacy, distinguishing disinformation and misinformation, reading advertisements and various media, and the structure of communication on platforms. etc.
	CISA: Resilience Series Graphic Novels	Graphic novels in which one learns about the risks of disinformation and misinformation through fictional stories inspired by the real world
Platform providers	Google: Be Internet Awesome	Learn the five principles of becoming a digital citizen (e.g., Share with Care) in an online game
	Meta: Get Digital!	Literacy programs customized for youth, educators and parents/guardians. Learn how to use digital tools
Academic research institutions	Washington State University, Check Please! Starter Course	Online course for learning how to research sources, evaluate highly specialized information, and find reliable and similar information

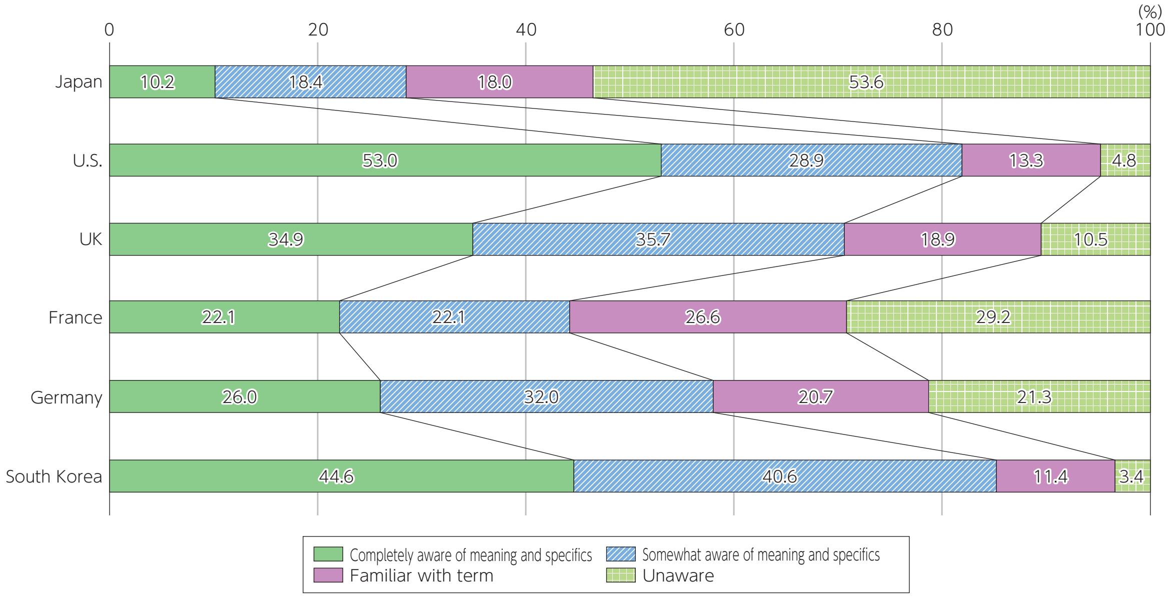
(Source) MIC (2022) "Report on the Survey on the Current Status and Issues of Measures for Improving Media Information Literacy"

4. The promotion of fact checking

In order to counter disinformation and misinformation on the Internet, it is important to promote fact checking, an activity for verifying the authenticity of information.

When a questionnaire survey was conducted in February 2022 on the awareness of fact checking in each country,[16] the percentage of respondents who answered they were aware of fact checking (the sum of "Aware of the meaning and specifics," "Somewhat aware of the meaning and specifics," and "Heard of the term") was lowest in Japan (46.5%) **(Figure 2-3-4-1)**. Although awareness of fact checking has been increasing in Japan since the previous survey (three periods), it is still low compared to other countries.

Figure 2-3-4-1 Level of awareness of fact-checking



(Source) MIC "Fiscal 2021 Survey on Disinformation Awareness in Japan and Other Countries"

Europe and the U.S. have taken the lead in fact-checking initiatives, and non-profit organizations are leading these initiatives. The activities of fact-checking organizations are mainly to check the authenticity of news and information distributed by news media and platform providers and to detect disinformation. Some organizations in cooperation with platform providers develop tools for fact checking, cooperate and give advice regarding disinformation measures, and carry out activities to improve media literacy.

Some Asian countries and regions, such as South Korea and Taiwan, are also undertaking activities to promote fact checking **(Figure 2-3-4-2)**.

[16] MIC "Fiscal 2021 Survey on Disinformation Awareness in Japan and Other Countries"

Figure 2-3-4-2 Activities of fact-checking organizations, etc. in other countries

Name and location of the organization	Overview, etc.
Name and location of the organization	• The Poynter Institute is a media research and professional development organization. IFCN is an internal organization • Partnerships with Google, Facebook, Tiktok and others to support the work of the world's leading fact-checking organizations. • Establishes standards for fact-checking organizations and implements certification. Signatory organizations carry out activities while presenting their certification marks. • Signatory fact-checking organizations collaborate to fact-check issues of international concern, including COVID-19 and the Ukraine crisis.
Poynter Institute IFCN (U.S.)	• Runs a website called Politifact that examines the veracity of statements made by politicians. Transcribes and evaluates statements for verification on a six-point scale called the Truth-O-Meter in addition to making their own evaluation comments.
Full Fact (United Kingdom)	• Established to publicize fact-checking results and suggest ways to reduce misinformation • Fact-checking of high-interest issues in the UK
Seoul National University (SNU) Fact-Check Center (Korea)	• Organization affiliated with the Seoul National University's Institute of Communication Research • Results of fact-checking conducted by mass media and online media in Korea are summarized and published on the center's website, SNU FactCheck. • Fact-checked articles published on the center's website, in conjunction with the major portal site NAVER, are also published on NAVER's Fact-Check page.
Taiwan Fact-Check Center	• Taiwan's first fact-checking organization and center established in 2018 provides educational content on its website to enable ordinary users to determine the authenticity of information on their own.

(Source) Prepared by MIC based on various published materials

In comparison, fact-checking activities in Japan have been described as limited. One reason for this is that in Japan, the mass media, which systematically compiles and distributes information in newspapers and broadcasts, is more functional than in other countries, and the public has not strongly demanded the need for a fact-checking organization because there are sufficient information sources for the public to judge information.

However, a variety of information, including information of uncertain authenticity, can now reach Japan instantly from overseas via the Internet, so the need to promote fact checking of online information is rapidly increasing in Japan. In response, initiatives are progressing in Japan too, such as the FactCheck Initiative Japan (FIJ), a non-profit organization that promotes fact checking, which has established the Fact Check Forum as a gathering place for those experiencing disinformation and misinformation, and the Safer Internet Association (SIA), which has established the Japan Fact-check Center (JFC) with the aim of becoming a signatory to international fact-checking organizations.

5. Promotion of R&D

As fake videos and disinformation and misinformation using deepfakes become a global problem, various initiatives, such as the development of technology to detect fake videos using AI, are underway in countries around the world, including Japan.

(1) Research institutions, etc.

In Japan, the National Institute of Information (NII) has developed SYNTHETIQ VISION, which automatically determines the authenticity of fake images generated by AI. SYNTHETIQ VISION performs automatic identification based on a large amount of data using a method that does not require any human analysis, etc. It has learned videos of varying image quality, enabling it to make judgments with a certain degree of reliability even when the image quality has been degraded by media processing, such as by compression or down conversion.[17] In January 2023, a private company announced that it would commercialize this program as a deepfake video detection service for celebrities, etc. This is the first practical application in Japan for the automatic verification of fake facial videos.

Overseas, research and development of technologies for detecting fake images and deepfakes are also underway with government support. In the U.S., for example, the Defense Advanced Research Projects Agency (DARPA) has been working on a project called Media Forensic (MediFor)[18] since 2015 and Semantic Forensic (SemaFor) since 2021 with the aim of developing technology that can automatically verify the authenticity of images and videos. SemaFor is a program that aims to further enhance the fake detection technology cultivated by MediFor to clarify the credibility of information sources and to ascertain whether the intent of modifications is malicious. In addition to universities, companies,

[17] NII press release material https://www.nii.ac.jp/news/release/2023/0113.html
[18] https://www.darpa.mil/program/media-forensics

such as Google, are also participating in the program.

(2) Companies, etc.

Platform providers and other private companies are also developing technologies and tools for detecting deepfake videos.

In September 2019, for example, Google announced an open-source database containing 3,000 videos generated by artificial intelligence (AI) using various published algorithms as part of an effort to promote the development of deepfake detection tools.

In addition, the Partnership on AI,[19] a non-profit organization established by GAFAM and involving 103 organizations and companies in 16 countries, held the Deepfake Detection Challenge (DFDC), an open competition for deepfake detection technology, in collaboration with universities from December 2019 to May 2020, and 2,114 teams from around the world participated.

In September 2020, Microsoft also released a tool called Microsoft Video Authenticator, which analyzes videos and images and displays the probability of manipulation as well as confidence scores[20] **(Figure 2-3-5-1)**. In October 2020, McAfee launched the McAfee Deepfakes Lab in an effort to determine whether videos attributed to candidates in the run-up to the U.S. presidential election were deepfakes.[21] Deepfakes Lab uses its own tools, which combine data science expertise with computer vision and deep learning techniques for deciphering hidden patterns to detect synthesized video elements that play an important role in authenticating original media files.

Figure 2-3-5-1 An example of a confidence score using Microsoft Video Authenticator

* The trustworthiness of the video is shown in real time. The red box indicates the deepfaked part.

(Source) Microsoft "New Steps to Combat Misinformation"[22]

Private companies in Japan are also conducting research studies on disinformation and misinformation. For example, Spectee Inc. provides services to government agencies and companies that analyze social media and other data to visualize and predict information when a disaster occurs. In providing this service, natural language analysis and image analysis, etc. are performed on social media data using AI that has undergone learning based on past disinformation. Disinformation, such as exaggerated expressions and misunderstandings, are classified into patterns in an effort to identify disinformation and understand its spread.

In January 2023, the Originator Profile Collaborative Innovation Partnership (OP CIP)[23] was established in cooperation with media and advertising companies. Originator Profile (OP) technology is a technology that makes it easy to identify high-quality articles and media that have been third party certified by adding information about web content creators and advertisers, etc. in a verifiable format. Specifically, it is assumed that basic information and information that contributes to the distributor's trustworthiness will be displayed on the user's web browser. And as a third-party organization, the Originator Profile Collaborative Innovation Partnership will certify this information. At present, OP technology is in the development and operational testing stage, but in the future it will be proposed to the standardization organization (W3C) with the aim of popularizing it as a global standard.

19 https://partnershiponai.org/
20 https://news.microsoft.com/ja-jp/2020/09/07/200907-disinformation-deepfakes-newsguard-video-authenticator/
21 https://kyodonewsprwire.jp/prwfile/release/M105029/202010195909/_prw_PR1fl_3mAEcG3w.pdf
22 https://news.microsoft.com/ja-jp/2020/09/07/200907-disinformation-deepfakes-newsguard-video-authenticator/
23 As of March 24, 2023, 20 companies and organizations are participating. https://originator-profile.org/ja-JP/news/press-release_20230324/

6. Institutional responses in each country

(1) Japan

The Act on the Limitation of Liability for Damages of Specified Telecommunications Service Providers and the Right to Demand Disclosure of Identification Information of the Senders (Act No. 137 of 2001) clarifies the requirements for limiting the liability of providers, etc. for damages, and it provides the right to request disclosure of the distributor's information from providers in the case of infringement of rights due to the distribution of information on the Internet. Amid the growing seriousness of rights violations caused by slander on the Internet, etc., an amendment was implemented to establish a new court procedure (non-contentious case procedure) for the disclosure of distributors' information in order to provide relief to victims more smoothly. It came into effect in October 2022.

(2) The EU

The Digital Services Act (DSA) stipulates the following user protections: the terms of use requirements, the handling of illegal content or content that violates the terms of use, and obligations regarding online advertising, including political advertising for intermediary service providers,[24] such as online platforms, according to the size of the business operator. It calls for tougher action by very large online platforms and online search engines[25] and for them to take stricter action in response to the serious social risks they pose by disseminating illegal and harmful content, including disinformation. For example, it requires companies to conduct risk analysis, assessment and risk mitigation measures related to the spread of illegal content through their services and its negative impact on fundamental rights, such as human rights and freedom of expression, and to provide at least one non-profiling-based option when using a recommender system (an algorithm that determines what users see). Violations of this requirement can result in a penalty equivalent to up to 6% of total revenue in the previous fiscal year.

(3) The U.K.

In March 2022, the Department for Digital, Culture, Media and Sport (DCMS) introduced the Online Safety Bill in Parliament, which states that rather than relying on self-regulation by platform providers and other online companies, the government will regulate them, and Ofcom will monitor whether the regulations are followed. According to the UK Government's Guide to the Online Safety Bill[26] published in December 2022, the bill requires online platform providers to remove illegal content (e.g., fraud and terrorism) and restrict access to age-inappropriate content that is harmful to children (e.g., pornography and slander).[27]

(4) Germany

In October 2017, the Network Enforcement Act came into force, making it mandatory for social media platforms with over two million registered users in Germany to publish transparency reports every six months that include the number of reported violations, the number of deletions, and efforts to prevent illegal postings, etc. In April 2021, the revised Network Enforcement Act came into force, making it mandatory for social media platforms to not only delete posts on certain serious matters but also to report the content of posts that meet the criminal constitution requirements and the IP addresses of to the posters to the investigative authorities. In June 2021, the act was amended to include video-sharing platforms and provide opportunities for objections and review decisions on content removal or prevention of access.

(5) The U.S.

Article 230 of the Communications Decency Act, passed in 1996, states that providers (1) are not liable in principle for information transmitted by third parties, and (2) are not liable for actions such as the deletion of harmful content (measures taken in good faith and voluntarily to restrict access), thus granting providers broad immunity. Regarding legal exemption provisions of this act, there have been discussions about making providers liable for the distribution of disinformation under certain requirements, and a draft Act has been submitted, but no amendments have been made as of April 2023.

---

[24] The DSA classifies providers of intermediary services (e.g., ISPs), hosting services, online platforms (online marketplaces, app stores, social media, etc.), and very large online platforms.

[25] Those who are designated by the European Commission as having an average of 45 million or more monthly active users in the EU

[26] https://www.gov.uk/guidance/a-guide-to-the-online-safety-bill#a-guide-to-the-online-safety-bill

[27] The amended Online Safety Bill passed the House of Commons on January 17, 2023, and it is being considered by the House of Lords as of the end of March 2023.

7. The promotion of international cooperation

It is important to cooperate internationally to deal with the distribution of illegal harmful information, disinformation, and misinformation on the Internet.

At the Meeting of G7 Digital Ministers held in May 2022, discussions were held on eSafety, etc., including ensuring transparency and accountability of measures to deal with illegal and harmful information by businesses at the global, national, and regional levels for each relevant policy, and the results were adopted as a ministerial declaration.[28] In addition, the Resilient Democracies Statement,[29] which was adopted by the G7 in June of the same year, states that information manipulation and interference, including disinformation, will be countered.

Furthermore, the G7 Ministerial Declaration on Digital and Technology,[30] which was adopted at the G7 Digital and Tech Ministers' Meeting in Japan in April 2023, reaffirmed the importance of actions taken by a wide range of stakeholders, including social media platforms, civil society, the internet technology community and academia, to address online manipulation, interference, and disinformation while respecting human rights, particularly the right to freedom of expression.

International organizations are also discussing how to deal with disinformation, etc. For example, the Declaration on a Trusted, Sustainable and Inclusive Digital Future,[31] which was adopted at the OECD Ministerial Meeting on the Digital Economy held in December 2022, declared that it would advance measures to address the challenges of digitalization, including combating disinformation online.

[28] G7 Digital Minister's Declaration (provisional translation) https://www.soumu.go.jp/main_content/000813435.pdf
[29] (Provisional translation) https://www.mofa.go.jp/mofaj/files/100364065.pdf
[30] (Provisional translation) https://www.soumu.go.jp/main_content/000879093.pdf
[31] (Provisional translation) https://www.soumu.go.jp/main_content/000850420.pdf

Chapter 3

Realizing a Robust and Sound Data Distribution Society That Is Required for the New Age

With the advancement of telecommunications networks, the volume of data distribution has increased, and a variety of digital services utilizing data have spread throughout society. However, with regard to the distribution and utilization of data, there are concerns about a fair competitive environment due to the concentration of data on some major platform providers, the fairness and transparency in the handling of collected and accumulated data, and issues such as the spread of illegal harmful information, disinformation and misinformation, and information bias on social media and other platforms. Each country is responding to these issues.

Under such circumstances and with the realization of 5G networks that enable ultra-high-speed and large-capacity data distribution and the further advancement of XR (cross-reality) technology, AI, and other technologies, there are new movements in the concept of distribution and management of data and in services that utilize data.

This chapter provides an overview of the emerging trends in data distribution and utilization, and it analyzes and summarizes issues and initiatives for realizing a society in which everyone can enjoy the benefits of diverse digital services utilizing data.

Section 1 New Trends in Data Distribution and Utilization

This section summarizes Web3, which is attracting attention as a new trend in data management, distribution, and utilization and its applied technologies (non-fungible tokens (NFTs), etc.), metaverses and digital twins, examples of the use of generative AI, and measures taken by various countries related to these technologies and services.

1. Web3

(1) What is Web3?

The proliferation of smartphones and social media has made it possible to use and share data in both directions, but it has also led to an excessive concentration of data on platform providers that provide the infrastructure for services. Accordingly, issues such as the development of a competitive environment in the data market and the transparent and appropriate handling of data have become apparent, and a range of measures are being implemented by various countries. (See Section 2 in Chapter 2.) Under such circumstances, Web3 is attracting attention as a new way of managing and distributing data.

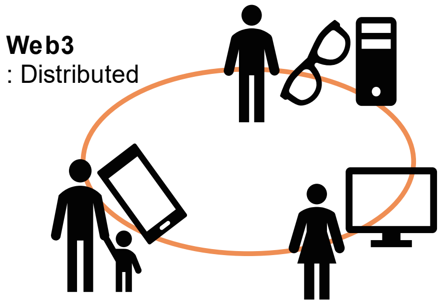
Web3 is a distributed network environment based on blockchain technology,[1] and it is expected that it will enable individuals to connect with other individuals without having to go through an intermediary, such as a platform provider, to perform data utilization and distribution management in both directions. Blockchain is used as the platform for data recording and data movement when users use internet services. Furthermore, by utilizing a smart contract, which is a program stored in a blockchain, it becomes possible to realize a mechanism that automatically executes the exchanging of a contract, etc. without human intervention.

Web3 has been described as decentralized because it creates a new digital economy in which independent users can directly connect with each other on a decentralized network that is based on blockchain without having to depend on a specific platform (**Figure 3-1-1-1**).

With Web3, the reduction in transaction costs and the capability to co-create, preserve, and exchange all kinds of value across borders and platforms is expected to have social impacts, such as building new business models in the cultural and economic fields, promoting investment and economic revitalization, and solving social issues.

[1] In this document, Web3 is considered a different concept to Web 3.0, which is proposed as a semantic web (technology that adds meaning [semantics] to information resources so that computers can process them autonomously without human intervention).

Figure 3-1-1-1 Features of Web3



	Web3
Flow of data and information	Distributed (information and rights are not biased by distribution management)
Core technology	Blockchain

(Source) Based on Document 1-2 from the 1st meeting of the MIC Study Group on the Utilization of Metaverse Towards Web3 Era

(2) An example of a Web3 application

a Non-fungible tokens (NFTs)

Non-fungible tokens (hereinafter referred to as NFTs) are unfalsifiable and tamper-proof digital data that can provide uniqueness to digital data on a blockchain to ensure its authenticity and can track transaction histories.[2] It is expected that NFTs will make it possible to prove the uniqueness and authenticity of original documents and enable designs that allow creators to earn revenue even during secondary distribution through programmability. Furthermore, initiatives for solving social problems and realizing a symbiotic society using NFTs are also underway.

For example, Social Art Lab, a general incorporated association that was established for the purpose of "creating an environment where people with disabilities can live in art," has been undertaking initiatives to convert the art of people with disabilities into NFTs so that they can be offered to a wide range of people, and it exhibits NFT art at events held at metaverse venues. It also sells art in the NFT marketplace and returns 74% of sales revenue to the artist or institution in the case of primary distribution.[3]

In August 2022, Chiba Institute of Technology began issuing academic certificates as NFTs. This is the first attempt in Japan to issue certificates as NFTs so that a person's academic history can be recorded on a blockchain, which prevents tampering. The certificate data can be managed using a virtual currency wallet, allowing users to connect to various platforms and showcase their qualifications in a one-stop shop.[4]

b Decentralized Autonomous Organizations (DAO)

A Decentralized Autonomous Organization (hereinafter referred to as DAO) is an organization that: utilizes blockchain technology and smart contracts, does not have a centralized management structure, and aims for autonomous management by participants.[5]

Some regions are now using DAOs to revitalize their communities and solve problems. For example, the Yamakoshi DAO was established in the Yamakoshi region of Niigata Prefecture with the aim of ensuring sustainable development of the region, and it uses the art of Nishikigoi, a symbol of Yamakoshi, as an NFT. Holders of this NFT art[6] can participate in the Yamakoshi DAO, and the proceeds from sales fund its activities.

In June 2022, Shiwa Town in Iwate Prefecture announced its Furusato DAO initiative, which aims to overcome physical constraints and bring together diverse human resources to solve local issues with new ideas. Local currency (tokens) will be issued to pay hometown taxes, etc., and it is currently working on several projects.[7]

c Trends in discussions and promotional measures in Japan and overseas

While it is expected that the Web3 environment will enable the building of new business models, revitalize investing and the economy, and promote the resolution of social issues, there is a need to collaborate globally to solve problems because the lack of an intermediary makes the location of responsibility and the targets of regulation ambiguous, and cross-border activities make it difficult to formulate rules on a country-by-country basis.

---

[2] https://www.meti.go.jp/shingikai/sankoshin/shin_kijiku/pdf/004_05_00.pdf
[3] https://prtimes.jp/main/html/rd/p/000000003.000091351.html
[4] Chiba Institute of Technology Press Release https://www.it-chiba.ac.jp/media/pr20220818.pdf
[5] Digital Agency: Web 3.0 Study Group Report (December 2022) https://www.digital.go.jp/councils/web3/#report
[6] As of September 14, 2022, 996 people had purchased NFTs. Note that these NFTs are distributed free of charge to residents of the Yamakoshi region.
[7] Presentational material presented by Shiwa Town, Iwate Prefecture, at the 4th meeting of the Digital Agency's Web 3.0 Study Group https://www.digital.go.jp/assets/contents/node/basic_page/field_ref_resources/495a2882-d9e4-4f25-b75f-acc6a5f38312/644f8005/20221025_meeting_web3_outline_01.pdf

In Japan, in response to the inclusion of the development of an environment for promoting Web 3.0, including the use of non-fungible tokens (NFTs) based on blockchain technology, in the Basic Policy on Economic and Fiscal Management and Reform 2022, which was approved by the Cabinet in June 2022, and the Priority Policy Program for Realizing Digital Society, each ministry and agency is examining issues and initiatives regarding its promotion. The Digital Agency created the Web 3.0 Study Group (chaired by Professor Jiro Kokuryo of the Faculty of Policy Management, Keio University), and in December 2022, it met and summarized future initiatives for the sound development of Web 3.0.[8]

Other countries are also examining promotional policies. In March 2022, the U.S. issued an executive order to examine strategies for utilizing digital assets and the underlying technologies that form their foundation, and initiatives are underway. In November 2022, the European Parliament passed a resolution to establish Digital Decade Policy Programme 2030, which includes plans for EU countries to jointly invest in Web3 and blockchain. In July 2022, the Shanghai Municipal People's Government in China released a draft of the 14th Five-Year Plan for the development of Shanghai's digital economy. This document includes plans to build an innovation system for blockchain technology, create a blockchain development ecology, and develop infrastructure for promoting Web3.

2. Metaverses and digital twins

(1) Metaverses

a What is metaverse?

XR (cross-reality) technologies such as virtual reality (VR), augmented reality (AR), mixed reality (MR), and substitutional reality (SR) have become more realistic due to the increasing capacity and speed of communications networks, improved computer rendering, and the evolution of devices and software (higher resolution and smaller sizes). During the COVID-19 pandemic, various economic and cultural activities were restricted, resulting in attention being focused on metaverses, where the real world and virtual space are linked and people can gather virtually from the comfort of their own homes and share the same experiences through events, etc. and transmit, experience, and share new value.

The global metaverse market is expected to grow from $65.51 billion in 2022 to $936.57 billion in 2030, and a number of companies are entering the market in anticipation of future growth.

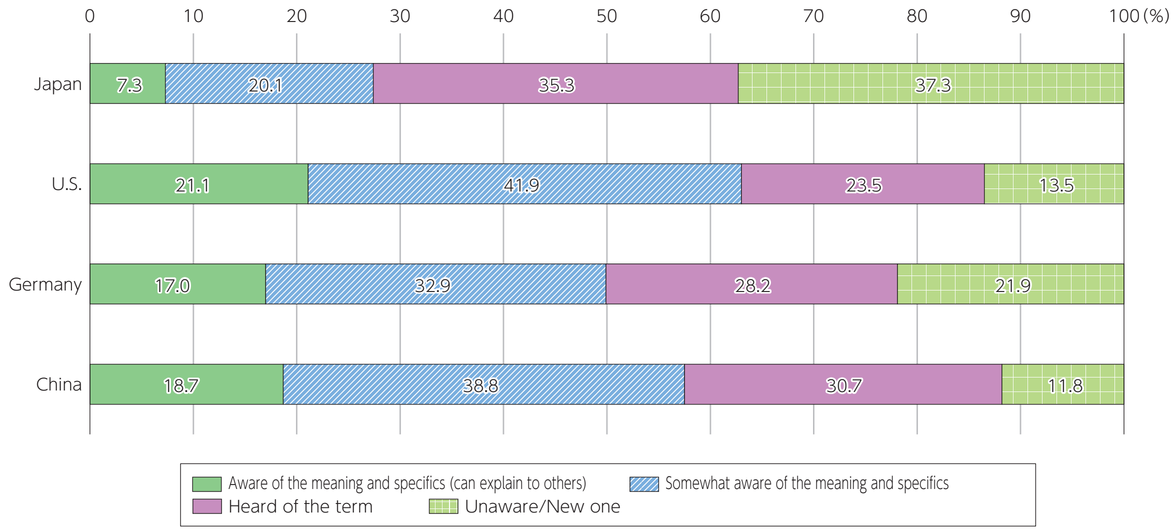
Although a clear definition of what a metaverse is has not yet been established, a report by the Ministry of Internal Affairs and Communications[9] defines it as "a virtual digital space accessible via a network, such as the Internet, that allows users to 'communicate' with each other," with characteristics such as (1) realism and reproducibility according to the intended use,[10] (2) self-projection and immersion, (3) interactivity (often in real time), and (4) the ability for anyone to participate in the virtual world (openness).

A questionnaire survey[11] that asked consumers in various countries about their awareness of the metaverse found that approximately 60% of respondents in Japan were aware of it (the sum of "Completely aware of meaning and specifics," "Somewhat aware of the meaning and specifics," and "Heard of the term") **(Figure 3-1-2-1)**, with the highest percentage of respondents being in their 30s (68.0%). Although awareness is lower than in other countries, the term "metaverse" is becoming increasingly better known by consumers in Japan.

However, only 2.8% of respondents in Japan answered "Currently using (have used in the past)" a metaverse, so the results show that there are very few consumers who have actually used one **(Figure 3-1-2-2)**.

[8] Digital Agency: Web 3.0 Study Group Report (December 2022) https://www.digital.go.jp/councils/web3/#report
[9] Interim Report of the MIC Study Group on the Utilization of Metaverse Toward the Web3 Era https://www.soumu.go.jp/main_content/000860618.pdf
[10] They may replicate the real world like digital twins, construct simplified models of the real world, or construct different worlds, including with respect to the laws of physics.
[11] Web survey of people living in Japan, the U.S., Germany, and China; age (20s, 30s, 40s, 50s, 60s, and over); sex (male and female); number of collected responses: 4,000 (Japan 1,000, U.S. 1,000, Germany 1,000, and China 1,000); implemented in February 2023

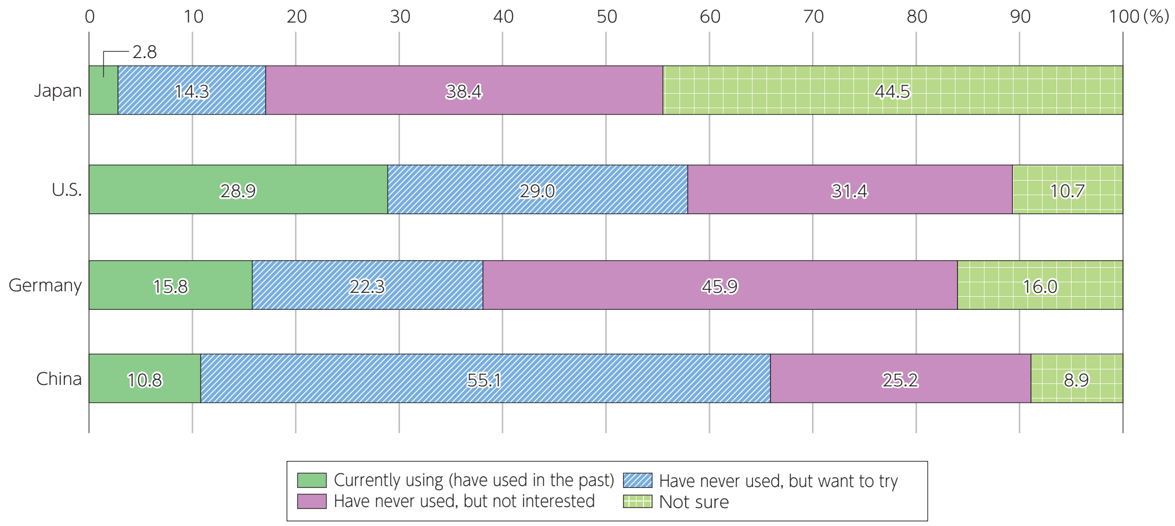
Figure 3-1-2-1 Awareness of metaverses by country



(Source) MIC (2023) "Survey Research on Advancement of ICT Infrastructure and Flow of Digital Data and Information"

Figure (related data) Awareness of metaverses by age
(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00042
(Data collection)

Figure 3-1-2-2 Experience of using a metaverse (by country)



(Source) MIC (2023) "Survey Research on Advancement of ICT Infrastructure and Flow of Digital Data and Information"

b Examples of use

Awareness of metaverses is gradually increasing in Japan, and the provision of various services in the entertainment field, such as metaverse-based music events and shopping, is progressing. In addition, attempts to utilize metaverses to provide opportunities for learning and employment in the metaverse space, as well as for community development in which real cities and virtual spaces are linked, have also begun.

(a) Entertainment (NTT QONOQ)

NTT QONOQ offers XR World, a metaverse service where users can enjoy live music, walk around as their avatars, and chat with other users in a virtual space, Matrix Stream, a live streaming service in a metaverse space, and XR City, an AR city walking app. Matrix Stream is also used to distribute virtual YouTubers (VTubers) who perform video streaming and other activities on YouTube.

(b) Education (Metaverse School of Engineering, the University of Tokyo)

The University of Tokyo established the Metaverse School of Engineering in October 2022 as a place for education in the field of engineering using digital technology to create a society where all people can acquire the latest information and practical engineering skills to realize their dreams (**Figure 3-1-2-3**).

In fiscal 2022, with the aim of providing new learning opportunities and information on engineering careers and based on the basic concept of diversity and inclusion in the field of engineering, the University of Tokyo launched the Junior Engineering Education Program for junior and senior high school students and the Reskilling Engineering Education Program, which are aimed at providing an opportunity for adults to relearn what they know, and the programs utilize metaverses.

Figure 3-1-2-3 Metaverse School of Engineering, the University of Tokyo

(Source) The University of Tokyo

(c) Creating jobs and realizing diverse working styles (PERSOL MARKETING CO., LTD.)

PERSOL MARKETING has started a business that provides workers that operate in a metaverse. In the current labor market, it is difficult to introduce suitable jobs to those that want to work but who are elderly, or are raising children, or who have certain physical characteristics, etc. By utilizing a metaverse to transcend distance, time, and physical characteristics, PERSOL MARKETING aims to realize a society in which more people can work in metaverse-based jobs, including information and hospitality services. In December 2022, at a metaverse-based job-hunting event organized by Toyota City, people who care for family members at home, etc. were employed as the information staff for the event. Going forward, PERSOL MARKETING aims to create a place where people can work in long-lasting jobs.

(d) Regional revitalization (KDDI Corporation)

Attempts to recreate real cities as metaverses in virtual space where events can be conducted that extend urban touchpoints and the urban experience are being developed.

For example, KDDI has been working on the Shibuya Ward Official Virtual Shibuya since 2020 as part of a project started in 2019 to revitalize the attractive real city of Shibuya using technologies such as 5G and XR. Virtual Shibuya recreates the city of Shibuya in a metaverse, and various events, such as Halloween festivals and live music performances, are held there (**Figure 3-1-2-4**). In 2023, with the aim of realizing open metaverses that connect to other platforms, the company began offering services that connect metaverses to Web3, digital twins, and other services, with a focus on city-linked metaverses, such as Virtual Shibuya.

In November 2021, the company established the Virtual City Consortium to develop and implement guidelines for metaverses and city-linked metaverses. The consortium announced its Virtual City Guidelines in April, 2022. In the future, it aims to further strengthen cooperation with real cities and expand economic and residential areas.

Figure 3-1-2-4 Virtual Shibuya

(Source) Shibuya 5G Entertainment Project

(e) Examples of uses in other countries

Uses for metaverses are advancing in a range of fields in various countries.

In the U.S., for example, VictoryXR, Inc. offers Metaversity, a platform that enables the creation of metaverse-based universities where classes are taught. As of March 2023, at least ten universities in the U.S. have adopted Metaversity, which offers classes in organic chemistry, anatomy, and physics and can display 3D models in its metaverse **(Figure 3-1-2-5)**.

As an example of regional revitalization, in October 2022, the Emirate of Sharjah in the United Arab Emirates announced plans to provide a metaverse called Sharjah Verse. The project aims to strengthen the local tourism industry and create jobs by recreating the country's tourist destinations and conducting sightseeing tours in its metaverse.

In January 2023, the city of Seoul in South Korea announced that it would launch a project called Metaverse Seoul, which recreates Seoul in a metaverse. The project is scheduled to be implemented in three stages by 2026. The first stage is to provide metaverse-based administrative services, such as the issuance of residence certificates and tax counseling. The second stage is to promote the development of the city by providing services related to real estate investment, and the third stage is to utilize AR technology for infrastructure management in Seoul City **(Figure 3-1-2-6)**.

Figure 3-1-2-5 Metaversity (U.S.)

Real university   Metaverse-based university

(Source) Publicly available information provided by VictoryXR, Inc. and others

Figure 3-1-2-6 Metaverse Seoul (Korea)

(Source) Publicly available information provided by Seoul City and others

c Controversies surrounding metaverses

As metaverses are starting to be utilized, issues regarding their popularization are also being discussed.

In the current metaverse market, there are many domestic and foreign platform providers. The creators of these metaverse "worlds"[12] mainly identify target users, select a platform, and build a world on the platform. Also, platform providers sometimes create their own metaverse worlds.[13] However, there is no compatibility or interoperability between worlds, especially between worlds that exist on different platforms, and rules for generating identities and avatars, including prohibited acts and data handling that are applied within a particular metaverse, vary according to the rules set by each operator. Therefore, if data formats and data exchange formats differ between platforms, it may not be possible to carry data over from one metaverse to another on a different platform.

Going forward, as metaverses proliferate in Japan and overseas and as metaverses become new living spaces

[12] Each metaverse world is built and operated on a platform. https://www.soumu.go.jp/main_content/000860618.pdf
[13] Interim Report of the MIC Study Group on the Utilization of Metaverse Toward the Web3 Era https://www.soumu.go.jp/main_content/000860618.pdf

for users, it is important to have an environment that allows users to freely move between various platforms while retaining avatars and items, etc. that indicate their identity. For this reason, standardization efforts to ensure interoperability in which standards for multiple platforms are shared for user convenience have begun.

In a metaverse, as in the real world, problems such as an avatar's behavior, including obscene language, discriminatory language, slander, threats, and molestation or physical actions, including harassment and violence such as stalking and voyeurism, fraudulent transactions and impersonation as well as the problem of protecting the privacy of persons controlling avatars may arise across national borders. In the process of expanding the use of metaverses in all fields, consideration is now being given on how to form rules in the metaverse space, including from the viewpoint of whether existing laws can be applied.[14]

d Promotional measures for metaverses in Japan and overseas

Countries are now working on initiatives to promote metaverses and digital twins.

In Japan, the Basic Policy on Economic and Fiscal Management and Reform 2022,[15] approved by the Cabinet in June 2022, mentioned the expansion of the use of content including metaverses, and the Intellectual Property Promotion Plan 2022,[16] released in the same month, identified legal issues related to content on metaverses and clarified issues. In addition, the Study Group on the Utilization of Metaverse Toward the Web3 Era has been held at the Ministry of Internal Affairs and Communications to examine issues related to the utilization of metaverses, etc. in mainly the information and communications field.[17]

Looking at other regions, the U.S. and the EU have released reports on priority issues and policy issues to be discussed to promote the use of metaverses. In addition, Korea is actively developing metaverses as the new industry after smartphones, and in January 2022, the Ministry of Science and ICT announced the Korea Metaverse New Business Leading Strategy **(Figure 3-1-2-7)**.

Figure 3-1-2-7 Promotion measures for metaverses in other countries

Country	Overview, etc.
U.S.	In August 2022, the Congressional Research Service released a report titled “The Metaverse: Concepts and Issues for Congress” that summarizes the policy issues that should be considered by Congress, such as metaverse technologies and concepts. The report lists issues such as the appropriate use of content, the protection of personal information such as biometric information, the domination of platforms by major companies, and the disparity between those who have access to high-speed communications environments and those who do not.
EU	In March 2023, a policy paper title “Metaverse - Virtual World, Real Challenges” was published. The report provides an overview of metaverses (definition, history of metaverses, future fields of application, development time span, elements and related technologies, countries and companies considered to play a major role) and summarizes potential challenges and opportunities in the EU (why and how the EU should engage with metaverses).
South Korea	In January 2022, the Ministry of Science and ICT published the Korea Metaverse New Business Leading Strategy. In line with the development of metaverses, the strategy states that the Korean government will take measures such as the development of a sustainable metaverse ecosystem based on public-private cooperation, human resource development, development of industry-leading companies, and the establishment of sound and exemplary infrastructure, as well as undertake initiatives to support platform development, develop practical human resources, establish funds, and develop rules, etc.
China	In July 2022, the Shanghai Municipal People's Government in China released its 14th Five-Year Plan for the development of Shanghai's digital economy. In the metaverse field, the plan states that virtual reality technologies will be enhanced, platforms will be developed, and new digital entertainment such as virtual concerts will be fostered.

(Source) Based on Document 7-2 from the 7th meeting of the MIC Study Group on the Utilization of Metaverse Towards Web3 Era

(2) Digital twins

a What is "digital twin"?

A digital twin is where a real space is recreated in a virtual space, based on data collected from the real world and after performing various simulations.

While metaverses and digital twins are both virtual spaces, compared with metaverses, where it does not matter whether the worlds created in such spaces are real or not, digital twins are positioned as a solution for performing simulations. Therefore, they must reproduce the real world. Also, while metaverses are often used for communicating through avatars and playing games in spaces that are not real, digital twins are often used to perform simulations that are difficult to perform in the real world.

By reproducing cities, cars, people, products, and devices in a digital twin, tests that are difficult to repeatedly perform in real spaces, such as traffic congestion predictions, human behavior simulations, manufacturing site monitoring, and durability tests, can be simulated repeatedly in a virtual space. This can provide the following benefits:

○**Optimize production and improve operational efficiency:** Optimization can be performed by optimizing the placement of devices and personnel, and

[14] https://www.kantei.go.jp/jp/singi/titeki2/kanmin_renkei/dai3bunkakai/dai1/gijisidai.html
[15] Approved by the Cabinet on June 7, 2022 https://www5.cao.go.jp/keizai-shimon/kaigi/cabinet/honebuto/2022/2022_basicpolicies_ja.pdf
[16] https://www.kantei.go.jp/jp/singi/titeki2/220603/siryou2.pdf
[17] https://www.soumu.go.jp/main_sosiki/kenkyu/metaverse/index.html
For details on this study group, see Section 6, Promotion of ICT utilization in Chapter 5 of Part 2

processes can be improved to shorten lead times. In addition, the results can be visually confirmed by simulations in a virtual space, thereby contributing to improving safety and reducing risks.

○**Reduce time and costs:** Compared to physically testing and prototyping, simulations can be performed easily in a virtual space, significantly reducing the time spent on physical testing.

○**Perform simulations that are not possible in the real world:** Phenomena that do not occur often in the real world can be easily generated and used to prepare for the future, such as major earthquakes and other events.

b Examples of uses

The use of digital twins began mainly with manufacturers, such as in the aviation industry and for manufacturing lines in general, but they are now used in a wide range of fields, including national and urban planning and disaster prevention.

As an example of their use in urban planning, since fiscal 2020, the Ministry of Land, Infrastructure, Transport and Tourism has been promoting the PLATEAU project,[18] which develops, utilizes, and creates open data for 3D city models. Up to August 2021, it had completed open data conversion of 3D city models of 56 cities nationwide. In order to promote the digital transformation of town planning, digital twins of real cities have been constructed and released as open data, enabling anyone to freely utilize this data.

In the field of disaster prevention, since 2019, Shizuoka Prefecture has been working on the VIRTUAL SHIZUOKA project in which the topography and buildings throughout the prefecture are acquired as three-dimensional information called point cloud data, which is also being released as open data. Information, including VIRTUAL SHIZUOKA information and aerial photographs taken in the past, was compared with data measured in 3D by drones, etc. at the locations where landslides occurred. It was then analyzed and utilized for the landslide disaster that occurred in Atami City, Shizuoka Prefecture, in July 2021 to grasp the damage situation as early as possible and to prevent secondary disasters (**Figure 3-1-2-8**).

Figure 3-1-2-8 VIRTUAL SHIZUOKA

(Source) Shizuoka Prefecture

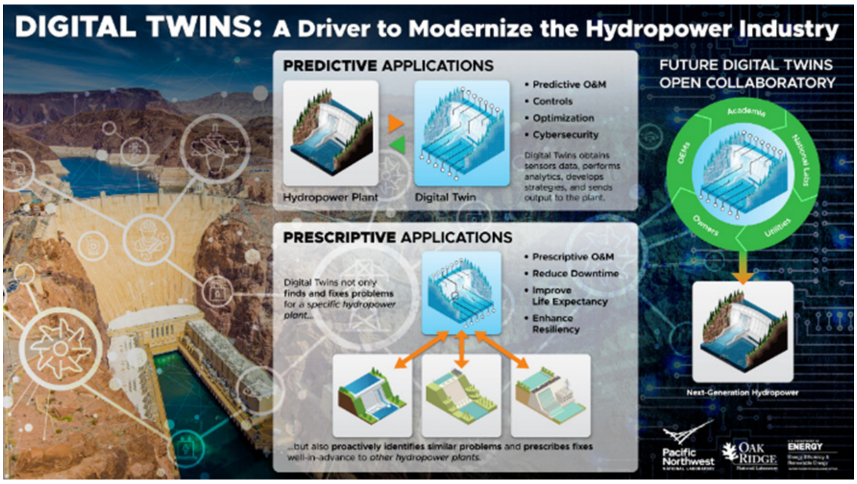
In the field of agriculture, initiatives for realizing agricultural platforms using digital twins are underway. Happy Quality Co., Ltd. offers a digital twin virtual platform that reproduces the cultivation environment in a virtual space, and it can be customized for individual farms. Utilizing this platform makes it possible to perform a range of monitoring activities and simulations. It is expected that smart agriculture will be realized through simulations of cultivation environments and remote cultivation guidance, enabling the agricultural industry to solve the problem of future labor shortages.

Outside Japan, digital twins are being used in various fields, including infrastructure management and urban planning.

For example, Oak Ridge National Laboratory and Pacific Northwest National Laboratory in the U.S. are working to develop an open platform for hydropower systems using digital twins. Monitoring an actual facility and comparing it to a digital twin will enable robust control and optimization of the facility, which is expected to reduce operating costs, improve reliability, and address increased operational complexity. Oak Ridge National Laboratory has also created digital twins for 129 million buildings across the United States, providing power companies and businesses with a way to make simulation-based decisions about how best to improve energy efficiency (**Figure 3-1-2-9**).

[18] https://www.mlit.go.jp/plateau/

Figure 3-1-2-9 Digital twin for hydroelectric systems (U.S.)



(Source) Oak Ridge National Laboratory HP

Shanghai is also using digital twin technology to run and manage the city.[19] It has developed a digital platform that reflects actual objects and information about the objects, such as buildings, street lamps, pipes, plants, etc., and it has demonstrated efficiency for managing social issues, such as garbage disposal and electric bicycle charging. During the COVID-19 pandemic, it was used for pandemic control and prevention, including providing accurate information on nearby residents to local centers for disease control and for future epidemiological studies.

3. Generative AI

(1) Generative AI trends

AI can analyze a massive amount of data to detect signs of failure or scam/spam information, to predict the future, or even to determine which video to show a website visitor next. AI that is used for data analysis is called analytical AI. This type of AI is already used widely throughout society.

However, a new type of AI called generative AI has made rapid progress recently. This type of AI is used to generate and create information—something that has conventionally been seen as a human specialty.

Open AI released GPT-3, a large language model that uses 175 billion parameters, in May 2020. The company followed this up with ChatGPT, a dialog-based AI chatbot based on GPT-3.5, in November 2022 and then GPT-4 in March 2023.

In the same month the following also happened: Microsoft announced that it would include AI based on GPT-4 in its search engine Bing and its internet browser Edge.[20] Google released Bard, an experimental dialog-based AI service using LaMDA (Language Model for Dialogue Applications) for public use, and Baidu, a Chinese search engine, released Ernie Bot, a dialog-based AI service similar to ChatGPT.

There have been developments in Japan as well. LINE Corporation and Naver Corporation collaborated to develop HyperCLOVA, a large language model (LLM) for the Japanese language. HyperCLOVA does not use a chat-based interface, but it can be used to create or summarize text.On April 1, 2023, Works Mobile Japan integrated with and absorbed LINE CLOVA (LINE's AI business that is responsible for HyperCLOVA). The company is now looking into using HyperCLOVA to provide support functions on its LINE WORKS service.[21]

2022 saw the introduction of prompt-based image-generation AI (also called text-to-image) in which users enter text to generate images. This makes it possible for AI to draw images similar to those that humans draw. Operating this technology initially required a high-performance PC capable of processing advanced calculations and storing a large amount of data. However, volunteers began developing applications that could be run on websites, allowing anyone to easily provide prompts for AI to create images.

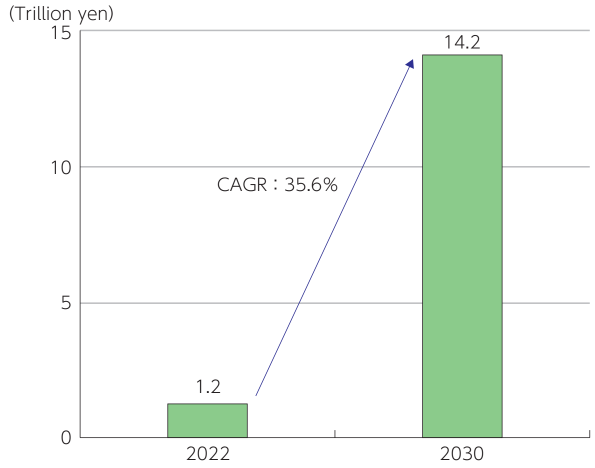
Generative AI is now available for use in many other applications. For example, AI can be used to provide answers or summarize text in response to typed questions, create source code for programs in response to prompts from the user, or even create music from text prompts.

According to SEQUOIA and GPT-3's "Prediction of Generative AI Deployment by the 2030s" published in September 2022, it is expected that the use of generative AI will continue to make progress in the order of text, coding, image, and video/3D/game fields.[22]

The global market for generative AI is expected to expand to approximately 14 trillion yen by 2030, with a compound annual growth rate (CAGR) of 35.6% from 2022 to 2030[23] (**Figure 3-1-3-1**). North America has the largest share of the market (40.2%), based on 2021 data.

[19] https://english.shanghai.gov.cn/nw48081/20220216/d4de492067ca497991823b9758001192.html
[20] https://blogs.bing.com/search/march_2023/Confirmed-the-new-Bing-runs-on-OpenAI's-GPT-4
[21] On April 1, 2023, Works Mobile Japan integrated with and absorbed LINE CLOVA (LINE's AI business that is responsible for HyperCLOVA). The company is now looking into using HyperCLOVA to provide support functions on its LINE WORKS service.
[22] Source: https://www.sequoiacap.com/article/generative-ai-a-creative-new-world/
[23] Based on predictions by the research firm Grand View Research, Inc. (at a conversion rate of 1 USD = 130.3715 JPY as of Jan. 25, 2023)

Figure 3-1-3-1 Global market size of generative AI



(Source) Survey by Grand View Research Inc.

(2) Controversies regarding generative AI

While the use of generative AI has been spreading all over the world, some issues with the technology have been raised, for example, the handling of confidential information, personal information protection, and the accuracy of answers it provides.

As discussed in more detail in Section 3 of Chapter 2, generative AI also has the possibility for misuse. It can be used to create fake images or videos that if spread, either intentionally or unintentionally, could infringe the rights of others or even cause social turmoil. For example, a prompt-based image-generation AI called Stable Diffusion was used in September 2022 to create fake images of flooding in Shizuoka Prefecture in Japan. These images were then spread through social media. Investigations revealed that it took only 14 seconds to create the images.[24] It is now possible for anyone to use image-generation AI to easily create and spread fake images of very high quality.

The technology can also be used to infringe upon intellectual property rights, which could have a negative economic impact on artists, illustrators, and other content creators. In January 2023, a number of artists in San Francisco sued two companies developing image-generation AI technology (Stability AI Ltd, Midjourney Inc. and DeviantArt, Inc.), claiming copyright infringement. The plaintiffs claimed that the companies had created copies of artwork protected under copyright and generated images mimicking the styles of millions of artists, infringing the rights of those artists. They requested monetary damages and a court order as a means to prevent copyright infringement by AI companies. In Japan, a company called RADIUS5 released "mimic," an AI trained on human-generated images that was capable of automatically generating images mimicking the style of the original artist. However, the service was terminated after only one day due to the many concerns voiced over the possibility of the technology being misused.

Although companies providing AI services have established rules for using their technologies, these companies must do more to ensure that users are made aware of their rules. Users must also strive to use these technologies in an ethical manner.

The use of generative AI is already being discussed at both national and international levels.

In March 2023, the Italian Data Protection Authority[25] temporarily prohibited the use of ChatGPT, claiming that sufficient information was not provided to data owners, that the company had a legal obligation to justify its collecting and processing of large volumes of personal data for machine learning, and that the mechanism in place for verifying the age of users was insufficient. In April of the same year, authorities in the UK[26] released eight points of consideration in developing and using generative AI that makes use of personal data, such as the requirement to clarify the legal basis of such technologies, the obligations of organizations managing the data, and the need to perform risk assessment. In the U.S., the National Telecommunications and Information Administration (NTIA) sent out a request for comments on the topic of a system for auditing, evaluating, and certifying AI.[27] Finally, in May of the same year, the Biden administration announced a new policy for promoting responsible AI innovation,[28] consisting of guidelines for investing in responsible artificial intelligence (AI) research and development, evaluating generative AI developed by private companies, and the use of AI by the federal government in order to stress the fact that companies are responsible for confirming safety prior to

[24] https://spectee.co.jp/report/202209_shizuoka_typhoon15_fake/
[25] Garante per la protezione dei dati personali
[26] Information provided by the Commissioner's Office
[27] https://ntia.gov/issues/artificial-intelligence/request-for-comments
[28] https://www.jetro.go.jp/biznews/2023/05/7c5bc3a8bf11f2ff.html

developing and releasing AI products.

In the EU, a decision was reached to establish a task force to investigate concerns over privacy protection with regard to ChatGPT.[29]

Cooperation between countries has also seen some progress in this area. During the G7 Digital and Tech Ministers' Meeting held in Takasaki, Gunma Prefecture, in April 2023, participants discussed the topic "Responsible AI and Promoting of AI Governance" and adopted "The G7 Digital and Tech Ministers' Declaration"[30] in which a decision was reached to convene for discussions on generative AI and to create an action plan for the promotion of global interoperability of AI governance as soon as possible.

During the G7 Summit held in Hiroshima in May2023, participants expressed a common understanding of the importance of engaging in international discussions on the topic of AI governance at the top level, as well as the importance of ensuring the interoperability of AI governance. Participants also agreed to establish the Hiroshima AI Process by the end of the year to discuss generative AI.[31]

[29] https://edpb.europa.eu/news/news/2023/edpb-resolves-dispute-transfers-meta-and-creates-task-force-chat-gpt_en
[30] https://www.soumu.go.jp/main_content/000879099.pdf
[31] https://www.mofa.go.jp/mofaj/files/100506875.pdf

Section 2 Toward Realizing an Abundant Data Distribution Society

As communications infrastructures become more advanced and the use of smartphones more common, diverse digital services that make use of data are becoming crucial parts of our lives. New forms of data usage, such as the metaverse and digital twin technology, have also been the subject of much recent attention. It is hoped that these technologies will contribute toward solving the various social/economic issues facing Japan, such as regional revitalization, disaster prevention, and the realization of diverse working styles.

This section summarizes issues and efforts involved in realizing a society where the safe and appropriate distribution of data is promoted and where anyone and everyone can benefit from the use of data.

1. Safe and robust communications networks supporting data distribution

There have been several recent incidents in Japan and elsewhere where communications infrastructures have been disabled due to large-scale natural disasters, abnormal weather, or even human errors. With an increasing amount of activity now conducted over the Internet, the impact of such incidents is much higher than it was in the past (**Figure 3-2-1-1**).

Figure 3-2-1-1 Examples of recent telecommunications services outages

Area	Date occurred	Details
Global	June 2022	Cloudflare: An outage occurred in 19 data centers throughout the world.
UK	July 2022	Google, Oracle: An outage occurred in cloud services due to a heatwave.
Japan	July 2022	KDDI: A communications outage occurred due to human error.
Japan	Aug. 2022	NTT West: A communications outage occurred in the FLET'S Hikari Internet service due to equipment failure.
Japan	Sept. 2022	Rakuten Mobile: A communications outage occurred due to an equipment error.
Japan	Sept. 2022	Softbank: A communications outage occurred due to human error.
South Korea	Oct. 2022	Naver, Kakao: A service outage occurred due to a fire at an SK C&C data center. Service was restored in South Korea on the day of the outage for Naver, and then five days later for Kakao.
Japan	Dec. 2022	NTT Docomo: A communications outage occurred due to an equipment error and human error.
U.S.	Feb. 2023	T-Mobile: A communications outage occurred.
Japan	April 2023	NTT East, NTT West: A communications outage occurred in services such as "HIKARI DENWA."

(Source) Created by MIC based on publicly available documents released by various companies

As the international situation becomes more complicated, ensuring the reliability and safety of communications infrastructures has become an extremely important issue from the perspective of guaranteeing economic security. Cyberattacks are growing more complex and sophisticated as digital technology advances, making security risks a widespread and critical issue. There have been many cases of cyberattacks targeting key infrastructures in countries all over the world, causing social turmoil. This is true even in Japan, where cyberattacks targeting private companies, including key infrastructure operators, have occurred. There have even been cases where investigations have determined that foreign governments were likely involved in these incidents.[1] Furthermore, as ICT devices continue to become more advanced and supply chains more complex and global, security risks in supply chains have also become apparent, as seen in the fact that unauthorized software installed in communications devices and systems used in information and communications infrastructures and unauthorized software, such as malware, being introduced through supply chains related to maintenance and operations.

There are also growing concerns about ensuring economic security and problems that could prevent devices and parts from being procured that are required for the provision of digital services. Factors such as antagonism between the U.S. and China have even changed the structure of global supply chains, and even in Japan, ensuring reliable access to ICT-related devices and parts is now directly related to ensuring economic security. The ratio of companies exporting ICT-related devices and parts to Japan in 2021 reveals the tendency of Japan to rely on certain countries, with China and Taiwan accounting for a large ratio of the semiconductors, mobile phones, portable automatic data processing machines, and parts, such as processors, that Japan imports.[2]

Amid concerns of natural disasters becoming more frequent and intense and the international situation becoming more complicated, it will be crucial to build more robust communications infrastructures (including arranging alternate means), decentralize data centers and submarine cables, enhance cybersecurity and supply chains, and implement other measures to ensure

[1] https://www.cas.go.jp/jp/seisaku/keizai_anzen_hosyohousei/dai3/siryou4.pdf
[2] MIC (2022), "Ensuring the Economic Security of the Digital Society"

that data can be distributed reliably and safely and that digital services remain available even during an emergency.

(1) Building resilient communications infrastructures

Robust communications infrastructures are crucial to maintain access to digital services even during a natural disaster or other emergency. There are currently a number of initiatives underway in Japan to create more robust communications networks, based on lessons learned during large-scale natural disasters, such as the Great East Japan Earthquake.

Telecom operators have implemented measures to prevent power outages and transmission line disconnections, based on experience during the Great East Japan Earthquake, where such failures occurred due to mobile phone base stations being switched off. Some measures being implemented to prevent power outages include deploying more vehicle-mounted power supplies and power generators and enhancing base station batteries. Meanwhile, measures being implemented to prevent transmission line disconnections include adding new transmission line routes and expanding emergency restoration measures that make use of satellite entrance lines and micro-entrance lines.

The National Institute of Information and Communications Technology (NICT) Resilient ICT Research Center is now working with Tohoku University and other industry, academia, and government organizations to research, develop, and verify resilient ICT infrastructures that can cope with environmental changes, such as large-scale disasters and communications outages.[3]

(2) Ensuring diverse communications infrastructures and measures

Intercarrier roaming allows mobile phone users to temporarily access other carrier networks. This technology is one means of providing continuous access to digital services even during natural disasters, communications outages, or other emergencies. One example of the use of this can be seen in Ukraine, where telecom operators[4] allow users to roam between networks at no charge to ensure continuous communication while the country is under attack from Russia. In the U.S., the Federal Communications Commission (FCC) in July 2022 implemented the Mandatory Disaster Response Initiative (MDRI), which requires providers to allow roaming between mobile carriers during disasters, such as hurricanes, wildfires, and long-term power outages.[5]

In Japan, the Ministry of Internal Affairs and Communications has been holding meetings for the “Study Group on Intercarrier Roaming in Emergency Situations” since September 2022. It has investigated a wide range of measures, including intercarrier roaming for mobile phones, to ensure that communication is available during emergencies. In December of the same year, the organization released the “First Report on Intercarrier Roaming in Emergency in JAPAN,”[6] a basic policy on introducing intercarrier roaming as quickly as possible and in a manner that allows for full roaming for data communications in addition to general calls and call backs from emergency agencies. In response, telecom operators have begun investigating policies for using and operating technologies in order to implement intercarrier roaming.

However, because there is always the possibility of a communications outage preventing the use of intercarrier roaming, it will be important to continue to promote comprehensive solutions, including utilizing other means of communication. Since March 2023, mobile carriers have begun providing auxiliary line services that allow users to switch to other carriers to maintain connectivity.[7] This provides a useful alternative for situations where users cannot access their carrier network due to a communications outage or disaster. In response to demands from mobile carriers belonging to the Telecommunications Carriers Association to continue to use the “00000JAPAN” SSID for disasters even if a communications outage occurs, the Wireless LAN Business Promotion Association (Wi-Biz) revised its “Guidelines on Providing Free Access to Public Wireless LAN during a Large-Scale Disaster” in May 2023 to allow access to “00000JAPAN” during a communications outage. Wi-Biz continues to investigate situations where alternate operations could be required during a natural disaster.

One other effective means of ensuring communication is to use non-terrestrial communications networks, such as satellites. The Starlink broadband internet service is being used to maintain communications in war-torn Ukraine. This service, provided by SpaceX (U.S.), utilizes a satellite constellation for communications. Even in Japan, telecom operators are engaged in efforts to utilize and introduce satellites, etc. for use during emergencies **(Figure 3-2-1-2)**. Authorities in Tokyo are also investigating the use of satellite communications to maintain access to the Internet even if a communications outage or disaster occurs.[8]

---

[3] https://www.nict.go.jp/resil/
[4] The three largest telecom operators in Ukraine (Kyivstar, Lifecell, and Vodafone Ukraine)
[5] https://www.soumu.go.jp/main_content/000838215.pdf
[6] https://www.soumu.go.jp/main_content/000852036.pdf
[7] https://news.kddi.com/kddi/corporate/newsrelease/2023/03/27/6618.html
[8] https://note.com/smart_tokyo/n/n51c567aefe31

Figure 3-2-1-2 Efforts by Japanese telecom operators to utilize and introduce satellites, etc.

	Overview
NTT	Established Space Compass, jointly funded by SKY Perfect JSAT. Aims to begin providing low-delay communications services within Japan using High Altitude Platform Station (HAPS) in fiscal 2025.
KDDI	Signed contract with SpaceX (U.S.) to use Starlink as the backhaul link to au base stations. Began operating in Hastushima (Atami, Shizuoka Prefecture) in December 2022, and plans to expand service to approximately 1,200 locations throughout Japan.
SoftBank	Currently developing an NTN solution to provide communications networks from outer space and the stratosphere, using three services: (1) satellite phone service provided by THURAYA, (2) LEO satellite communications service provided by OneWeb, and (3) HAPS provided by HAPSMobile (a subsidiary of SoftBank).
Rakuten Mobile	Working with AST SpaceMobile (U.S.) on the "SpaceMobile" project to build mobile broadband networks utilizing LEO satellites. Aims to allow smartphones to communicate directly with satellites.

(Source) Created by MIC based on publicly available documents released by various companies

(3) Strengthening data centers, submarine cable functions, and safety measures

Data centers serve to store and process data and are the foundation for a variety of internet services, including data communications. Japan also relies on submarine cables for about 99% of its international communications, which are becoming even more important as the volume of cross-border data flows increases. In addition, as tensions between the United States and China continue to rise and the international situation, such as the invasion of Ukraine, becomes more complex, it is increasingly important to strengthen security measures for data centers and submarine cables from the viewpoint of economic security.

In Japan, currently about 60% of data centers are located in the Tokyo metropolitan area.[9] In addition, domestic submarine cables are mainly laid on the Pacific Ocean side, while the Sea of Japan side is undeveloped (this condition is called "missing link"), and the landing bases of submarine cables are concentrated in the Boso Peninsula and the Shima Peninsula. With data centers and submarine cable landing stations concentrated in specific areas, a large-scale disaster in the Tokyo metropolitan area could have a significant impact on the communications environment on a nationwide scale. In fact, the Great East Japan Earthquake caused damage to KDDI's submarine cables in ten locations off the coast of Ibaraki Prefecture and Choshi in Chiba Prefecture, both of which are located on the Pacific side, and connections to at least ten countries were affected.[10] In January 2022, an eruption of an underwater volcano off the coast of Tonga severed a submarine cable, and it took five weeks to restore communications.[11]

Given the importance of data centers and submarine cables, Japan is currently decentralizing their locations. As part of the Digital Garden City Nation Infrastructure Development Plan (Revised) announced in April 2023, the Ministry of Internal Affairs and Communications, in cooperation with the Ministry of Economy, Trade and Industry, plans to develop over ten regional data centers in about five years. And in light of the fact that the Tokyo and Osaka areas are increasingly becoming data center hubs, it also plans to promote the development of third and fourth core data center hubs to complement and replace Tokyo and Osaka for the time being. In addition, while paying close attention to trends in infrastructure development that are in line with internet traffic conditions, initiatives toward greening, and collaborations using Multi-access Edge Computing (MEC) and AI, based on the discussions at the Expert Meeting on Digital Infrastructure Development (DCs, etc.) and in cooperation with the Ministry of Economy, Trade and Industry and other relevant ministries and agencies, the Ministry of Internal Affairs and Communications will proceed with considering how data centers and other infrastructure should be distributed and the necessary support for site development. With regard to submarine cables, the Ministry of Internal Affairs and Communications plans to start operation of submarine cables on the Sea of Japan side by the end of fiscal 2026 and to promote distribution of landing stations and efforts to strengthen Japan's functions as a hub for international data distribution, such as multi-routing of international submarine cables and the laying of branch lines for landing stations, in conjunction with efforts to develop data center sites and strengthen safety measures for international submarine cables and landing stations **(Figure 3-2-1-3)**.

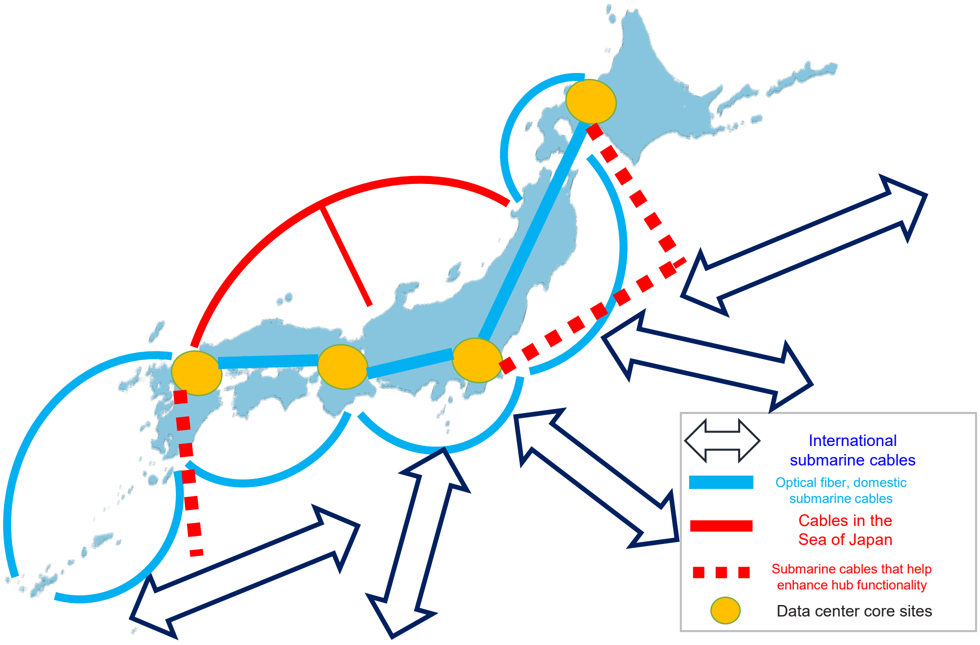
As a concrete measure, the Ministry of Internal Affairs and Communications has been providing subsidies to private businesses for digital infrastructure development using the Fiscal 2021 Supplementary Budget Digital Infrastructure Development Fund (Specified Telecommunications Facilities Development Promotion Fund) as a source of funding. As of June 2022, seven local data center projects have been adopted.

[9] The reason behind the concentration of data centers in the Tokyo metropolitan area is that constructing data centers close to Tokyo, which is where there is the largest demand for data, reduces the latency time of communications and improves the quality of services. In addition, from the viewpoint of operations and maintenance, it is desirable to locate data centers in the Tokyo metropolitan area for easy access by maintenance personnel. So locating data centers in Tokyo metropolitan area has been very advantageous for operators.

[10] The cable is believed to have been severed by the earthquake, which caused the ground beneath the sea to shift, placing excessive load on the cable.

[11] https://www.technologyreview.jp/s/266975/tongas-volcano-blast-cut-it-off-from-the-world-heres-what-it-will-take-to-get-it-reconnected/

Figure 3-2-1-3 Image of data center and submarine cables maintenance



(4) Responding to cybersecurity and supply chain risks

It is necessary not only to prepare for large-scale natural disasters but also to address cybersecurity risks (including those in the supply chain) and procurement risks.[12]

In light of the increasing importance of preventing acts that harm the security of the nation and its citizens from taking place in relation to economic activities in the face of the increasing complexity of the international situation and changes in the socioeconomic structure, the Act on the Promotion of Ensuring National Security through Integrated Implementation of Economic Measures (Act No. 43 of 2022) was enacted in May 2022.

In order to prevent important facilities that are part of Japan's core infrastructure from being used as a means for acts (including cyberattacks) that obstruct the stable provision of services performed outside Japan and to ensure the stable provision of core infrastructure services, this act stipulates a system for "ensuring the stable provision of specified social infrastructure services" in which the government reviews plans in advance when core infrastructure operators introduce important equipment, etc. Telecommunications is stipulated as one of the industries that may be subject to the regulations.

In addition to working on the steady implementation of the system from the perspective of procurement risks, it is important to be able to secure telecommunications infrastructure autonomously without being overly dependent on specific countries. To this end, it is necessary to consider ways to procure reliable devices and parts, including promoting research and development in Japan and diversifying suppliers.

Furthermore, in light of the global importance placed on ensuring the safety and reliability of communications infrastructure, it is necessary for the public and private sectors to promote overseas expansion of 5G and submarine cables while strengthening cooperation with other countries as economic security measures, including measures with respect to supply chain risks.

2. Development of advanced ICT infrastructure that supports ultra-high-speed, high-capacity data distribution

As new technologies and services, such as blockchain-based NFTs, DAOs, metaverses, and digital twins, begin to be utilized, it will be necessary to transmit huge amounts of data at a very high speed and without delay in order for these technologies and services to penetrate society in the future.[13]

In addition, it is expected that in the 2030s, the integration of cyberspace and physical space (Cyber Physical Systems [CPS]) will advance, and physical communications in physical spaces will be reproduced in the form of digital data in cyberspace. By using AI, it is also expected that it will be possible to ascertain the status of

[12] For details on the MIC's cybersecurity policy, see Section 5, Cybersecurity policy trends in Chapter 5 of Part 2.
[13] According to Manabu Tsukada, Associate Professor at the Graduate School of Information Science and Technology at the University of Tokyo, delays, scale, and data transfer speeds are major points in the popularization of metaverses. For example, to achieve one of the goals for metaverses of unlimited numbers of users who can synchronize events and experience them satisfactorily, delays should be kept to within 150 milliseconds, and in more demanding environments, such as games, delays should be kept to within 20 milliseconds.

physical spaces at any time and make decisions on subsequent actions based on such information. Thus, it will be necessary to meet a wide variety of requirements, including performance beyond 5G.

Therefore, Beyond 5G (6G), which is a more advanced information and communications infrastructure than 5G, is essential for realizing the data-driven Society 5.0, which makes the most of CPS for socioeconomic activities **(Figure 3-2-2-1)**.

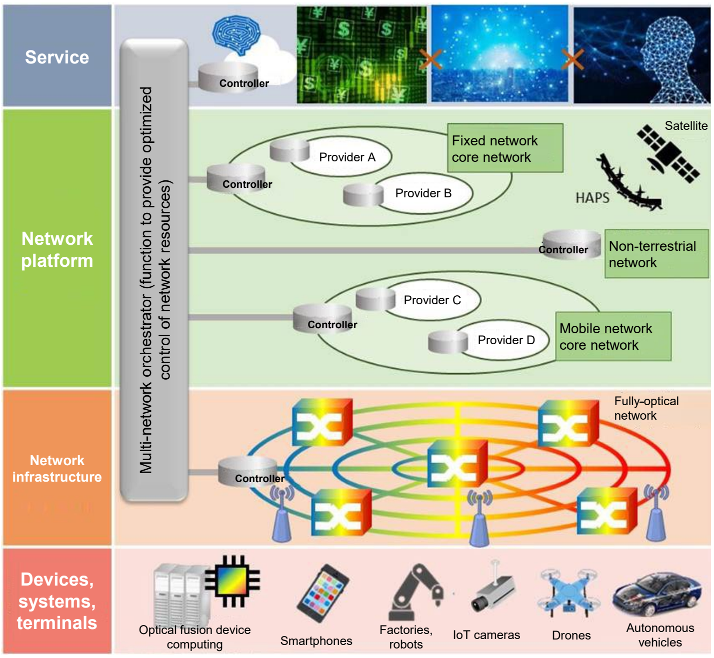
As well as further advancing the functions of 5G, which are high speed and high capacity, low latency, and multiple simultaneous connections, Beyond 5G (6G) is also expected to realize new functions, such as reduced power consumption due to recent advances in remote and online communication traffic in response to increases in network power consumption, scalability to expand communication coverage, and network safety, reliability, and autonomy.

In particular, as environmental problems, such as global warming, become more serious, reducing the power consumption of information and communications infrastructure has become an issue, and attention is being paid to fully optical network technology,[14] which utilizes photoelectric fusion technology to achieve higher network speeds and significantly lower power consumption by combining telecommunications and optical communications.

In the interim report of the Information and Communications Technology Strategy Beyond 5G- With the aim of building a robust and vibrant society in the 2030s- issued by the Information and Communications Council (June 30, 2022), the concept of capturing Beyond 5G (6G) as an entire network that includes wired, wireless, land, sea, air, space, etc. rather than as an extension of current wireless communications, the ideal network for Japan, the key technology areas that Japan should focus on, including all-optical network technology, non-terrestrial network (NTN) technology, and secure virtualization and integrated network technology, and the direction of strategically promoting research and development, social implementation, intellectual property and standardization, and overseas expansion. Based on this, the Ministry of Internal Affairs and Communications is devising new policies, including legal amendments and the creation of a permanent fund, that are based on budgetary measures.[15]

In addition, activities, such as the examination of use cases and technical challenges, international cooperation, and the promotion of intellectual property and standardization through industry-academia-government cooperation organizations (the Beyond 5G Promotion Consortium and Beyond 5G New Business Strategy Center), are also progressing in industry.

Figure 3-2-2-1 The ideal Beyond 5G network



(Source) Summary of the Information and Communications Council's interim report on the "Information and Communications Technology Strategy Beyond 5G"

[14] This is one of the major technology areas in NTT's IOWN Initiative.
[15] For details, see [Policy focus] Toward the realization of Beyond 5G (6G), and Section 7, ICT Technology Policy Trends in Chapter 5 of Part 2, etc.

3. Formation of international rules, including standardization

In order for new services and products to proliferate, it is important to disseminate rules for services and products.

Since digital spaces, such as metaverses, do not have the concept of borders and people from all over the world can participate and use them via the Internet, it is necessary to form and disseminate international rules, including standardization, in cooperation with the international community.

With regard to metaverses, there is already a growing movement toward the formation of international rules led by the private sector, with many companies and organizations participating in international forum organizations aimed at realizing interoperability. At its annual meeting in May 2022, the World Economic Forum announced the launch of the New Initiative to Build an Equitable, Interoperable and Safe Metaverse[16] as a public-private framework for international cooperation on metaverses. In June 2022, The Khronos Group Inc. in the U.S. led the establishment[17] of the Metaverse Standards Forum, an industry group that promotes the development of interoperability standards for metaverses, and it is working on developing open standards for metaverses, such as avatar identity management, privacy, and human interfaces, such as XR.

In addition, ITU-T Study Groups is examining security, wired content transmission, encoding, distribution of digital media, etc. in anticipation of ensuring the mutual compatibility of metaverses. Regarding standardization of transmission lines, it has also set delay tolerances, jitter as an indicator of dispersion, and packet loss requirements, etc. Furthermore, the metaverse focus group (FG-MV)[18] was established to collect information on the standardization of metaverses in a wide range of areas, and it is promoting examination of items that should be standardized in the future and how cooperation with other standardization organizations should be conducted.

The VRM Consortium is taking the lead in developing the VRM format, a standard for 3D avatars developed in Japan. And relevant organizations in Japan, such as the VRM Consortium and private companies, are actively working on international standardization, including participating in the Metaverse Standards Forum.[19]

In this way, in addition to ensuring interoperability between multiple platforms, Japan is also moving toward standardization of advanced data compression technologies and standards for 3D avatars, so it is necessary for Japan to actively and proactively address and promote these initiatives in cooperation with the international community.

With regard to AI, which is becoming increasingly advanced and more widely adopted, it is important for each country to cooperate in examining which measures should be promoted and the form of regulations, etc.

The promotion of development, utilization and appropriate regulation of AI are all important. Based on these ideas, at the G7 Digital and Technology Ministers' Meeting held in April 2023, which Japan presided over, discussions were held on measures for realizing the common vision of each country to promote the adoption of "trustworthy AI." As a result, an action plan was agreed on to promote interoperability of AI governance, such as a basic framework for AI management and operation, which varies by country and region, and an agreement was also reached to quickly establish a forum for discussing generative AI, such as ChatGPT. In addition, at the G7 Hiroshima Summit in May of the same year, it was agreed to create the Hiroshima AI Process to discuss generative AI. Going forward, it is necessary to continue to promote development of the environment for utilizing AI in cooperation with other countries, based on action plans.

4. Creation of abundant and sound information spaces

As described in Chapter 2, Section 3, the spread of social media has made it possible for all parties to disseminate information on the Internet and easily obtain various kinds of information. On the other hand, numerous problems have arisen regarding the distribution and utilization of data, such as the spread of illegal harmful information, disinformation and misinformation, and information bias. These issues are not confined to cyberspace or any particular age bracket but to society as a whole, including in the real world.

However, at present there is no magic solution for these problems, and no solution has been found for one of the causes of these problems, the "attention economy" on the Internet. In addition, the spread of generative AI and deepfake technologies has made it possible for anyone to easily create fake text and images, and the Japanese public is increasingly exposed to information that the human eye has difficulty discerning whether it is real or not. The problem of disinformation and misinformation is expected to become more complicated in the future due to the misuse of these technologies.

In order to realize a sound information space where everyone can use digital services with peace of mind, further initiatives are required by a variety of stakehold-

[16] https://initiatives.weforum.org/defining-and-building-the-metaverse/home
[17] As of March 2023, more than 2,300 organizations are participating, including Meta, Microsoft, Alibaba, Deutsche Telekom, Sony Entertainment, and NTT QONOQ.
[18] Focus group: a fixed-term organization that is open to non-ITU members with the purpose of collecting a wide range of information for examining the development of recommendations
[19] Interim Report of the MIC Study Group on the Utilization of Metaverse Toward the Web3 Era https://www.soumu.go.jp/main_content/000860618.pdf

ers, including operators of platforms that serve as a place for distributing, sharing, and utilizing data.

In the second report published by MIC's Study Group on Platform Services (chaired by Professor George Shishido of the Graduate School for Law and Politics, University of Tokyo) in August 2022, the direction of initiatives regarding disinformation and misinformation going forward is to comprehensively promote voluntary initiatives by a wide range of stakeholders, including platform operators, by, for example, promoting fact-checking initiatives in cooperation with platform operators, fact-checkers, fact-checking promotion organizations, and existing media, etc. and ascertaining the status of initiatives for improving ICT literacy and the problem of disinformation in Japan from the perspective of ensuring freedom of expression, based on voluntary initiatives by the private sector.

In this context, platform operators are required to appropriately set and operate disinformation policies that are based on risk analysis and assessment and promote transparency and accountability in these initiatives. Therefore, it is necessary for the government to continuously conduct monitoring and verification of these initiatives.

It is also necessary to improve the literacy of users of digital services.

In Japan up to now, measures for improving ICT literacy have mainly targeted young people, with the main aim of encouraging them to avoid risks associated with ICT use, such as how to avoid internet-related problems. With the use of ICT and digital services becoming commonplace, it is becoming increasingly important for all generations to learn the characteristics of digital services, the responsibilities associated with their behavior when using those services, and how to accept, utilize, and disseminate information in an independent and interactive manner while using ICT, etc.

The Ministry of Internal Affairs and Communications held the Working Group on Improving Literacy for ICT Use (chaired by Professor Tatsuhiko Yamamoto of the Graduate School of Law, Keio University) to discuss and examine measures to promote improving the literacy required for the digital society in the future while taking into account the concept of "digital citizenship" in which people voluntarily engage with the digital society. Based on the discussions of this committee, etc., the MIC plans to prepare and publish in the summer of 2023 a roadmap that summarizes future issues to be addressed. Going forward, it is necessary to proceed with examining the formulation of indicators for literary proficiency and the development of content for improving literacy, based on this roadmap.

New digital technologies and services, such as generative AI and metaverses, which have evolved and spread rapidly in recent years, will make the lives of ordinary citizens more convenient and bring various benefits, but this depends on these technologies being used properly. Incorrect use of these technologies may create problems not only for the user but may also violate the interests and rights of others.

In order for everyone to enjoy the convenience of using AI, etc., it is necessary to acquire the skills and literacy needed to properly use it.

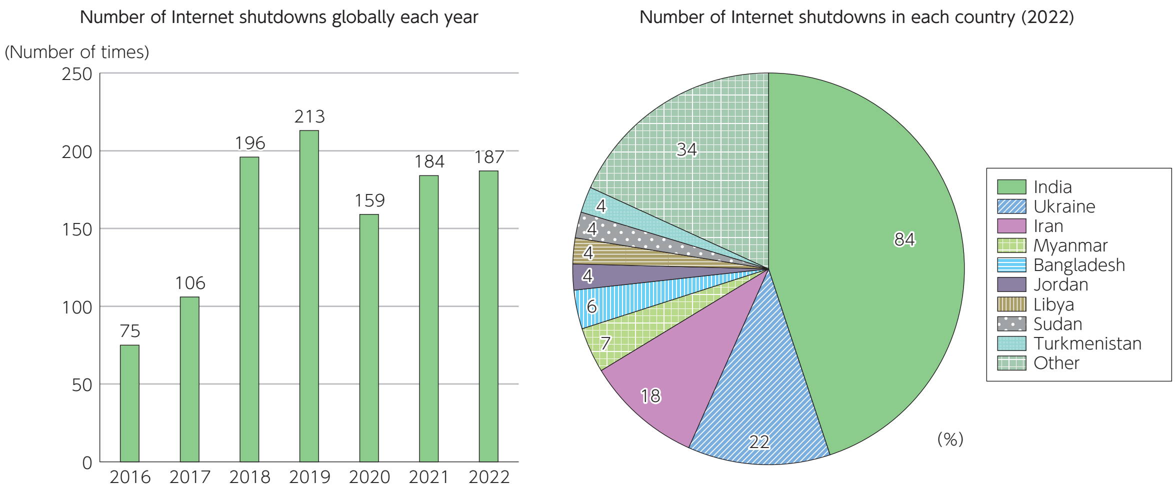
Column Maintaining and promoting a free and open Internet

The Internet originated as a communications network between universities and research institutes under the ARPANET program[1] in the U.S., and it started to be used commercially in the 1990s. With the widespread adoption of personal computers and the development of broadband networks, it has expanded worldwide. The Internet has developed into a free and open space accessible to all in accordance with the basic principles of autonomy, dispersion, and cooperation, and it has become the foundation that supports our socioeconomic activities, where all kinds of people share knowledge and information, and a range of digital services and businesses are created by various stakeholders.

As a governance framework supporting a free and open Internet, the Internet Corporation for Assigned Names and Numbers (ICANN) has played a major role in the management and coordination of resources, such as domain names and IP addresses, and the Internet Engineering Task Force (IETF) has played a major role in the standardization of internet-related technologies. ICANN and the IETF operate according to the principle that governments are just one of the parties involved in decision-making and that democratic decision-making involves multiple stakeholders, including researchers, companies, engineers, and civil society. In addition, the Internet Governance Forum (IGF) was established in 2006, following the consensus statement of the United Nations-sponsored World Summit on the Information Society (WSIS). The IGF also adopts a multi-stakeholder approach in which various parties, including industry, government, academia, and the public, participate in discussions, based on the idea that a wide range of participants share their wisdom to solve problems.[2]

As a threat to this kind of free and open Internet, the movement towards a "splinternet" has become apparent. The term splinternet is a combination of "splinter" and "Internet," and it refers to a situation in which the Internet becomes fragmented due to government regulations and interventions, technological factors, and business activities.[3] According to a report by Access Now, an international NPO, 35 countries experienced at least 187 internet shutdowns in 2022, with both figures up from the previous year **(Figure 1)**.

Figure 1 Internet shutdowns in the world



(Source) Created based on "WEAPONS OF CONTROL, SHIELDS OF IMPUNIT"[4]

Fragmentation caused by government regulation and intervention includes state control and management of the Internet that is based on China and Russia's claim of cyber sovereignty.[5]

Since the 1990s, China has been censoring and fragmenting the Internet under a national strategy called the Golden Projects. To protect its interests being negatively affected by information from other countries, it has created an internet censorship system called the Great Firewall (Golden Shield), which blocks access to Google, Facebook, YouTube, and other sites in China. A survey carried out by Freedom House in 2022 found that of the 65 countries surveyed, China had the least amount of freedom on the Internet.

In addition, in recent years, China has proposed positioning the International Telecommunication Union (ITU), a specialized agency of the United Nations, as an internet management organization, and it has begun to

1 It is a network program between universities and research institutes that is funded by the Advanced Research Projects Agency of the U.S. Department of Defense. The world's first packet communication was realized in 1969.
2 https://japanigf.jp/about/igf
3 See Section 2 in Chapter 2 for information on the concentration of digital data with platform providers, etc. and Section 3 in Chapter 2 for information on the algorithmic selection and restriction of data on the Internet.
4 https://www.accessnow.org/wp-content/uploads/2023/03/2022-KIO-Report-final.pdf
5 Unlike the idea espoused by Western countries and Japan, etc. that governments and public authorities should not intervene in internet governance and that the Internet should develop outside of government regulations, China and Russia advocate the concept of cyber sovereignty, which states that active control of cyberspace within their borders should be internationally recognized as a national interest.

strengthen its influence in the ITU. As an intergovernmental organization, the ITU is based on a one-country, one-vote system, and private organizations are not expected to be involved in ITU decisions. It is considered that the aim of China's insistence on centralizing discussions on internet governance in the ITU is for countries to take the lead in managing the Internet and for international agreements to be managed on a one-country-one-vote system that includes developing countries so that China's opinions are more strongly reflected.[6]

In September 2019, China's Huawei, together with the Ministry of Industry and Information Technology (a government agency) and two Chinese state-owned telecommunications companies, proposed to the ITU "New IP." This would form the basic technology of a new Internet on the basis that the quality of the current internet protocol (IP) (best effort type) cannot cope with the introduction of cutting-edge technology in the future. This proposal was strongly opposed by Western countries and the IETF, which argued that New IP is incompatible with the existing IP and would compromise interconnectivity. In December 2020, the ITU concluded that New IP would not be discussed further.

The Russian government has also begun to regulate and intervene in the Internet, and in November 2019, a federal law (commonly known as the Sovereign Internet Law) came into effect to block or restrict internet communications with foreign countries in the event of an emergency, etc. The law requires telecom operators to install technical tools on their networks to counter threats to internet traffic and to restrict access to prohibited websites. It also stipulates that the Federal Service for Supervision of Communications, Information Technology and Mass Media centrally manages communications networks when the Internet in Russia is threatened.

In addition to these developments regarding cyber sovereignty by China and Russia, the current complex international situation has led to new fragmentation. Specifically, four days after Russia invaded Ukraine in February 2022, the Ukrainian government requested ICANN to revoke the Russian domain .ru and to suspend DNS root servers in Russia. As discussed above, the Internet is a global platform that is used under the unwritten law that it is accessible to people all over the world, so this request from the Ukrainian government attracted the attention of various countries as it shook the foundation of the Internet. In response, ICANN refused to accept the Ukrainian government's request, saying the "unilateral disconnection of a domain is not stipulated in ICANN policy." Regarding the invasion of Ukraine, not only governments but also companies are taking actions, and in March 2022, two major U.S. telecom operators cut off their connections to Russian networks.[7]

So far, the Internet has supported the creation of digital services, the expansion of innovation, and active communications as a universal infrastructure that is accessible to all without the influence or intervention of any particular state. In order to avoid the fragmentation of the Internet and to maintain and promote a free and open Internet, it is important to maintain the management and operation of the Internet based on a multi-stakeholder framework rather than national initiatives.

For this reason, in April 2022, the U.S. issued the Declaration for the Future of the Internet[8] together with 60 countries and regions, including Japan, Australia, and countries in Europe. The declaration expresses concern that "Access to the open Internet is limited by some authoritarian governments, and online platforms and digital tools are increasingly used to repress freedom of expression and deny other human rights and fundamental freedoms." It also calls for support for an open, free, global, interoperable, reliable, and secure Internet in the future. Furthermore, with regard to the future of the Internet and the Internet and digital technologies, the declaration presents the following principles: (1) protection of human rights and fundamental freedoms, (2) a global Internet (with no fragmentation), (3) inclusive and affordable access to the Internet, (4) trust in the digital ecosystem, and (5) multi-stakeholder internet governance.

In addition, the G7 Digital and Tech Ministers' Meeting in Takasaki, Gunma, held in April 2023, reaffirmed the importance of maintaining and developing internet governance through a multi-stakeholder framework to ensure open and free access to the Internet. The ministers also expressed their opposition to excessive government intervention that unreasonably restricts the distribution of data on the Internet and their continued commitment to ensuring Data Free Flow with Trust (DFFT).

In October 2023, the annual meeting of the Internet Governance Forum (IGF) will be held in Japan. It is expected that the multi-stakeholder discussions, which included the government, the private sector, and the technical and academic communities, will yield meaningful results that support a free and open Internet.

[6] In February 2022, China and Russia issued a statement stating they share the position that "[Both countries] support the internationalization of internet governance, affirm that countries have equal rights to governance, and any attempt to limit the sovereign right to ensure domestic security by regulating domestic segments of the Internet is unacceptable" and that they were "interested in greater ITU participation in addressing these issues."
https://www.digitalpolicyforum.jp/column/220902/

[7] As the trends and nature of the splinternet itself have changed significantly over time, there are indications that Splinternet 1.0, which is defensive in nature to protect a country's own information environment from other countries, has shifted to Splinternet 2.0 in which specific countries are strategically and aggressively disconnected from global networks in order to exclude them. Professor Toshiya Jitsuzumi of Chuo University stated that in the so-called Splinternet 1.0 stage, internet disruptions were done by national governments, but the Splinternet 2.0 stage is characterized by disruptions being done not only by national governments but also by private companies.

[8] Provisional translation: https://www.soumu.go.jp/main_content/000812030.pdf

Part 2
Current Status and Issues in the Information and Communications Field

Chapter 4

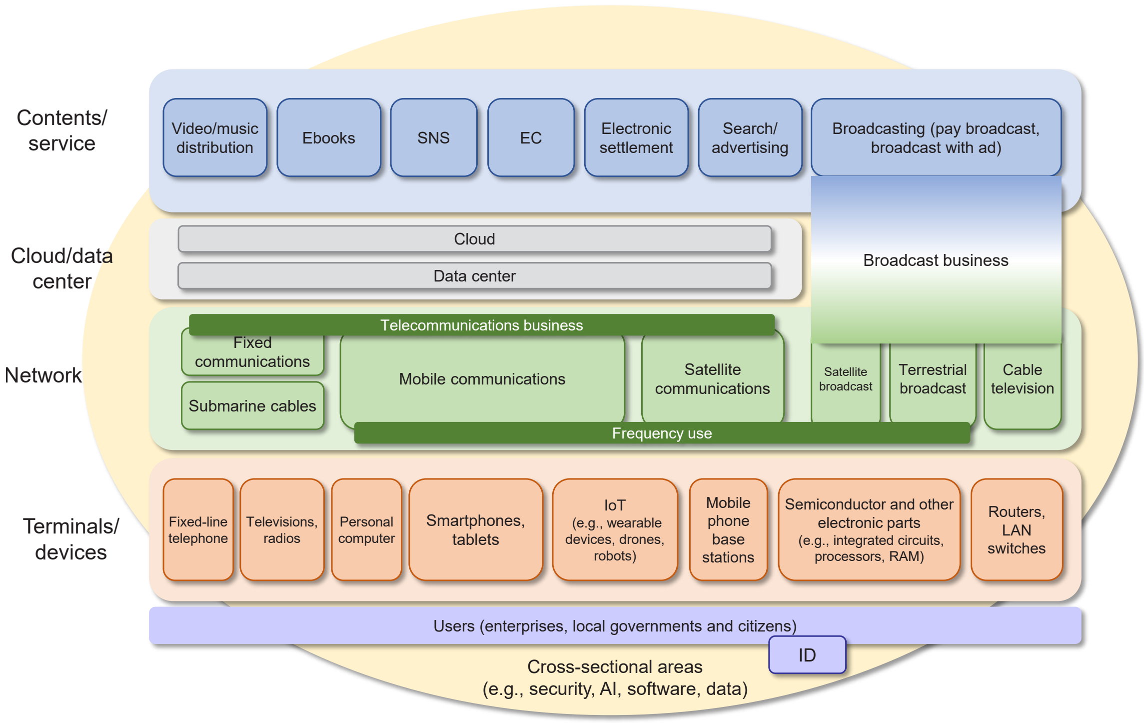
Trends in the ICT Market

Section 1 Trends in the ICT industry

1. Size of the ICT market

The ICT market includes equipment and devices that serve as the interface with users, networks provided by telecommunications carriers and broadcasters, etc., clouds and data centers, content services including video and music distribution, security, and, AI **(Figure 4-1-1-1)**.

Figure 4-1-1-1 Structure of the ICT market by layer



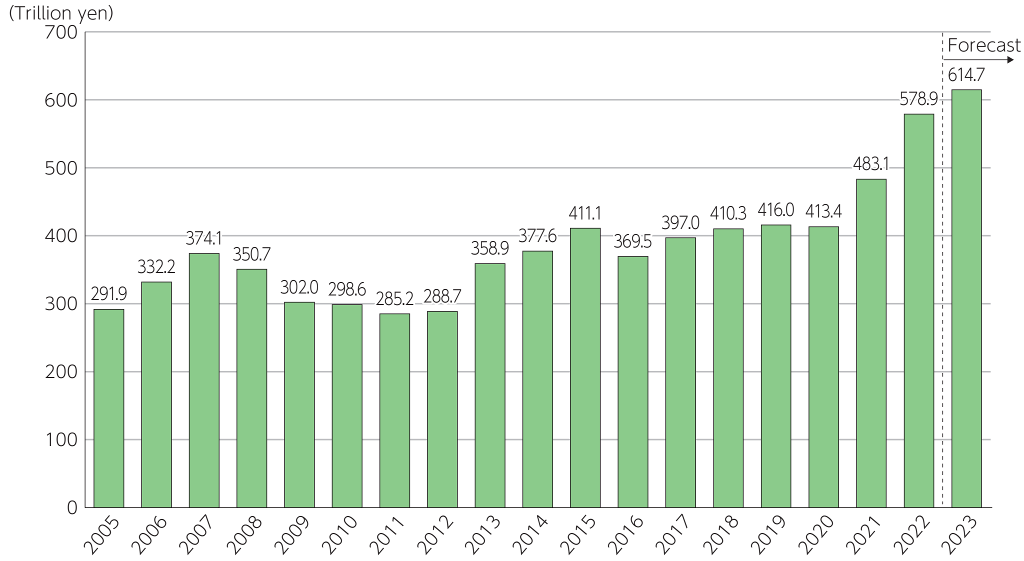
(Source) Created by MIC

Due to the spread of smartphones, cloud service and other factors, the global ICT market (in terms of expenditure)[1] has been on the increase since 2016. In 2022, it increased significantly to 578.9 trillion yen [2] (up 19.8% from the previous year[3]), and is forecasted to increase to 614.7 trillion yen in 2023 [4] (**Figure 4-1-1-2**).

The Japanese ICT market (in terms of enterprise IT expenditure)[5] is expected to increase significantly to 27.2 trillion yen in 2022 (up 5.2% from the previous year). By industry, growth in banking and investment services (+ 7.9%) and government offices/local government (+ 7.7%) was significant. In addition to cost reductions through automation and labor savings, renewal of legacy systems, and increased investment in efficiency improvements, investment in a wide range of industries is expected to increase as a result of the easing of COVID-19 restrictions.

[1] The ICT market includes data center systems, enterprise software, devices, ICT services, and communications services.a
[2] The average exchange rate for each year is used to convert to yen. In 2023, the average exchange rate between January and March is used (the same applies hereinafter).a
[3] Note that 2022 was also affected by the depreciation of the yen (the same applies hereinafter).
[4] MIC (2023) "Survey Study on the Trends in the Market Environment Surrounding ICT" (the same applies hereinafter)a
[5] The ICT market includes data center systems, software, devices, IT services, telecom services and internal services.a

Figure 4-1-1-2 Changes in global ICT market size (in terms of expenditure)

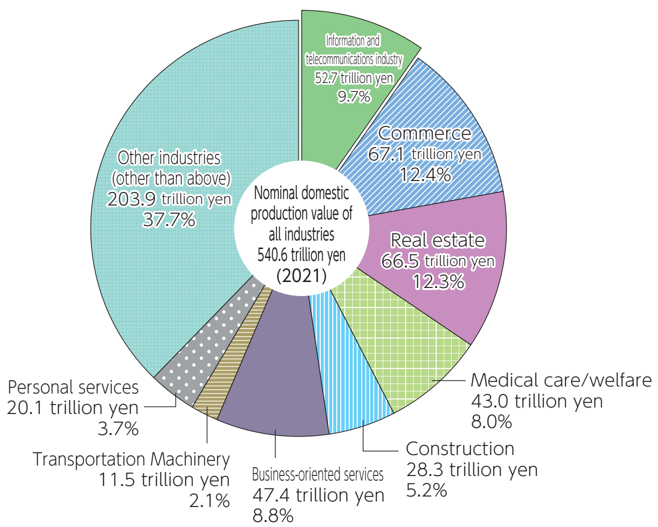


(Source) Statista (Gartner)[6]

2. Gross domestic product (GDP) of the ICT industry[7]

The nominal GDP of the ICT industry in 2021 was 52.7 trillion yen, an increase of 0.8% compared to 52.2 trillion yen in the previous year **(Figure 4-1-2-1, Figure 4-1-2-2)**. Looking at the changes in nominal GDP by sector in the ICT industry, while the trend in most sectors has remained almost flat, the information services sector and the services incidental to the Internet sector are showing increases **(Figure 4-1-2-3)**.

Figure 4-1-2-1 GDP of major industries (nominal)

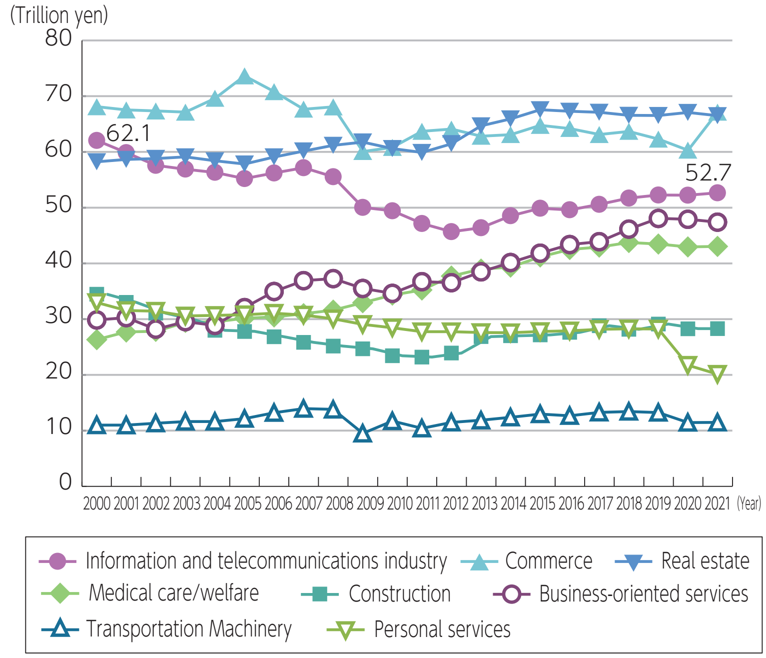


(Source) MIC (2023) "Survey on Economic Analysis of ICT in Fiscal 2022"

[6] https://www.statista.com/statistics/203935/overall-it-spending-worldwide/

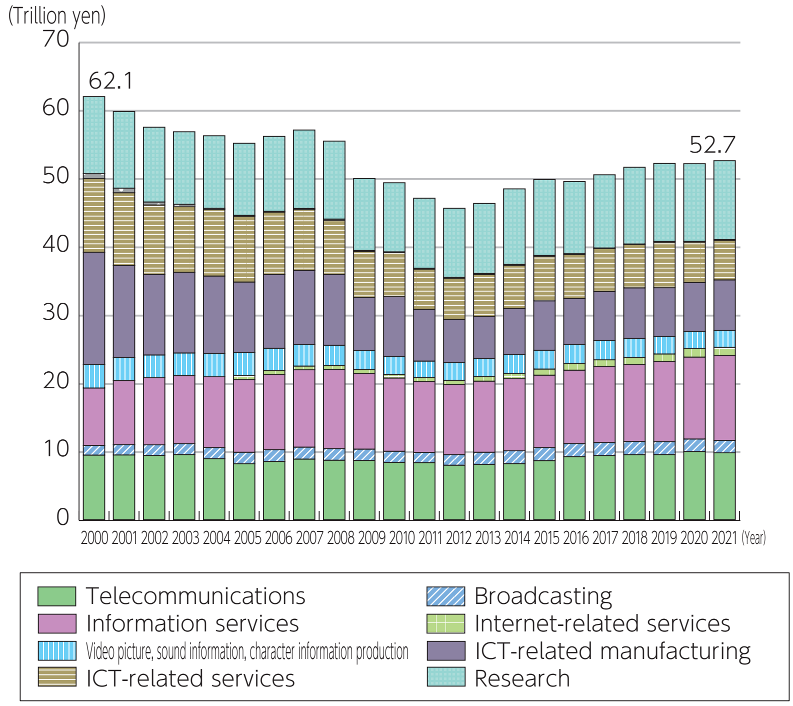
[7] The ICT industry has nine areas: telecommunications, broadcasting, information services, services incidental to the Internet, video/sound/character information production, manufacturing related to information and communications, services related to information and communications, construction related to information and communications, and research.

Figure 4-1-2-2 Changes in nominal GDP of major industries



(Source) MIC (2023) "Survey on Economic Analysis of ICT in Fiscal 2022"

Figure 4-1-2-3 Changes in nominal GDP of the ICT industry



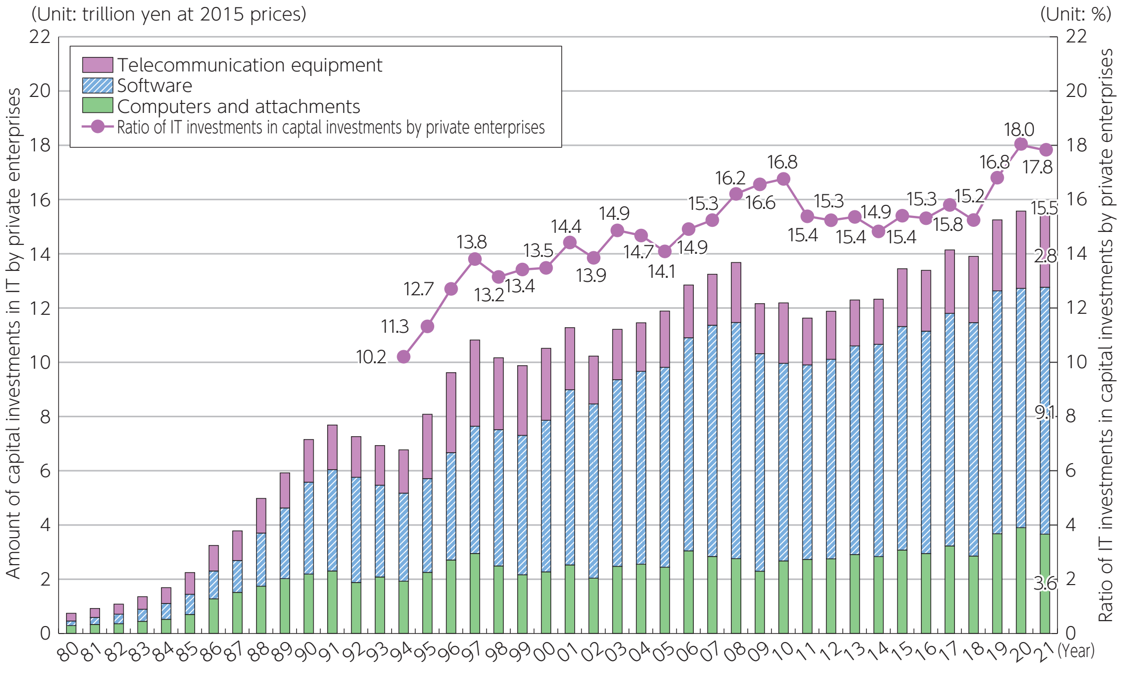
(Source) MIC (2023) "Survey on Economic Analysis of ICT in Fiscal 2022"

3. IT investments[8]

In 2021, IT investment in Japan's private companies was 15.5 trillion yen (down 0.4 % from the previous year) in terms of 2015 prices. By type of IT investment, investments in software (entrusted development and packaged software) accounted for nearly 60% of the total at 9.1 trillion yen. The ratio of IT investments to capital investment by private companies in 2021 was 17.8% (0.2 point decrease from the previous year), with IT investment accounting for a certain position in capital investment (**Figure 4-1-3-1**).

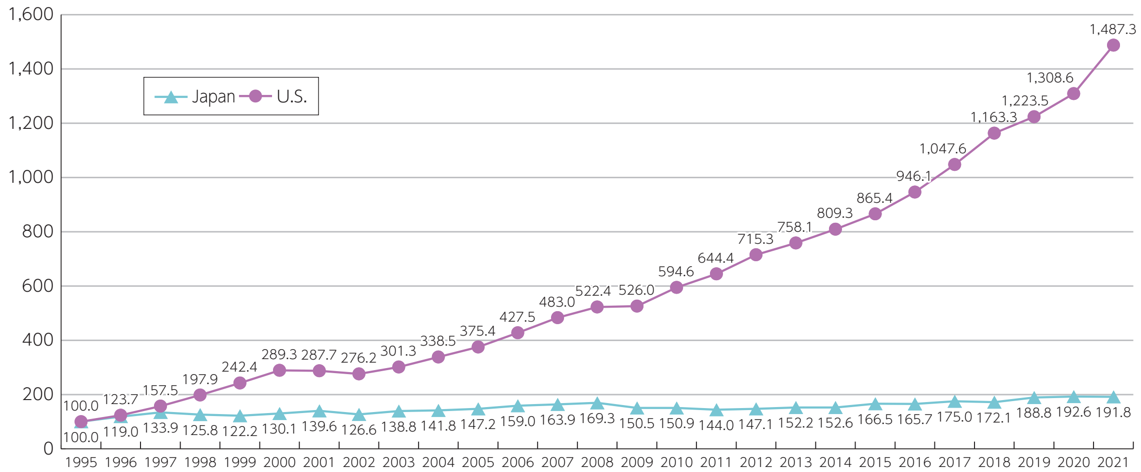
A comparison of the trends in IT investment between Japan and the U.S. shows that although IT investment in the U.S. stalled during the Lehman shock from 2008 to 2009, it has shown a rapid recovery since then, while IT investment in Japan has shown a slower recovery than that in the U.S., although the decline immediately after the Lehman shock was small (**Figure 4-1-3-2**).

Figure 4-1-3-1 Changes in IT investment in Japan



(Source) MIC (2023) "Survey on Economic Analysis of ICT in Fiscal 2022"

Figure 4-1-3-2 Comparison of IT investments in the private sector in Japan and the U.S.



*1995 = indexed as 100 (Japan: 2015 price; U.S.: 2012 price)

(Source) MIC (2023) "Survey on Economic Analysis of ICT in Fiscal 2022"

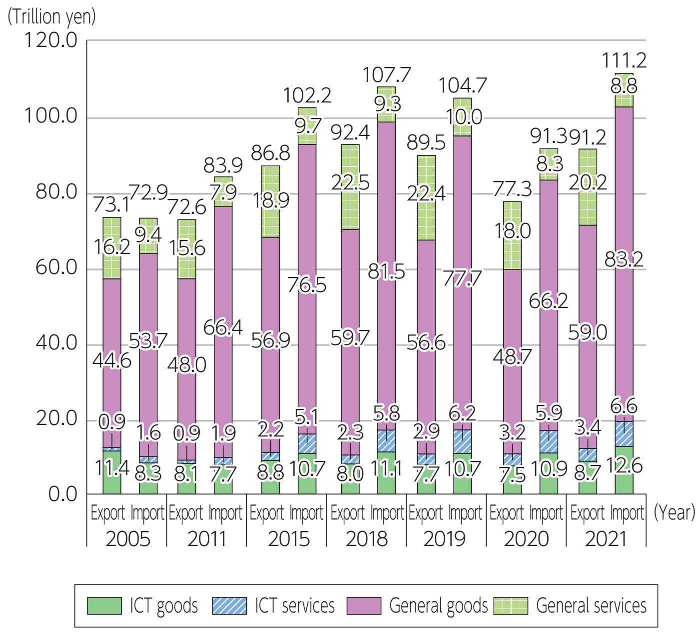
[8] Here, the term refers to investment in information and communications capital goods (computers and attachments, telecommunications equipment, software). The use of cloud services that have spread drastically in recent years is the purchasing of a service rather than the purchasing of capital goods and therefore is not included in IT investment here.

4. Exports and imports in the ICT field

In 2021, nominal value of exports and imports of all goods/services were 91.2 trillion yen and 111.2 trillion yen respectively. Of the above, exports of ICT goods/services[9] were 12 trillion yen (13.2% of all exports), while imports were 19.2 trillion yen (17.3% of all imports). The import surplus of ICT goods was 3.9 trillion yen (up 15.2% from the previous year) and the import surplus of ICT services was 3.3 trillion yen (down 18.7% from the previous year) (**Figure 4-1-4-1**).

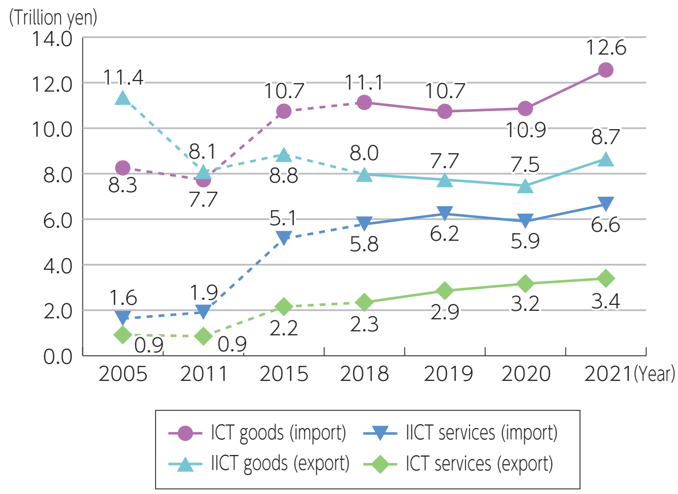
Looking at the change in the value of imports and exports of ICT goods and services, ICT services have consistently had an import surplus since 2005. However, regarding ICT goods, although there was an export surplus in 2005, the trend of an import surplus has continued in recent years due to a subsequent decrease in exports and increase in imports. Furthermore, ICT goods accounts for nearly 70% of both exports and imports of ICT goods and services (**Figure 4-1-4-2**).

Figure 4-1-4-1 Changes in the value of imports and exports of goods and services (nominal)



(Source) Prepared based on the MIC "ICT Industry Linkage Table" (for each fiscal year)

Figure 4-1-4-2 Changes in the value of imports and exports of ICT goods and services (nominal)



*There are different blanks in the data from 2005 to 2018 so trends are shown using dashed lines.

(Source) Prepared based on the MIC "ICT Industry Linkage Table" (for each fiscal year)

[9] In the table of 77 endogenous sectors, ICT goods and services refers to 1 to 43 and general goods and services refers to 44 to 77 (see note 4 at the end of this document). ICT goods includes communications devices such as personal computers and mobile phones, electronic components such as integrated circuits, televisions and radios, etc. and ICT services includes fixed and mobile telecommunications services, broadcasting services, software businesses, newspapers and publications, etc.

5. Trend of R&D in the ICT field

(1) State of research and development expenditure

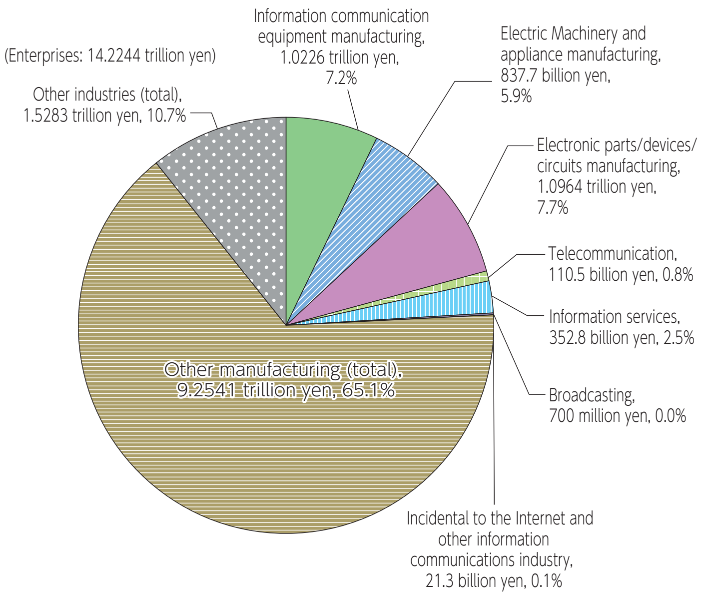
a Changes in R&D expenditures in major countries

In 2019, the U.S. continued to hold the top spot in R&D spending by major countries at 71.6739 trillion yen. China is in second place, followed by the EU and Japan, but Japan's R&D spending has been flat and the gap between the major countries in higher positions is widening.

b State of R&D expenditure in Japan

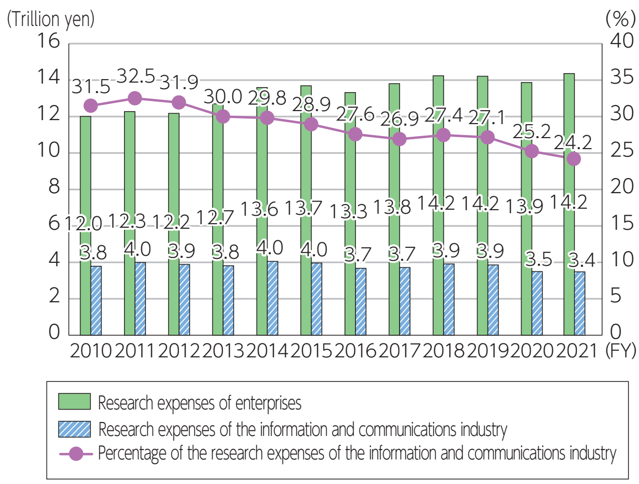
In fiscal 2021, the total expenditure for science and technology R&D in Japan (hereinafter "research expenditure") was 19.7408 trillion yen (sum of the research expenditure of companies, NGOs, public organizations, universities, etc.), which includes expenditure of 14.2244 trillion yen by companies. Of this research expenditure by companies, research expenditure in the ICT industry[10] was 3.4420 trillion yen (24.2%) (**Figure 4-1-5-1**), and in recent years this figure has either trended downward or remained the same (**Figure 4-1-5-2**).

Figure 4-1-5-1 Percentages of research expenditure by companies (fiscal 2021)



(Source) Prepared based on the MIC "2022 Science and Technology Research Survey"[11]

Figure 4-1-5-2 Changes in research expenditure by companies



(Source) Prepared based on the MIC "Science and Technology Research Survey" for each fiscal year[12]

[10] Here, the term refers to information and communications equipment manufacturing, electric machinery and appliance manufacturing, electronic parts/devices/circuits manufacturing, information communications (information services, telecommunications, broadcasting, incidental to the Internet and other information communications industries).
[11] https://www.stat.go.jp/data/kagaku/index.html
[12] https://www.stat.go.jp/data/kagaku/index.html

(2) State of R&D human resources

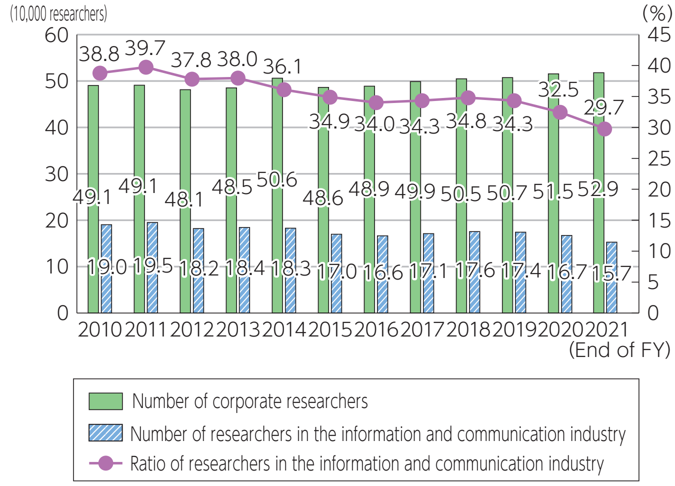
a Changes in the number of researchers in major countries

The number of researchers[13] in all major countries is on the rise. The number of researchers in 2021 in Japan was 690,000, the third largest number after China (2,281,000 in 2020) and the U.S. (1,586,000 in 2019). The most recent year figures for other countries, in descending order, are Germany (452,000 in 2020), South Korea (447,000 in 2020), France (322,000 in 2020), and the United Kingdom (316,000 in 2019).

b Number of researchers in Japan

At the end of fiscal 2021, the number of researchers in Japan (total of the researchers at companies, NGOs, public organizations, universities, etc.) was 908,330, of which 529,053 were at companies. Of the number of researchers at companies, 157,219 (29.7%) were researchers in the ICT industry, and this number has been decreasing in recent years (**Figure 4-1-5-3**).

Figure 4-1-5-3 Changes in the number of researchers at companies



(Source) Prepared based on the MIC "Science and Technology Research Survey" for each fiscal year[14]

Figure (related data) Percentages of the number of researchers at companies by industry (as of March 31, 2022)
Source: Prepared based on the MIC "2022 Science and Technology Research Survey"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00094
(Data collection)

(3) State of patents

In 2020, 597,000 patent applications were filed in the U.S. The percentage of applications filed by non-residents has been on the rise in recent years, suggesting that the U.S. market is attractive overseas. In 2020, the number of applications filed in Japan was 288,000, which was the most after China and the U.S., but the number of patent applications has been decreasing since the mid-2000s, and the gap has widened.

In terms of the changes in the number of patent families[15] by technology area in Japan, the U.S., and China, the information and communications technology percentage is increasing in the U.S. and China, but it is stagnant in Japan.

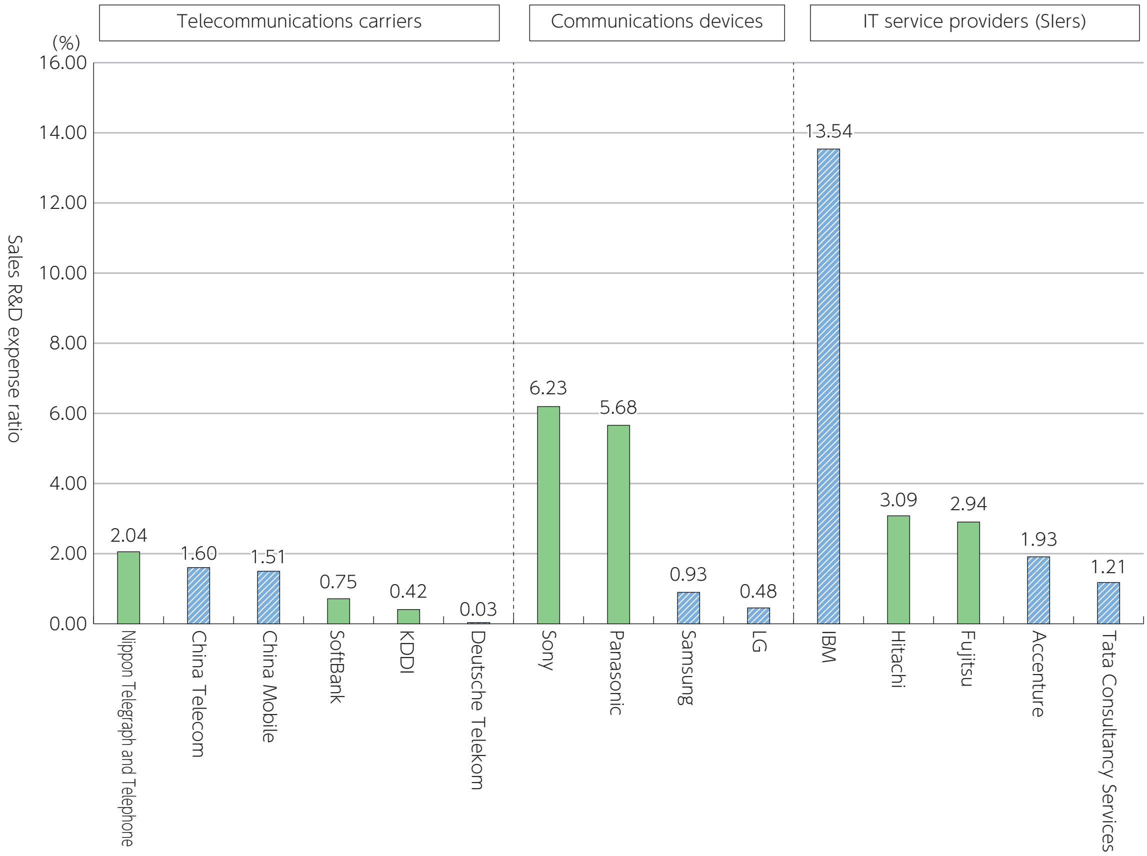
[13] Measured by converting research work into fulltime employment.
[14] https://www.stat.go.jp/data/kagaku/index.html
[15] A patent family is a bundle of patent applications in two or more countries that are linked directly or indirectly by priority rights. Generally, patents with the same content that are filed in more than one country belong to the same patent family. Thus, counting patent families prevents the same application from being counted twice. In other words, the number of patent families is considered to be approximately the same as the number of inventions.
https://www.nistep.go.jp/sti_indicator/2021/RM311_45.html

(4) R&D trends of major domestic and overseas companies in the ICT field

Excluding some companies such as IBM, the percentage of R&D expenditure to sales for major information and communications companies in Japan and overseas in 2021 remains less than 10% (**Figure 4-1-5-5**).

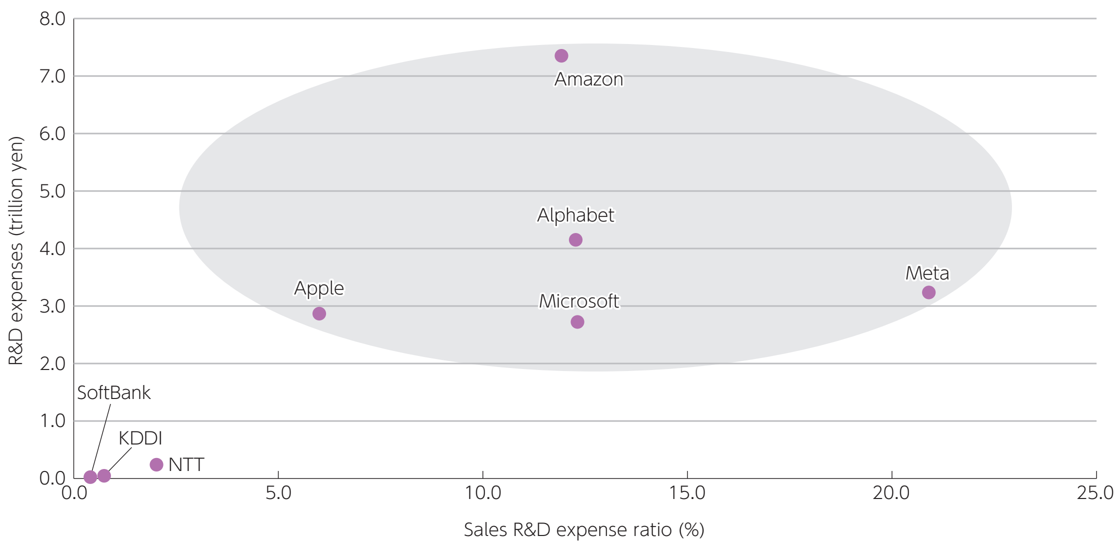
The percentage of R&D expenditure to sales of major Japanese telecom providers in 2021 was 2% at NTT and less than 1% at KDDI and SoftBank, while GAFAM's[16] percentages ranged from 6% to 21%, indicating that they are active in R&D (**Figure 4-1-5-6**).

Figure 4-1-5-5 Comparison of research and development expenditures by telecommunications carriers, communications devices and IT service providers (2021)



(Source) Prepared based on the annual reports released by companies

Figure 4-1-5-6 Comparison of research and development expenditures between major Japanese companies and GAFAM (2021)



(Source) Prepared based on the annual reports released by companies

[16] Google, Amazon, Facebook, Apple and Microsoft

(5) Examples of research and development of new technologies in the ICT field: Green of ICT using photoelectric fusion technology

Due to the progress of digitalization, the electric power consumption of communications network equipment and data centers, etc. has increased considerably. As global warming intensifies, it is necessary to contribute to the realization of a green society by reducing the power consumption of ICT-related equipment and facilities through the development and introduction of new technologies. Photoelectric fusion technology, a key technology for all-optical networks,[17] is a technology that replaces computer calculations traditionally performed by electricity with processing that uses light. Because light consumes less energy than electricity, this is expected to save a lot of energy.

However, since the light-to-electricity conversion process requires the addition of components and consumes an additional amount of electricity, if this extra electricity consumption exceeds the effect of the power saving mentioned above, overall power saving will not be achieved.

As an element that helps to solve this problem, Photonic Crystal has recently been developed in which extremely small holes are made in silicon used for semiconductors. The smaller the size of the chip (integrated circuit) that performs calculations, the lower the amount of heat generated (= energy loss) when light passes through it, and using photonic crystal enables chips to be made extremely small.

According to the development roadmap of the Innovative Optical and Wireless Network (IOWN) Initiative announced by NTT in 2019, which will realize high-speed, large-capacity communications by utilizing innovative light-centered technologies such as photoelectric fusion, the first step is to establish a technology that connects the chip used for calculation with peripheral components using light, the next step is to connect the chips with each other using light, and the final step in 2030 is to commercialize a photoelectric fusion chip that performs calculations light.

[17] See Section 2 in Chapter 3 of Part 1

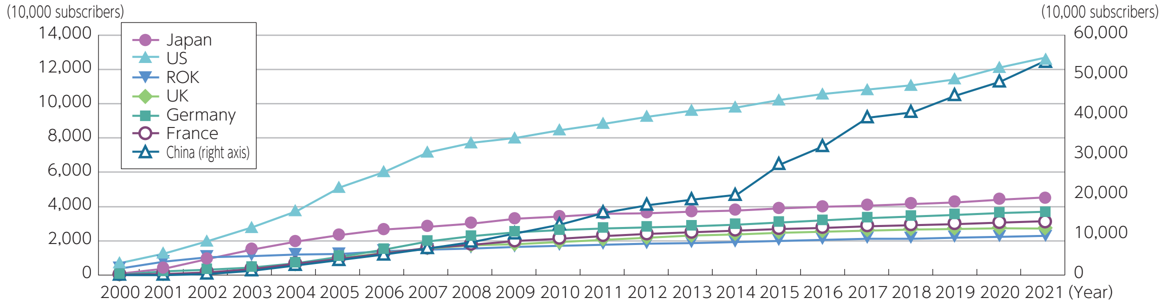
Section 2 Trends in the telecommunications field

1. Trends in the domestic and overseas communications markets

The number of fixed broadband service subscriptions[1] has been increasing in all major countries since 2000 (**Figure 4-2-1-1**). By country, China rose to the top position overtaking the U.S. in 2008 and has been sharply increasing the number since 2015. China's compound annual growth rate (CAGR) from 2000 to 2021 is 62%, which is far higher than the U.S.'s 15% and Japan's 21%.

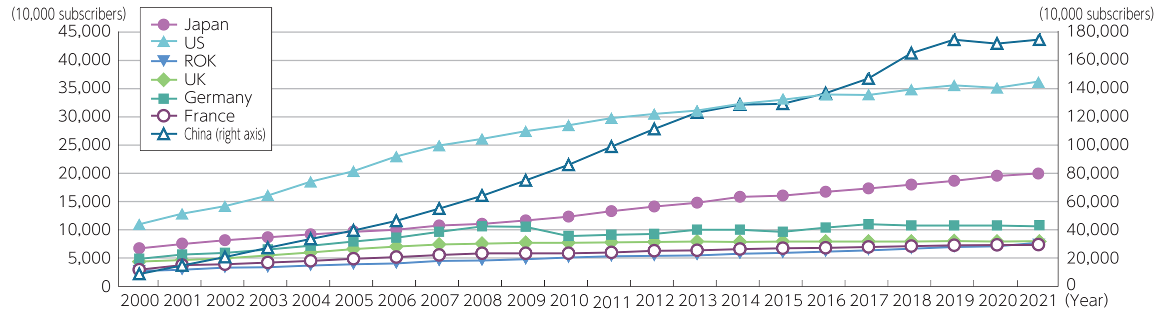
The number of mobile phone subscriptions[2] has also been on the increase in major countries, with China showing an especially sharp increase (**Figure 4-2-1-2**). China's compound annual growth rate (CAGR) from 2000 to 2021 is 15%, which is far higher than the U.S.'s 6% and Japan's 5%. In 2021, the percentage of the number of mobile phone subscriptions compared to the population was 159.7% (63.5 point increase from 2010) in Japan, 107.3% (15.7 point increase from 2010) in the U.S. and 121.5% (57.8 point increase from 2010) in China.[3]

Figure 4-2-1-1 Changes in fixed broadband service subscriptions in major countries



(Source) ITU[4]

Figure 4-2-1-2 Changes in the number of mobile phone subscriptions in major countries



(Source) ITU[5]

[1] Statistics from ITU. Fixed-broadband subscriptions are shown. Fixed broadband refers to high-speed lines providing a communication speed of 256 kbps or faster for either or both uplink and downlink. High-speed lines include cable modems, DSL, optical fiber and satellite communications, fixed wireless access and WiMAX, etc., but do not include mobile network (cellular system) based data communications subscriptions.

[2] Statistics from ITU. Mobile-cellular subscriptions are shown. The number includes deferred-payment subscriptions and prepaid subscriptions. Prepaid subscriptions are included only when the service was used for a fixed period of time (e.g., three months). Data card and USB modem subscriptions are not included.

[3] Number of mobile subscriptions includes prepaid-based subscriptions.

[4] https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx

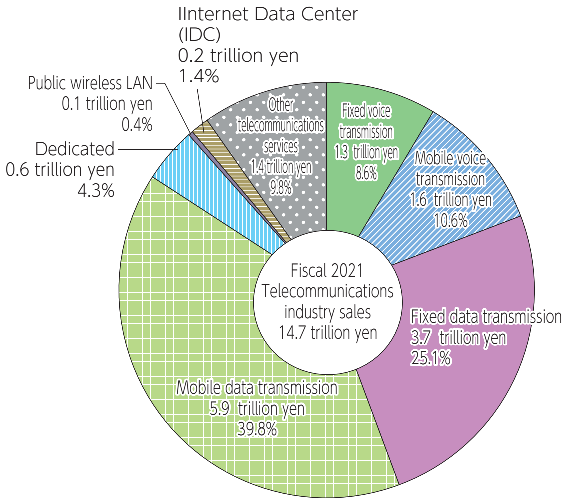
[5] https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx

2. Current status of the telecommunications field in Japan

(1) Market size

Total sales of the telecommunications industry in fiscal 2021 are estimated to be about 15 trillion yen. Looking at the breakdown, data transmission (fixed and mobile) accounted for about 9.6 trillion yen (65%) and voice transmission accounted for about 2.8 trillion yen (19.2%) (**Figure 4-2-2-1**).

Figure 4-2-2-1 Composition of sales in the telecommunications industry



*1 Fixed voice transmission is the sum of domestic and international services.

*2 Fixed data transmission includes sales through Internet access (ISP, FTTH, etc.), IP-VPN, and wide area Ethernet.

(Source) Prepared based on the MIC "Basic Survey on the Information and Communications Industry"[6]

(2) Number of business operators

The number of telecommunications carriers at the end of fiscal 2022 was 24,272 (334 registered business operators and 23,938 notified business operators), with the number continuing to increase following the previous fiscal year (**Figure 4-2-2-2**).

Figure 4-2-2-2 Changes in the number of telecommunications carriers

End of FY	2015	2016	2017	2018	2019	2020	2021	2022
Number of telecommunication carriers	17,519	18,177	19,079	19,818	20,947	21,913	23,111	24,272

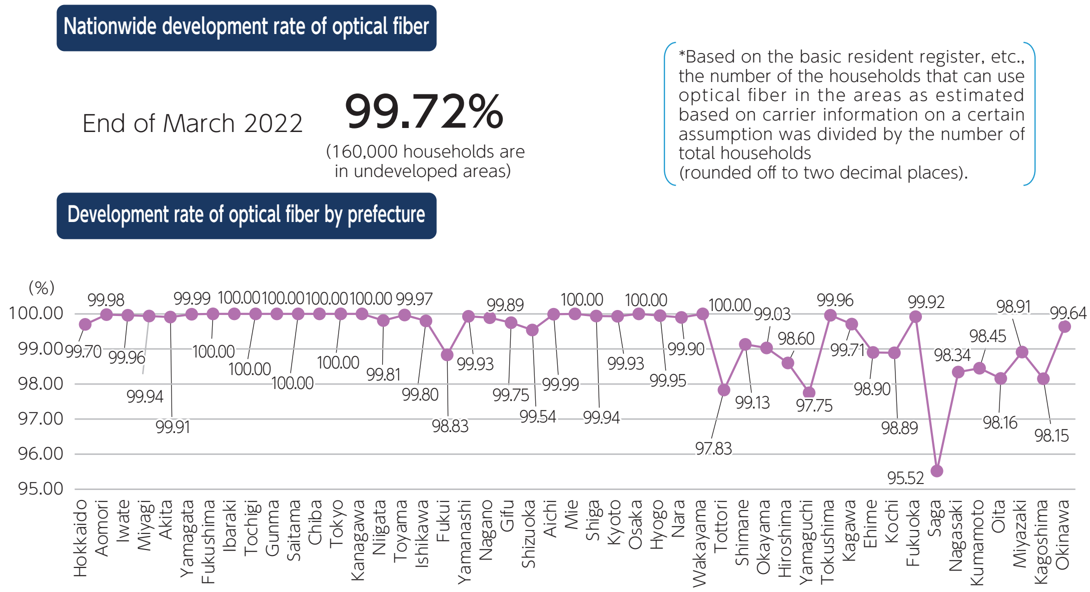
(Source) Information and Communications Statistics Database[7]

[6] https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html
[7] https://www.soumu.go.jp/johotsusintokei/field/tsuushin04.html

(3) State of infrastructure development

The household coverage rate of optical fiber in Japan at the end of fiscal 2021 was 99.72% (**Figure 4-2-2-3**).

Figure 4-2-2-3 State of preparation of optical fiber as of March 31, 2022 (estimated)



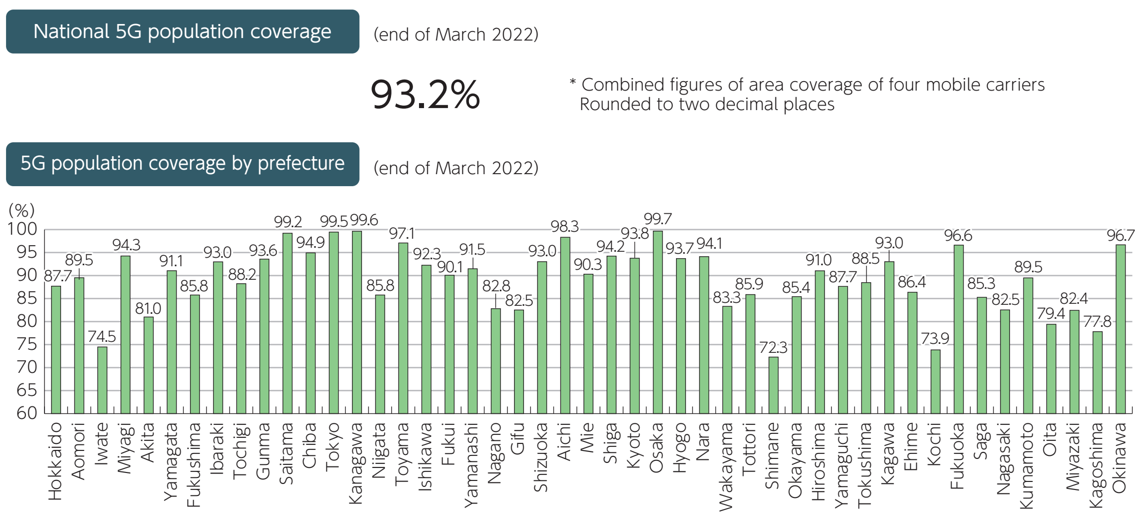
(Source) MIC "Survey on Broadband Infrastructure Coverage Rate at End of Fiscal 2021"[8]

According to the OECD, the percentage of optical fiber connections in total fixed broadband as of June 2022 in Japan is the second highest among member countries, indicating that Japan's digital infrastructure is advanced even by international terms.

Figure (related data) Percentage of optical fiber in fixed broadband in OECD member countries
Source: OECD Broadband statistics. 1.10. Percentage of fiber connections in total fixed broadband, June 2022
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00108
(Data collection)

As of the end of fiscal 2021, Japan's national 5G population coverage rate was 93.2%, and by prefecture, it exceeded 70% in all prefectures (**Figure 4-2-2-4**).

Figure 4-2-2-4 Japan's 5G coverage as percentage of population (as of end of March 2022)

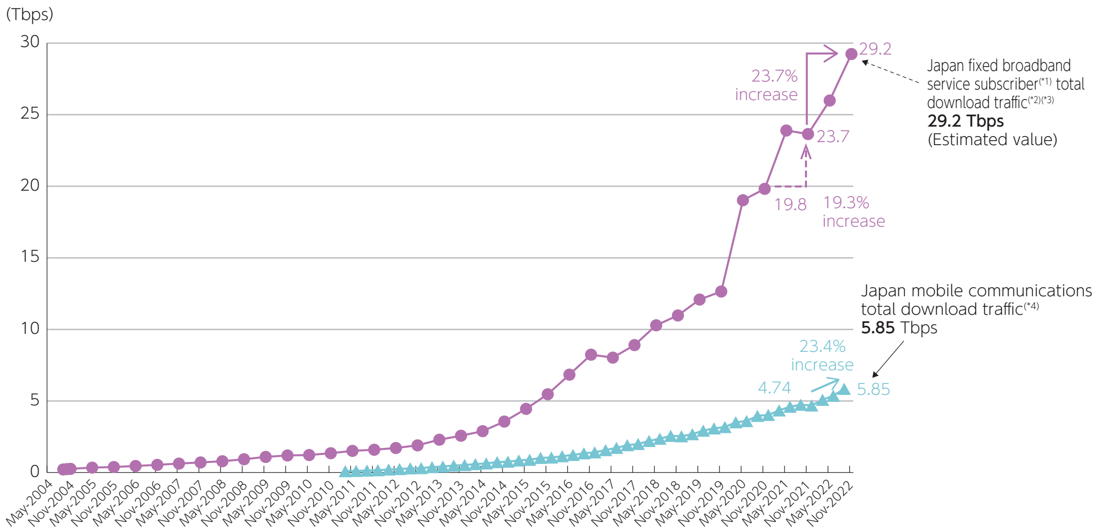


[8] https://www.soumu.go.jp/menu_news/s-news/01kiban02_02000476.html

(4) State of traffic

Total download traffic for fixed broadband service subscribers in Japan has surged since the start of the COVID-19 pandemic. Since then, although the rate of change has fluctuated, it has generally continued to increase. As of November 2022, it was up 23.7% from the same month in the previous year. Total download traffic for mobile communications has also continued to increase on the whole, with an increase of 23.4% as of September 2022 compared to the same month of the previous year (**Figure 4-2-2-5**).

Figure 4-2-2-5 Changes in Internet traffic (fixed systems, mobile systems, download traffic)



*1 Services for individuals (FTTH, DSL, CATV, FWA) (including some corporations)

*2 Prior to May 2011, this also includes some mobile communications traffic to and from mobile phone networks.

3 Since May 2017, the number of cooperating ISPs increased from five to nine, resulting in discontinuities due to aggregated and estimated values based on information from the nine ISPs.

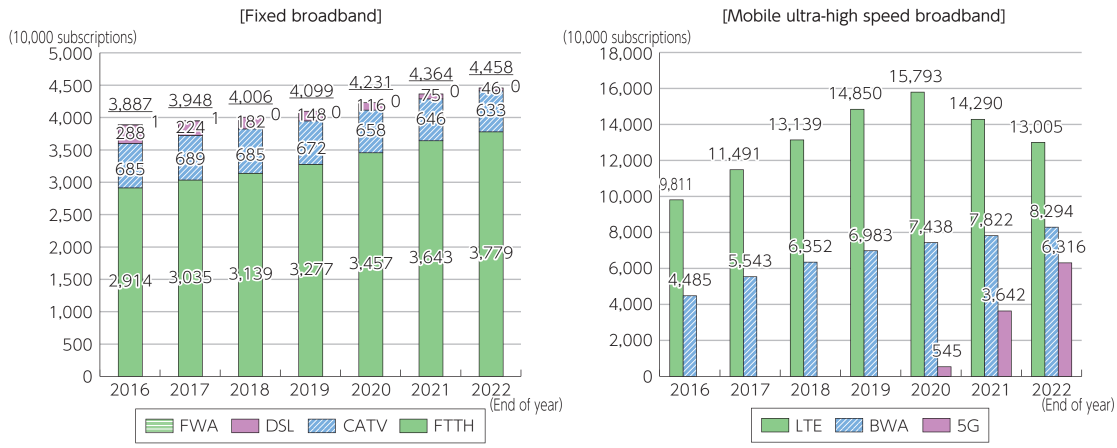
*4 From "MIC Current State of Mobile Communications Traffic in Japan (Sept. 2022)" (measured in March, June, Sept., and Dec.)

(Source) MIC (2023) "Results of Aggregating Internet Traffic in Japan (for November 2022)"[9]

(5) State of broadband usage

As of the end of December 2022, the number of fixed broadband subscriptions[10] was 44.58 million (up 2.2% from the same period of the previous year), and of the mobile ultrafast broadband subscriptions,[11] 130.05 million were 3.9th or 4th generation mobile phones (LTE) (down 9.0% from the same period of the previous year), 63.16 million were 5th generation mobile phones (up 26.74 million from the same period of the previous year), and 82.94 million were BWAs (up 6.0% from the same period of the previous year) (**Figure 4-2-2-6**).

Figure 4-2-2-6 Changes in the number of broadband subscriptions



*The figures for the past differ from those published last year due to revisions in business operator reports.

(Source) Prepared based on the MIC "Quarterly data on the number and share of subscriptions to telecommunications services (Fiscal 2022 Q3 (End of December))"[12]

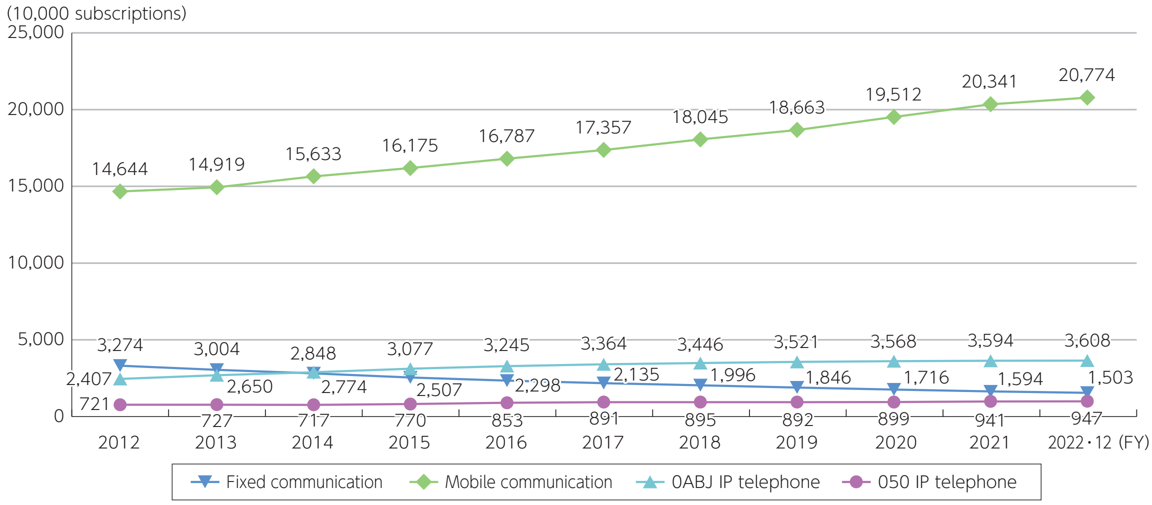
[9] https://www.soumu.go.jp/main_content/000861552.pdf
[10] The number of fixed-line broadband subscriptions is the sum of the FTTH, CATV (limited to coaxial, HFC), DSL, and FWA subscriptions.
[11] This is the number of LTE, BWA, and 5G subscriptions, and does not include 3G or PHS subscriptions.
[12] https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000215.html

(6) State of the number of subscriptions with voice communications services

In recent years, the number of subscriptions to fixed communications (NTT East/West subscribed telephones (including ISDN), chokushu telephones[13] and CATV telephones, excluding 0ABJ type IP phones) has been on a downward trend, while the number of subscriptions to mobile communications (mobile phones, PHS and BWA) and 0ABJ type IP phones has shown solid growth. As of the end of December 2022, the number of subscriptions to mobile communications was approximately 13.8x that of fixed communications (**Figure 4-2-2-7**).

As of the end of December 2022, the share of each business operator by number of subscriptions in the mobile communications market was NTT DOCOMO with 36.1% (down 0.5 points from the same period of the previous year, 41.7% when including provision related to MVNOs), KDDI Group with 27.0% (down 0.1 points from the same period of the previous year, 30.4% when including provision related to MVNOs), Softbank with 20.9% (±0 points, 25.7% when including provision related to MVNOs), Rakuten Mobile with 2.2% (down 0.1 points from the same period of the previous year), and MVNOs with 13.8% (up 0.6 points from the same period of the previous year) (**Figure 4-2-2-8**).

Figure 4-2-2-7 Changes in the number of subscriptions to voice communications services



*1 For fiscal 2022, data up to the end of December was used, so care must be taken when comparing over time.

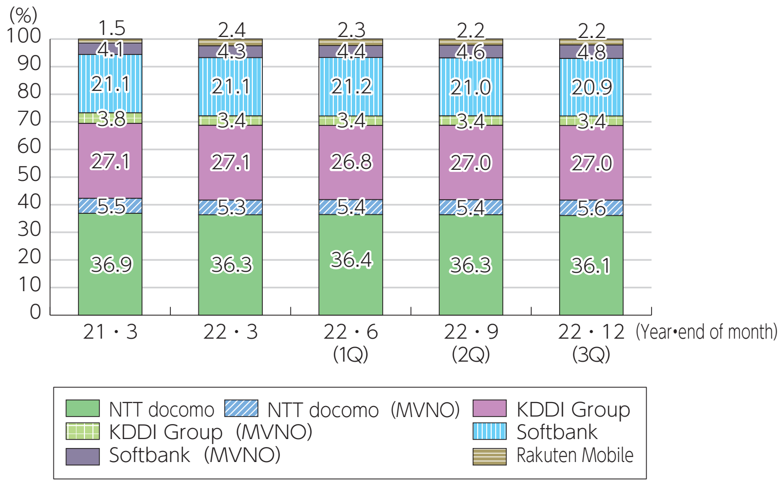
*2 Mobile communications is the sum of mobile phones, PHS, and BWA.

*3 For mobile communications since fiscal 2013, figures are adjusted for intra-group transactions. Adjusted for intragroup transactions means when an MNO receives mobile phone and BWA services as an MVNO from another MNO in the same group and then provides them together with their own services on a single mobile phone, etc., the contracts are counted as one contract instead of two contracts.

(Source) Prepared based on the MIC "Publication of quarterly data on the number and share of subscriptions to telecommunications services (Fiscal 2022 Q3 (End of December))"

[13] Chokushu telephone is a subscribed telephone service by telecommunications carriers other than NTT East/West and includes choku subscription, choku subscription ISDN, new-type chokushu and new-type chokushu ISDN.

Figure 4-2-2-8 Changes in share of mobile communications subscriptions (adjusted for intra-group transactions) by business operator



*1 Adjusted for intragroup transactions means when an MNO receives mobile phone and BWA services as an MVNO from another MNO in the same group and then provides them together with their own services on a single mobile phone, etc., the contracts are counted as one contract instead of two contracts.

*2 The share of the KDDI Group includes KDDI, Okinawa Cellular and UQ Communications.

*3 The share of MVNOs is calculated by MNO group that provides services and is indicated by the supplementary note (MVNO) after the name of the MNO group.

*4 Rakuten Mobile's share as an MNO. MVNO services provided by Rakuten Mobile are included in NTT DOCOMO (MVNOs) and KDDI Group (MVNOs).

(Source) Prepared based on the MIC "Publication of quarterly data on the number and share of subscriptions to telecommunications services (Fiscal 2022 Q3 (End of December))"

(7) International comparison of telecommunications charges

Comparing communications charges in Tokyo (Japan) with New York (U.S.), London (UK), Paris (France), Dusseldorf (Germany) and Seoul (Korea) (total of six cities), as of March 2023, charges for smartphones in Tokyo (4G, business operator with the top MNO share, new contract) are low for plans with a monthly data capacity of 5 GB and 20 GB, and medium level for plans with a monthly data capacity of 50 GB and 100 GB.

Regarding fixed-telephone charges, the basic rate and local-call rate for three minutes at 12:00 on a weekday are at a medium level.

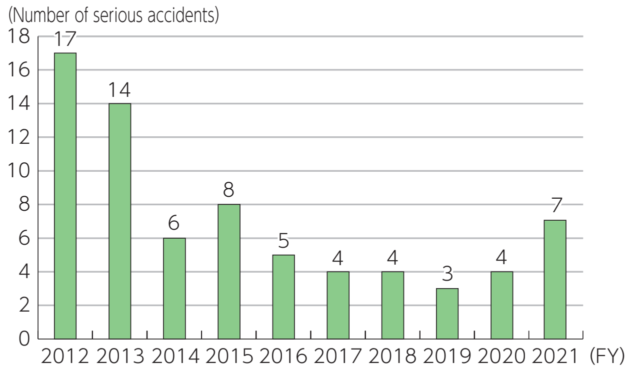
Figure (related data) International comparison of mobile phone charges by model (fiscal 2022)
Source: MIC "FY2022 Survey on Domestic-Overseas Price Difference of Telecommunication Service"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00126
(Data collection)

Figure (related data) International comparison of fixed telephone charges based on individual charges (fiscal 2022)
Source: MIC "FY2022 Survey on Domestic-Overseas Price Difference of Telecommunication Service"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00127
(Data collection)

(8) State of the occurrence of telecommunications service accidents

In fiscal 2021, 6,696 accidents that required quarterly reporting were reported, and of these accidents seven were serious accidents,[14] with this number on the rise since fiscal 2019 **(Figure 4-2-2-9)**.

Figure 4-2-2-9 Changes in the number of serious accidents



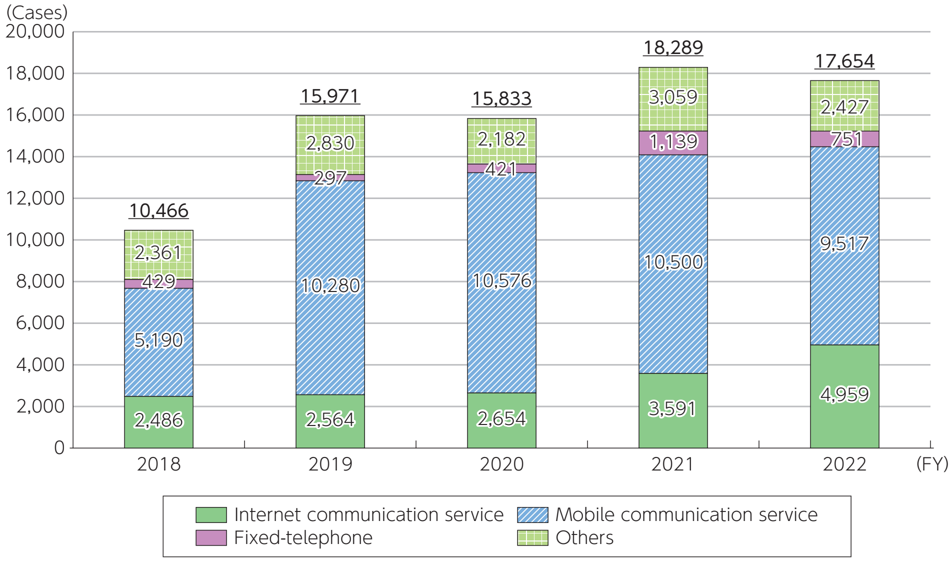
(Source) MIC "Accidents in Telecommunications Services (Fiscal 2021)"[15]

(9) Complaints and requests for consultation on telecommunications services, and requests for consultation on illegal and harmful information

a Complaints and requests for consultation on telecommunications services

The number of complaints and consultations on telecommunications services received by MIC in fiscal 2022 was 17,654, which is a decrease from the previous year **(Figure 4-2-2-10)**. In addition, the complaints and consultations received by consumer centers nationwide and MIC by service were most frequently related to MNO services **(Figure 4-2-2-11)**.

Figure 4-2-2-10 Changes in the number of complaints and inquiries received by MIC



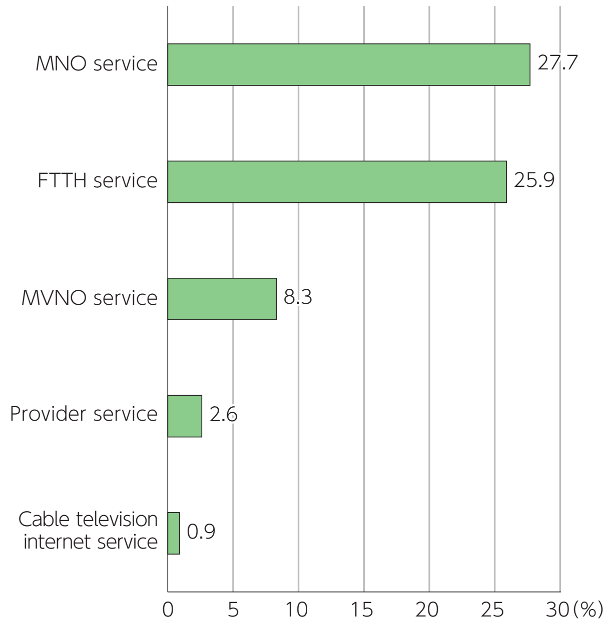
(Source) Created by MIC

[14] Accidents falling under Article 28 of the Telecommunications Business Act "When a serious accident specified by an Ordinance of the Ministry of Internal Affairs and Communications has occurred with respect to telecommunications activities, (the telecommunications carrier) shall report without delay to the Minister for Internal Affairs and Communications to that effect including its reason or cause."

[15] https://www.soumu.go.jp/menu_news/s-news/01kiban05_02000263.html

*Number of reports from business operators. With regard to serious accidents, from fiscal 2008, a decline in the quality of a telecommunications service is also classified as a serious accident, and from fiscal 2015, reporting standards have been set for each category of telecommunications service, rather than uniformly for telecommunications services, so changes from year to year cannot be simply compared.

Figure 4-2-2-11 Breakdown of complaints and consultations received by consumer centers nationwide and the Ministry of Internal Affairs and Communications (random sample of those received between April 2022 and September 2022)



*There is a possibility that ISP services provided together with FTTH lines are only included in provider services.

(Source) MIC "Regular Meeting for Monitoring Consumer Protection Rules and ICT Service Reliability (14th meeting)"

b Requests for consultation on illegal and harmful information, etc.

The number of consultations received by the Illegal and Harmful Information Consultation Center (Illegal Harmful Hotline) operated by the Ministry of Internal Affairs and Communications, continues to remain high, with 5,745 consultations in fiscal 2022. (**Figure 4-2-2-12**). In fiscal 2022, the five business operators that were the source of most consultations were Twitter, Google, Meta, 5 Channel, and Bakusai (**Figure 4-2-2-13**).

Figure 4-2-2-12 Changes in the number of consultations regarding illegal and harmful information

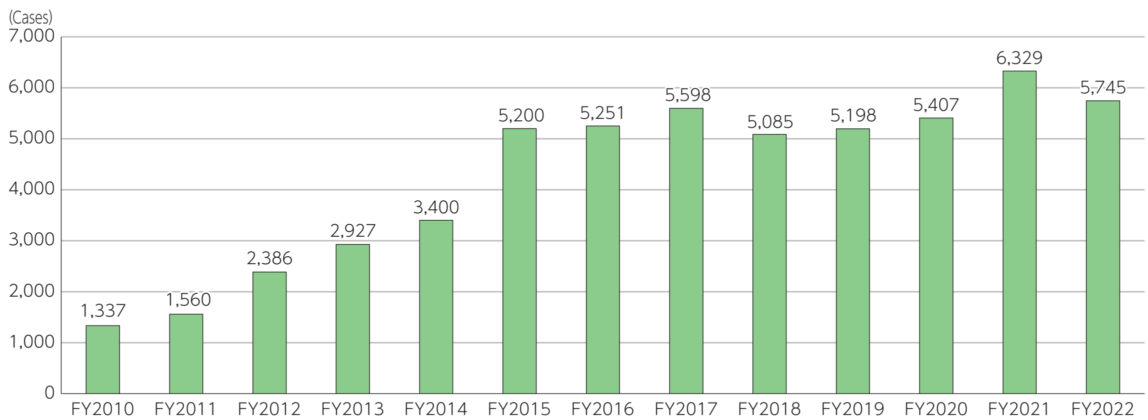
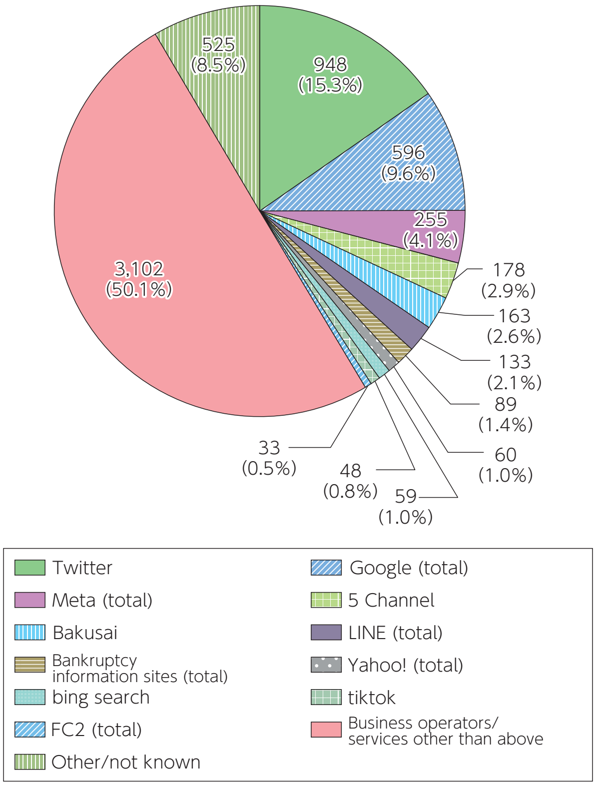


Figure 4-2-2-13 Breakdown of the number of consultations provided at the Illegal Harmful Hotline by business operator



Business operator, service, etc.		Number of requests	Percentage
Twitter		948	15.3%
Google (total)		596	9.6%
	Search	229	
	YouTube	158	
	map	180	
	Other	29	
Meta (total)		255	4.1%
	Instagram	199	
	Facebook	55	
	Whatsapp	1	
5 Channel		178	2.9%
Bakusai		163	2.6%
LINE (total)		133	2.1%
	Livedoor services (*2)	61	
	Services in LINE applications	72	
Bankruptcy information sites (total)		89	1.4%
Yahoo! (total)		60	1.0%
	Search	17	
	Auction	14	
	Advice	14	
	News	5	
	Other	10	
bing search		59	1.0%
tiktok		48	0.8%
FC2 (total)		33	0.5%
Business operators/services other than above		3,102	50.1%
Other/not known			8.5%

*1 Breakdown of the number of consultations (work): By business operator/service (n=6,189) <fiscal 2022> *Number of consultations (work): 5,745 cases
*2 LINE sold the livedoor service on December 27, 2022, so responses from January 2023 are not included.
*3 Total number of consultations (work), and counseling centers do not determine whether or not individual consultations constitute a violation of rights.
*4 Since data is compiled by entering a representative domain for each work case, it is not strictly compiled statistical information because there are cases where an applicable domain covers multiple sites.
*5 Some use their own domains, so the actual domain may not be known.

3. New trends in the communications field

(1) Virtualization

Virtualization is a technology that integrates and reproduces multiple pieces of hardware (servers, OSs, CPUs, memory, networks, etc.) in software to enable the use of hardware of any specifications without being bound by physical limitations. Depending on the hardware to be virtualized, various virtualization solutions are offered, including server virtualization, desktop virtualization, storage virtualization, and network virtualization.

Against the backdrop of the rise of cloud services, the growing adoption of network virtualization and automation, and the strategic initiatives of major companies, advances in network virtualization technology are accelerating globally. In Japan, too, it has become an established method for constructing and operating infrastructure in data centers, and is experiencing a gradual growth trend due to the growing need for faster and more efficient network construction and operation within corporate LANs.

In 2021, Japan's client virtualization solution (on-premises) market size (sales) was approximately 621.5 billion yen (down 1.9% from the previous year), showing negative growth for the second consecutive year. By vendor, Fujitsu, Hitachi, NEC, Itochu Techno Solutions (CTC), Kindryl Japan, NTT Data, and Hewlett-Packard Japan were the top vendors in that order.

Figure (related data) Market revenue share of domestic client virtualization solutions (on-premises) by vendor sales (2021)
Source: IDC "Japan Virtual Client Computing Market Share" (July 6, 2022)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00136
(Data collection)

(2) Open-RAN

Regarding the radio access networks (RAN) of telecommunications carriers, initiatives to update the configuration of network equipment, such as to Open RAN[16] that enables multiple vendors, are underway in various countries. According to GSMA Intelligence, as of 2023 there were 18 telecommunications carriers commercially deploying Open RAN, but more than 80 telecommunications carriers have expressed interest or announced plans to deploy a solution.[17]

For example, Dish Network in the U.S. is building a cloud-native Open RAN-based 5G SA network that achieved 20% population coverage as of June 2022.

In Europe, five of the largest telecommunications carriers (Deutsche Telekom, Orange, Telefonica, Vodafone, Telecom Italia Mobile) are co-promoting Open RAN, saying they will support the development of Open RAN technology to enable deployment in populated areas.[18] Vodafone also launched Europe's first commercial Open RAN in a populated area in the UK in May 2023.[19]

In December 2022 in Japan, NTT DOCOMO, KDDI, SoftBank, and Rakuten Mobile established Japan OTIC (Open Testing & Integration Centre) in Yokosuka Cityas a center for testing and certification based on the standards stipulated by the O-RAN ALLIANCE. The OTICs that have so far been established in countries in Europe and elsewhere, is led by one major telecom operator and is believed to be the first in the world to be jointly established and operated by multiple telecommunications carriers.[20] In January 2023, KDDI began commercial deployment of O-RAN-compliant 5G virtual base stations using Fujitsu wireless equipment and Samsung Electronics wireless controllers.[21] NTT DOCOMO launched the OREX brand in February 2023 and announced that it will work with global communications device vendors to strengthen its support system for global telecommunications carriers to implement Open RAN.[22] In addition, Rakuten Symphony, a subsidiary of Rakuten, is also engaged in external sales of Open RAN, with sales of $476 million in fiscal 2022.[23]

---

[16] Open Radio Access Network. Mobile Front Haul that is interface between Distributed Unit (DU) and Radio Unit (RU) is standardized as O-RAN Front Haul by the O-RAN Alliance. The standardization is expected to facilitate provision of communications network equipment by various vendors and at the same time facilitate area building and lower equipment procurement costs.

[17] GSMA [Industry moves to execute on open RAN potential]
https://www.gsma.com/futurenetworks/latest-news/industry-moves-to-execute-on-open-ran-potential/

[18] "Major European operators accelerate progress on Open Ran maturity, security and energy efficiency"
https://newsroom.orange.com/major-european-operators-accelerate-progress-on-open-ran-maturity-security-and-energy-efficiency/?lang=en

[19] Vodafone "Vodafone's first Open RAN sites deliver better connectivity in busy seaside towns"
https://www.vodafone.com/news/technology/vodafone-first-open-ran-sites-better-connectivity-busy-seaside-towns

[20] Yokosuka City Website
https://www.city.yokosuka.kanagawa.jp/4430/documents/20221220_japan-otic.pdf

[21] KDDI news release https://news.kddi.com/kddi/corporate/newsrelease/2023/01/24/6508.html

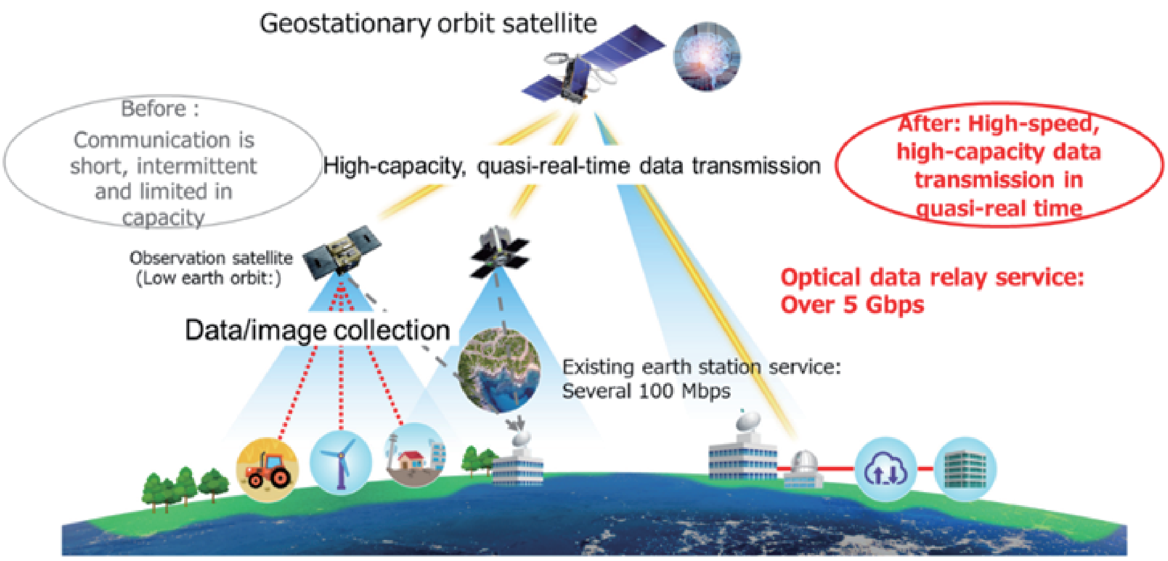
[22] NTT DOCOMO news release
https://www.docomo.ne.jp/binary/pdf/info/news_release/topics_230227_00.pdf
NTT DOCOMO now provides Open RAN support for overseas telecommunications carriers to five companies: KT in Korea, DISH Wireless in the U.S., Singtel in Singapore, and Smart Communications and Vodafone Group in the UK.

[23] Rakuten Group financial results https://corp.rakuten.co.jp/investors/documents/results/2022.html

a Non-terrestrial network (NTN)

The construction of a non-terrestrial network (NTN) is intended to expand communications coverage to seamlessly connect land, sea and air. For example, in August 2022, T-Mobile in the U.S. announced plans to allocate a portion of its mid-band frequency band allocated to mobile phones to communication with SpaceX's Starlink satellite, which will be launched in 2023, to enable communication with remote areas that are currently outside the service area, and a beta version of the new service is expected to be available as early as 2023. In Japan, Space Compass, Inc., which was established by NTT and SKY Perfect JSAT Corporation, plans to launch an optical data relay service in fiscal 2024 that enables large-capacity, near-real-time data transmission by transmitting a vast amount of data collected in space by observation satellites to the ground via geostationary orbit satellites (**Figure 4-2-3-1**). In addition, Japan Radio Co., Ltd., SKY Perfect JSAT Corporation, the Graduate School of Engineering of the University of Tokyo, and the National Institute of Information and Communications Technology, in cooperation with the European Space Agency (ESA), Eurescom, and the Fraunhofer FOKUS Institute, conducted the first Japan-Europe joint experiment on satellite 5G integrated control including geostationary satellite links in Japan from January to February 2022, and succeeded in transmitting 5G control signals, 4K images, and IoT data over long-distance 5G networks between Japan and Europe.

Figure 4-2-3-1 Overview of optical data relay service



(Source) Nippon Telegraph and Telephone Corporation "NTT and SKY Perfect JSAT Corporation agree to establish Space Compass, Inc."

Section 3 Trends in the broadcasting and content fields

1. Broadcasting

(1) Size of the broadcasting market

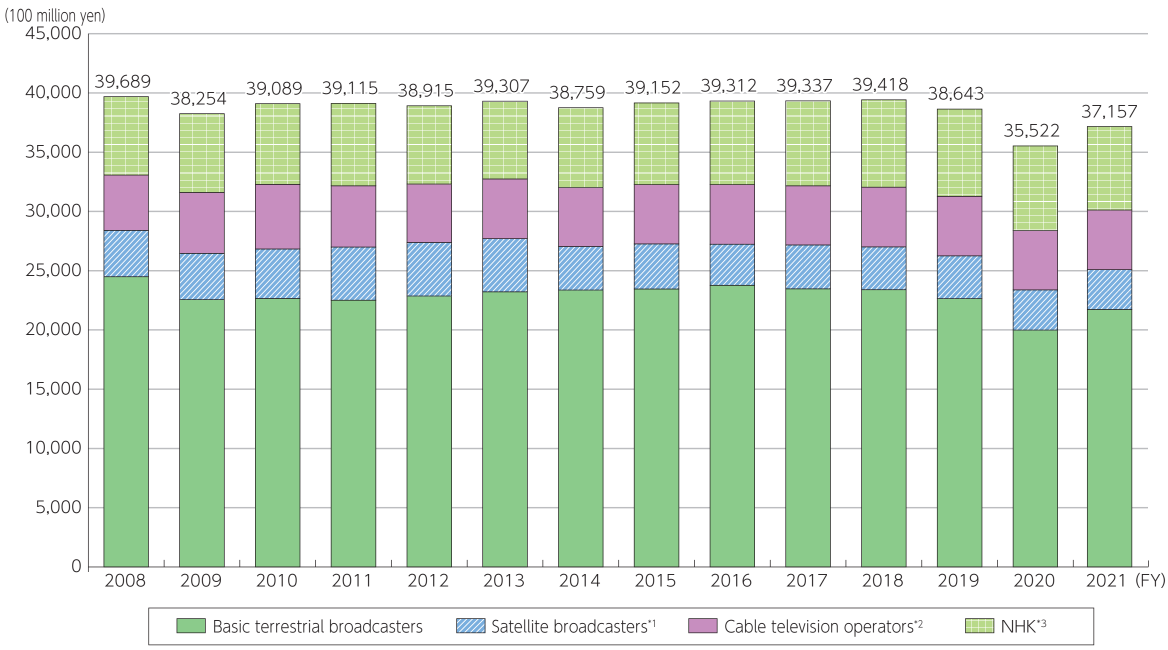
a Sales of broadcasters

In Japan, broadcasting is conducted through a dual system. NHK operates broadcasting based on subscription fee income and private broadcasters operate broadcasting based on advertising revenue or broadcasting fees. In addition, the Open University of Japan operates broadcasting for education.

Net sales of broadcasters as a whole, including revenues from broadcasting operations and revenues from non-broadcasting operations, increased from fiscal 2020 to 3.7157 trillion yen in fiscal 2021 (up 4.6% from the previous fiscal year).

Looking at the breakdown, total sales of private basic terrestrial television broadcasters were 2.1701 trillion yen (up 8.5% from the previous fiscal year), total sales of private satellite broadcasters were 341.8 billion yen (up 0.9% from the previous year), total sales of cable TV operators were 499.0 billion yen (down 0.3% from the previous year) and ordinary business income of NHK was 704.8 billion yen (down 1.2% decrease from the previous year) **(Figure 4-3-1-1)**.

Figure 4-3-1-1 Changes in the size of the broadcasting industry market (total sales) and market breakdown



*1 Calculated based on operating revenues related to the satellite broadcasting business.

*2 Up to fiscal 2010, cable TV operators were commercial corporations that conducted independent broadcasting using facilities approved under the former Cable Television Broadcasting Act (including facilities registered under the former Broadcast Act for Use of Telecommunications Services that uses a broadcasting system equivalent to the facilities), and from fiscal 2011, cable television operators are registered general broadcasters (limited to commercial corporations) that conduct independent broadcasting using cable telecommunications equipment (with both excluding operators using the IP multicast method).

*3 NHK's value is ordinary business income.

*4 Community broadcasters who are also engaged in cable television are excluded.

(Source) Prepared based on the MIC "Income and Expenditures of Private Broadcasters" and NHK "Financial Statements" for each fiscal year

In 2022, advertising expenditures of private basic terrestrial broadcasters totaled 1.7897 trillion yen, with 1.6768 trillion yen pertaining to television broadcasting and 112.9 billion yen pertaining to radio broadcasting.[1]

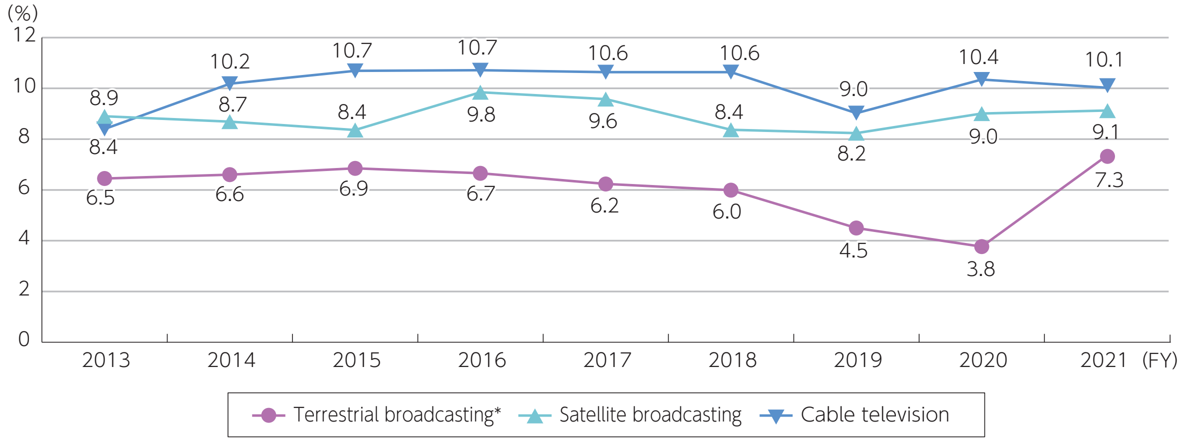
Figure (related data) Changes in advertising expenditures of terrestrial private broadcasters
Source: Prepared based on Dentsu's "Advertising Costs in Japan"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00141
(Data collection)

[1] For details on the entire advertising market, see "2 Advertising" in Section 3-2 of Chapter 3.

b Financial status of private broadcasters

Private basic terrestrial broadcasters (operating profit on sales was 7.3% in fiscal 2021), private satellite broadcasters (operating profit on sales was 9.1% in fiscal 2021) and cable TV operators (operating profit on sales was 10.1% in fiscal 2021) all continued to post profits following fiscal 2020 (**Figure 4-3-1-2**).

Figure 4-3-1-2 Changes in operating profit on sales of private broadcasters



*Basic terrestrial broadcasting excluding community broadcasting

(Source) Prepared based on the MIC "Income and Expenditures of Private Broadcasters" for each fiscal year. etc.

(2) Number of business operators

At the end of fiscal 2022, the breakdown of private broadcasters was 534 private basic terrestrial broadcasters (including 339 broadcasters conducting community broadcasting) and 42 private satellite broadcasters (**Figure 4-3-1-3**).

Figure 4-3-1-3 Changes in the number of private broadcasters

At the end of fiscal year				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Terrestrial	Television broadcast (Single operation)	VHF		16	93	93	94	94	98	94	94	95	95	95	96	96
		UHF		77												
	Basic satellite broadcasting	Medium -wave (AM) broadcasting			13	13	14	14	14	14	14	15	15	15	16	16
		Ultrashort wave (FM) broadcasting			307	319	332	338	350	356	369	377	384	384	388	390
			Community broadcasting of the above	246	255	268	281	287	299	304	317	325	332	334	338	339
		Short wave			1	1	1	1	1	1	1	1	1	1	1	1
	Television/radio broadcasting (combined operation)				34	34	33	33	33	33	33	32	32	32	31	31
	Text broadcasting (single operation)				1	0	0	0	0	0	0	0	0	0	0	0
	Multimedia broadcasting					1	1	1	4	4	4	6	6	2	2	0
	Subtotal				449	461	475	481	500	502	515	526	533	529	534	534
Satellite	Basic satellite broadcasting	BS broadcasting			20	20	20	20	20	19	19	22	22	20	22	21
		110 degrees east longitude CS broadcasting			13	22	23	23	23	23	20	20	20	20	20	20
	General satellite broadcasting				82	65	45	7	5	4	4	4	4	4	4	4
	Subtotal				108	92	72	46	44	41	39	41	41	39	42	42
Cable television	General cable broadcasting pertaining to registration (limited to operators of voluntary broadcasting)	Broadcasting using former authorized facilities (limited to operators of voluntary broadcasting)		502	556	545	539	520	510	508	504	492	471	464	464	–
		Broadcasting using former cable services														
			IP multicast broadcasting of the above	5	5	4	3	3	3	5	5	5	5	5	4	–
	Subtotal			528	556	545	539	520	510	508	504	492	471	464	464	–

*1 The number of television broadcasters (single operation) at the end of fiscal 2015 included five operators (including one which also operates basic terrestrial broadcasting) conducting basic terrestrial broadcasting for mobile reception.

*2 Regarding satellite broadcasters, based on the amended Broadcast Act that came into force in June 2011, BS broadcasting and 110 degrees east longitude CS broadcasting are counted as basic satellite broadcasting while other satellite broadcasting is counted as general satellite broadcasting.

*3 Some satellite broadcasters operate two or more types of broadcasting (BS broadcasting, 110 degrees east longitude CS broadcasting, and general satellite broadcasting) so the totals of each column do not match the values in the subtotal column. Furthermore, from fiscal 2011, only operating broadcasters are included.

*4 Regarding cable television operators, up to fiscal 2010, former approved facilities operators under the former Cable Television Broadcasting Act and registered operators under the former Act on Broadcast on Telecommunications Services were included, and from fiscal 2011, registered general broadcasters conducting independent broadcasting using cable telecommunication facilities under the Broadcast Act are included (regarding IP multicast broadcasting, up to fiscal 2010, it is included in former broadcasting using cable services, and from fiscal 2011 it is included in registered general broadcasters conducting independent broadcasting using cable telecommunications equipment).

(Source) Prepared based on the MIC "Current State of Cable Television"[2] (only the values for cable TV operators)

(3) State of the provision of broadcasting services

a Terrestrial television broadcasting

Nationwide, 127 companies (including 31 combined operation companies) were providing private terrestrial television broadcasting at the end of fiscal 2022.

Figure (related data) Number of available private terrestrial television broadcasting channels (fiscal 2022)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00144
(Data collection)

[2] https://www.soumu.go.jp/main_content/000504511.pdf

b Terrestrial radio broadcasting

Medium-wave (AM) broadcasting services are provided by local private basic terrestrial broadcasters (47 companies at the end of fiscal 2022).

Ultrashort wave (FM) broadcasting services are provided by local private basic terrestrial broadcasters (390 companies at the end of fiscal 2022). Of these broadcasters, 339 are community broadcasters for some districts of a municipality in principle.

Short wave broadcasting is conducted by one private basic terrestrial broadcaster as of the end of fiscal 2022.

c Multimedia broadcasting

As of the end of fiscal 2022, there are no private basic broadcasters conducting V-Low multimedia broadcasting using the 99 MHz to 108 MHz frequency band that became available through the digitalization of terrestrial television broadcasting.

d Satellite broadcasting

(a) Basic satellite broadcasting

BS broadcasting is conducted by NHK, the Open University of Japan and private broadcasters (21 companies as of the end of fiscal 2022) using the satellites of the Broadcasting Satellite System Corporation, and 110 degrees east longitude CS broadcasting is conducted by private broadcasters (20 companies as of the end of fiscal 2022) using the satellites of SKY Perfect JSAT Corporation.

Since December 2018, new 4K and 8K satellite broadcasting is being conducted for 18 programs of 10 companies in BS and 110 degrees east longitude CS broadcasting. In the field of dextrorotation BS broadcasting, in March 2022, three companies (BS Yoshimoto Co., LTD., BS Shochiku Tokyu Co., Ltd. and Japanet Broadcasting Co., Ltd.) that were authorized for basic satellite broadcasting in November 2019 opened free channels with diverse themes including regional revitalization.

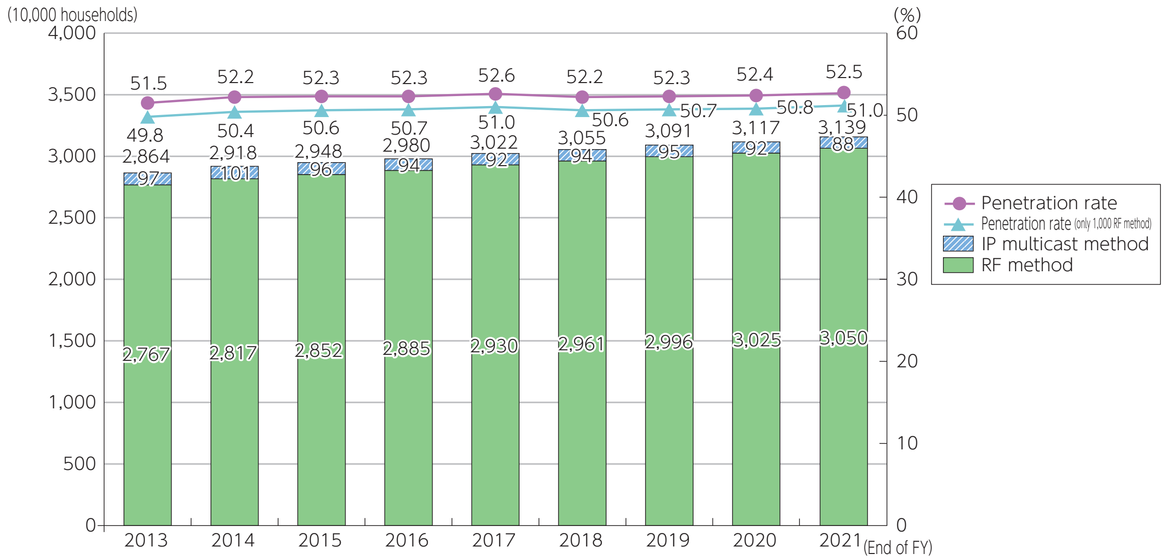
(b) General satellite broadcasting

General satellite broadcasting is conducted by private broadcasters (4 companies as of the end of fiscal 2022) using the satellites of Sky Perfect JSAT Corporation.

e Cable television

The number of cable TV operators was 464 at the end of fiscal 2021. Cable television provides multichannel broadcasting including re-transmission of terrestrial and satellite broadcasting and independent broadcasting channels. The number of subscribed households receiving services through cable telecommunications equipment (with 501 terminals or more) performing independent broadcasting as per their registration is approximately 31.39 million and penetration rate of all households is approximately 52.5% (**Figure 4-3-1-4**).

Figure 4-3-1-4 Changes in the number of subscribed households and penetration rate for receiving services from cable telecommunications equipment that provide independent broadcasting as per their registration



*1 The penetration rate is calculated from the number of households in the Basic Resident Register.

*2 The number of subscribed households with the RF method means the total number households (including the number of households with radio interference) connected to the cable telecommunications equipment as per their registration.

(Source) Prepared based on the MIC "Current State of Cable Television"[3]

[3] https://www.soumu.go.jp/main_content/000504511.pdf

(4) State of NHK

a State of domestic broadcasting by NHK

At the end of fiscal 2022, the number of domestic NHK broadcasting channels was 9: two channels for terrestrial television broadcasting; three channels for radio broadcasting; and four channels for satellite television broadcasting **(Figure 4-3-1-5)**.

Figure 4-3-1-5 NHK domestic broadcasting (end of fiscal 2022)

Category			Number of channels
Terrestrial broadcasting	Television broadcasting		2
	Radio broadcasting	Medium-wave (AM) broadcasting	2
		Ultrashort wave (FM) broadcasting	1
Satellite broadcasting (BS broadcasting)	Television broadcasting		4

*1 The radio broadcasting frequency is also indicated by the channel.

*2 With regard to television broadcasting, analog television broadcasting ended on March 31, 2021, and all broadcasting has been shifted to digital broadcasting.

b NHK's international television and radio broadcasting

NHK's international television and radio broadcasts to Japanese and foreign nationals overseas and covers almost the entire world (**Figure 4-3-1-6**).

Figure 4-3-1-6 NHK's international television and radio broadcasting (plan as of April 2023)

	Television		Radio
	For overseas Japanese	For foreigners	For overseas Japanese and foreigners
Broadcasting hours	Around 5 hours a day	24 hours a day	75 hours 7 minutes in total per day
Budget	19..8 billion yen (FY2023 NHK budget)		4.9 billion yen (same as on the left)
Language	Japanese	English	18 languages
Service area	Almost all over the world		Almost all over the world
Satellites used / Transmission facilities	Foreign satellites, CATV, etc.		Domestic transmitting stations, overseas relay stations, etc.

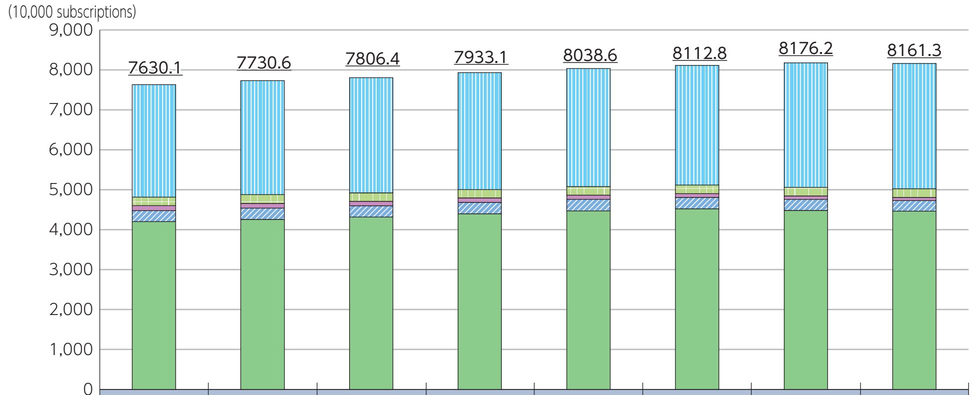
*The number of broadcasting hours of international TV broadcasting for foreigners includes the broadcasting hours of Japan International Broadcasting (JIB).

(5) State of broadcasting service usage

a Number of subscribers

The number of subscribers to broadcasting services in fiscal 2021 increased from the previous fiscal year for cable television and decreased for other broadcasting services (**Figure 4-3-1-7**).

Figure 4-3-1-7 Number of subscribers to broadcasting services



	2014	2015	2016	2017	2018	2019	2020	2021 (FY)
Cable television	2,817.0	2,852.0	2,885.0	2,930.3	2960.7	2,995.9	3,117.1	3,138.5
110 degrees east longitude CS	212.0	219.5	209.3	208.4	213.7	215.8	218.3	217.1
124/128 degrees east longitude CS	125.4	120.3	114.4	109.4	102.7	93.1	84.4	76.6
WOWOW	275.6	280.5	282.3	287.6	290.1	285.5	279.1	268.0
NHK	4,200.1	4,258.3	4,315.4	4397.4	4,471.4	4,522.5	4,477.3	4,461.1
Satellite contract, etc.	1,911.3	1,993.3	2,066.7	2147.6	2,221.5	2,289.1	2,274.2	2,271.5

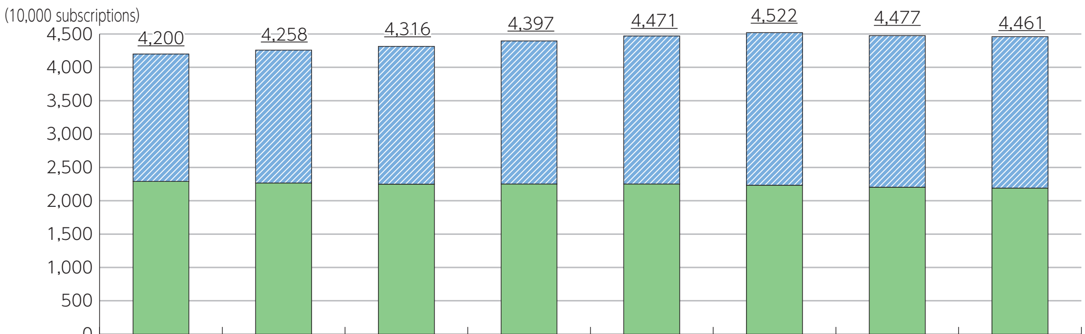
*1 The number of subscribers to terrestrial broadcasting (NHK) is the number of NHK subscriptions of all subscription types.
*2 The number of subscribers to satellite contracts, etc. is the number of NHK satellite contracts and special contracts.
*3 The number of WOWOW subscribers is the number of WOWOW subscriptions.
*4 The number of subscribers of 124/128 degrees east CS is the number of Sky Perfect! premium service subscriptions.
*5 The number of subscribers of 110 degrees east CS is the number of Sky Perfect! subscriptions.
*6 The number of households subscribed to cable television is the number of households subscribed to cable telecommunications equipment that carry out independent broadcasting as per their registration.

(Source) Prepared based on material from the Japan Electronics and Information Technology Industries Association, Japan Cable Laboratories, and NHK,and the MIC "Current State of Satellite Broadcasting" and "Current State of Cable Television"

b Number of subscriptions to NHK

In fiscal 2021, the number of NHK subscriptions was 44.61 million, consisting of about 21.90 million terrestrial contracts (ordinary and color), 22.70 million satellite contracts and about 10,000 special contracts (**Figure 4-3-1-8**).

Figure 4-3-1-8 Changes in the number of NHK broadcast subscriptions



	2014	2015	2016	2017	2018	2019	2020	2021 (FY)
Special contract	1	1	1	1	1	1	1	1
Satellite contract	1,910	1,992	2,066	2,146	2,220	2,288	2,273	2,270
Terrestrial contract	2,289	2,265	2,249	2,250	2,250	2,233	2,203	2,190
Total	4,200	4,258	4,316	4,397	4,471	4,522	4,477	4,461

(Source) Prepared based on material from NHK

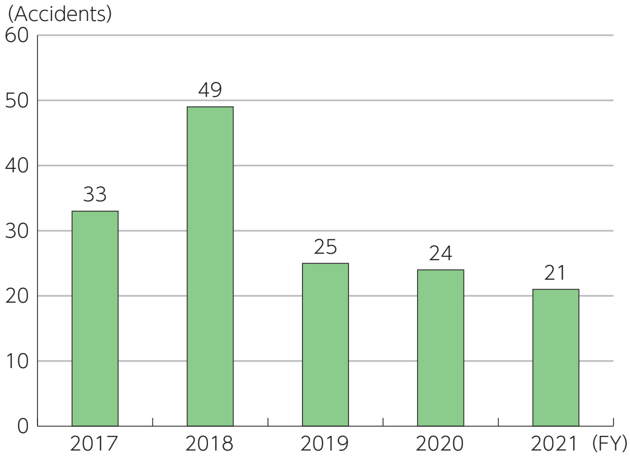
(6) Ensuring of security and reliability of broadcasting equipment

Due to the highly public nature of broadcasting as a means of widely and instantly transmitting important information such as information necessary for daily life and disaster information, the broadcasting equipment that supports this requires a high level of safety and reliability.

In fiscal 2021, the number of broadcasting suspension accidents that occurred was 339, of which 21 (about 6%) were serious accidents[4] (**Figure 4-3-1-9**). In the light of these accidents, initiatives to prevent similar accidents have been promoted by sharing the cases in the industry in addition to reliable implementation of recurrence prevention measures by individual business operators.

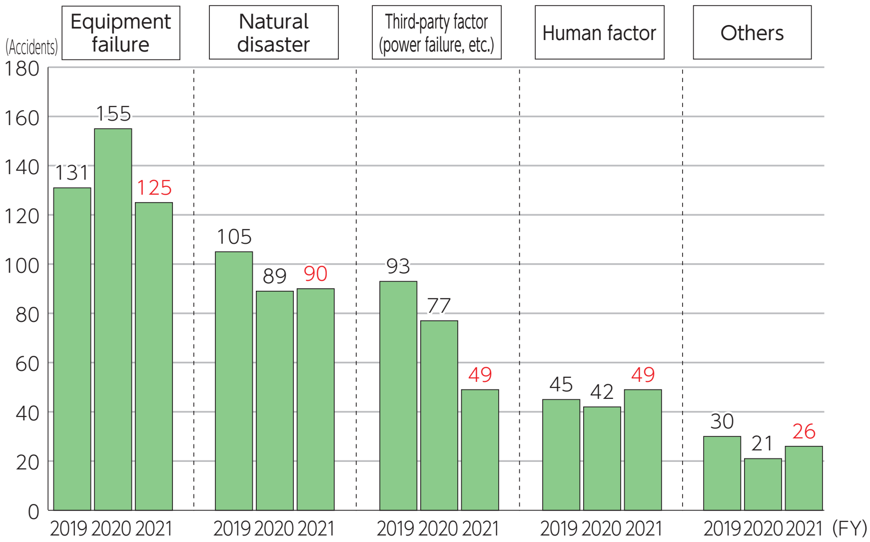
The number of terrestrial and satellite broadcasting suspension accidents that occurred was 262, which was the smallest number since fiscal 2011 when aggregation started. The number of cable broadcasting accidents has decreased compared to fiscal 2020, and the number of serious accidents was the lowest in the last five years. The top cause for the occurrence of broadcasting suspension accidents continued to be equipment failure, followed by natural disasters (**Figure 4-3-1-10**).

Figure 4-3-1-9 Changes in the number of serious accidents



(Source) Prepared based on the MIC "State of the Occurrence of Broadcasting Suspension Accidents"[5] (fiscal 2021)

Figure 4-3-1-10 Changes in the number of broadcasting suspension accidents by cause



(Source) Prepared based on the MIC "State of the Occurrence of Broadcasting Suspension Accidents (fiscal 2021)"[6]

---

[4] Accidents falling under Articles 113, 122 or 137 of the Broadcast Act: "If the suspension of broadcasting caused by the equipment for basic broadcasting or other major accident stipulated in the Ministerial Ordinance of the Ministry of Internal Affairs and Communications occurs, the approved basic broadcaster must report such matter as well as the reason or cause without delay to the Minister for Internal Affairs and Communications."

[5] https://www.soumu.go.jp/menu_news/s-news/02ryutsu08_04000508.html

[6] https://www.soumu.go.jp/menu_news/s-news/02ryutsu08_04000508.html

2. Content market

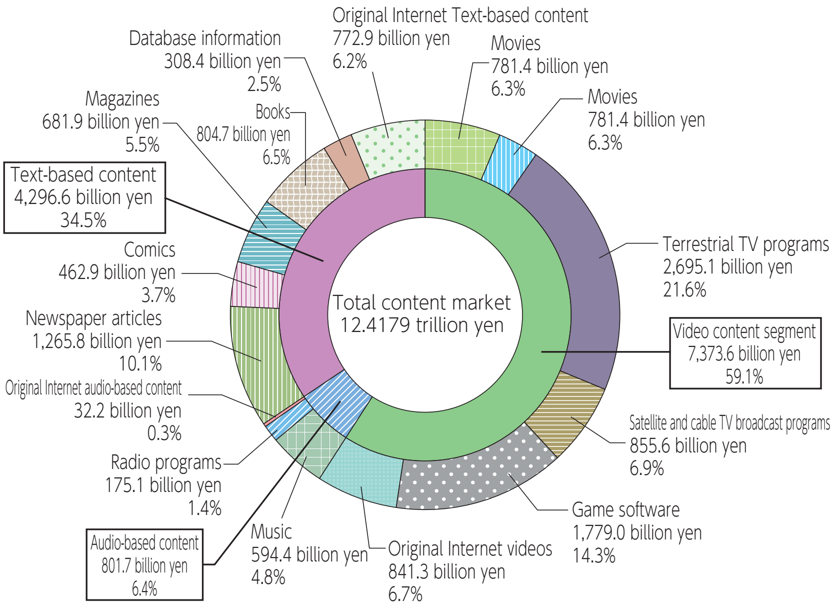
(1) Size of the Japanese content market

a Market overview

The Japanese content market was valued 12.4719 trillion yen in 2021. By content segment, video-based content accounted for about 60% of the market. Text-based content and audio-based content accounted for about 35% and 6% respectively[7] (**Figure 4-3-2-1**).

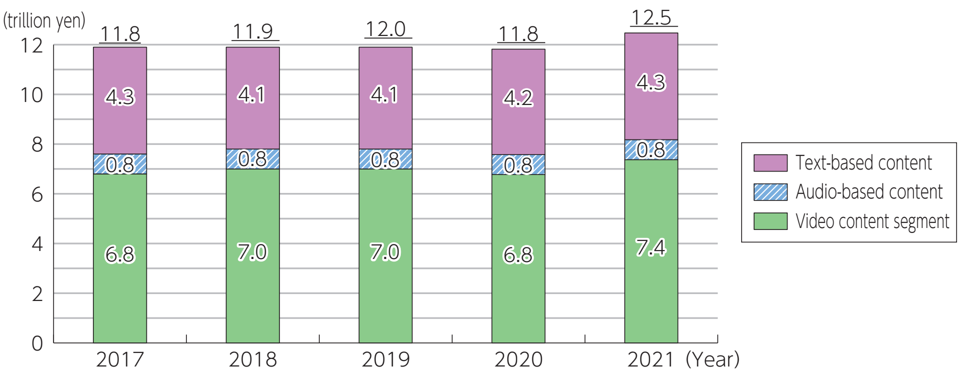
The size of the content market increased significantly in 2021, despite a decline the previous year. By content type, video-based content has increased significantly (**Figure 4-3-2-2**).

Figure 4-3-2-1 Breakdown of the Japanese content market (2021)



(Source) MIC Institute for Information and Communications Policy "Survey on Media/Software Production and Distribution"

Figure 4-3-2-2 Changes in size of the Japanese content market (by content type)



(Source) MIC Institute for Information and Communications Policy "Survey on Media/Software Production and Distribution"

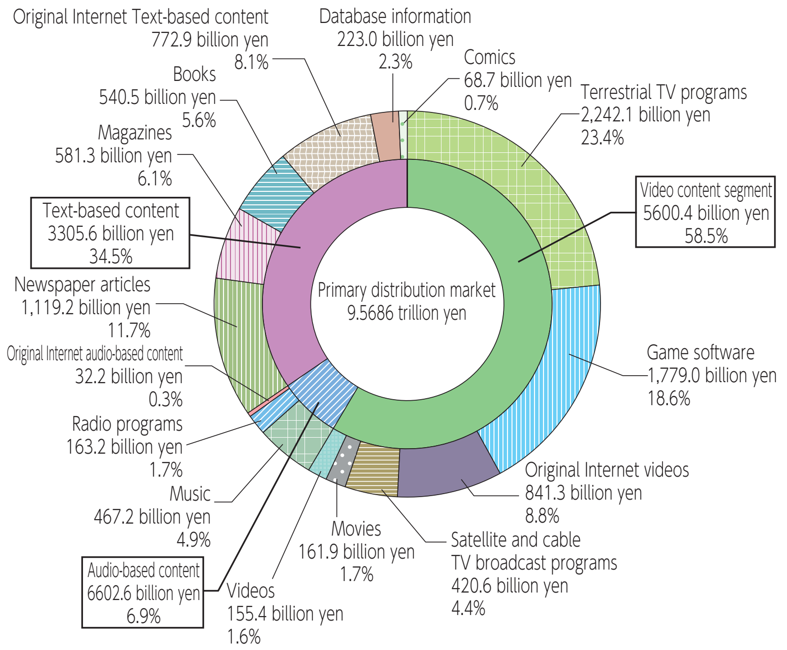
[7] Rather than aggregation by media, market size was calculated and analyzed after aggregation according to distribution stage such as primary distribution and multi-use with a focus on the original nature of the content.

b State of multi-use

The size of the primary distribution market was 9.5686 trillion yen in 2021, a significant increase from the previous year. The primary distribution market is 5.6004 trillion yen for video-based content, 3.3056 trillion yen for text-based content, and 662.6 billion yen for audio-based content **(Figure 4-3-2-3)**.

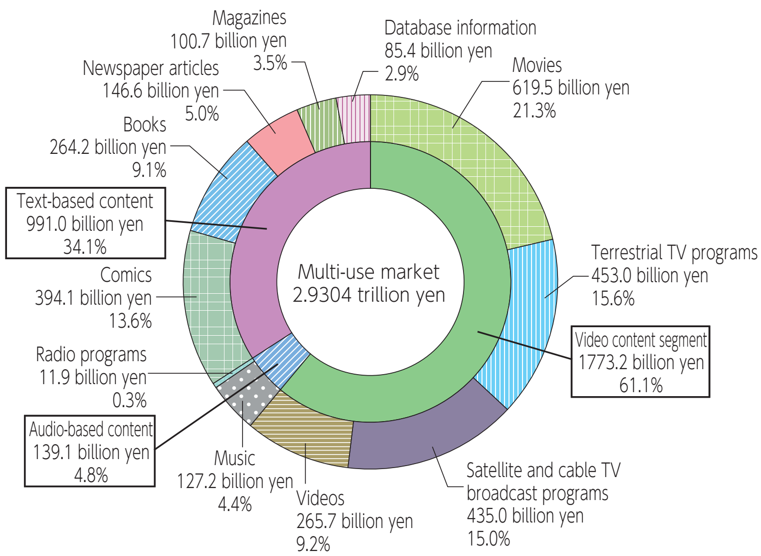
Compared to this, the size of the multi-use market was 2.9034 trillion yen, down from the previous year. The breakdown is 1.7732 trillion yen for video-based content, 991.0 billion yen for text-based content and 139.1 billion yen for audio-based content **(Figure 4-3-2-4)**.

Figure 4-3-2-3 Breakdown of primary distribution market (2021)



(Source) MIC Institute for Information and Communications Policy "Survey on Media/Software Production and Distribution"

Figure 4-3-2-4 Breakdown of multi-use market (2021)



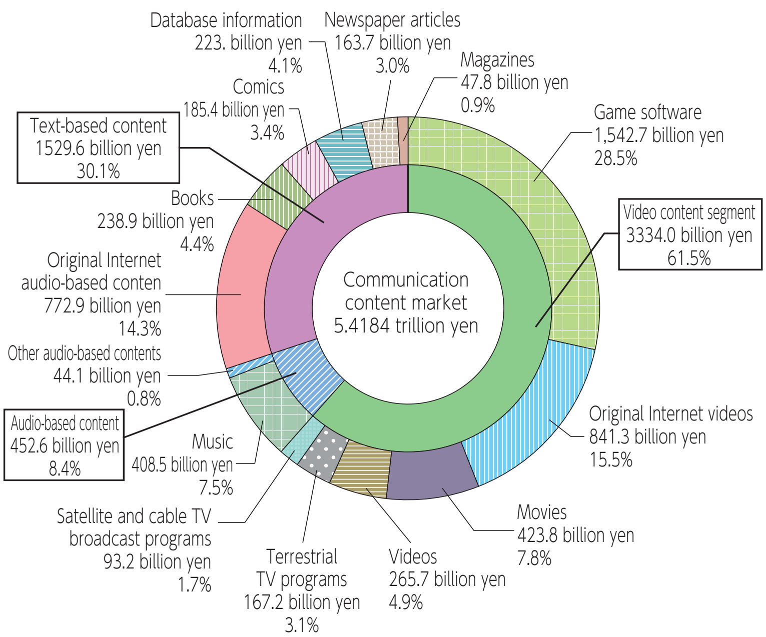
(Source) MIC Institute for Information and Communications Policy "Survey on Media/Software Production and Distribution"

c Communication content market

In the content market, the market size of communication content for personal computers and mobile phones, etc. via the internet is valued at 5.4184 trillion yen. As for market composition by content segment as a percentage, video-based content, text-based content and audio-based content account for 61.5%, 30.1% and 8.4% respectively (**Figure 4-3-2-5**).

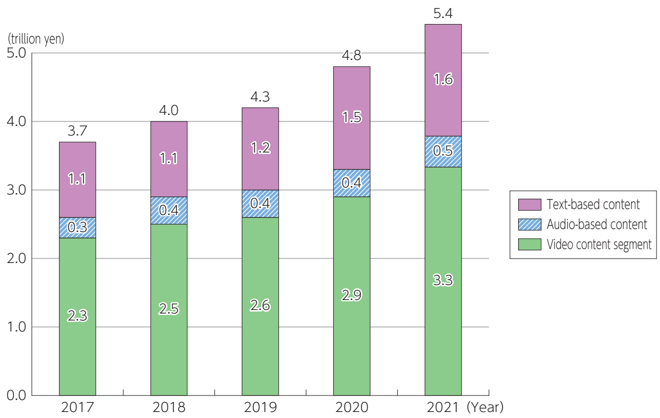
The size of the market for communication content has been still growing in recent years. By content type, video-based content continues to increase due to growth in movies, net originals, and game software, etc., while text-based content is also increasing thanks to growth in original internet content, and together these contribute to the expansion of the communication content market (**Figure 4-3-2-6**).

Figure 4-3-2-5 Breakdown of the communication content market (2021)



(Source) MIC Institute for Information and Communications Policy "Survey on Media/Software Production and Distribution"

Figure 4-3-2-6 Changes in the size of the telecommunications content market (by content type)

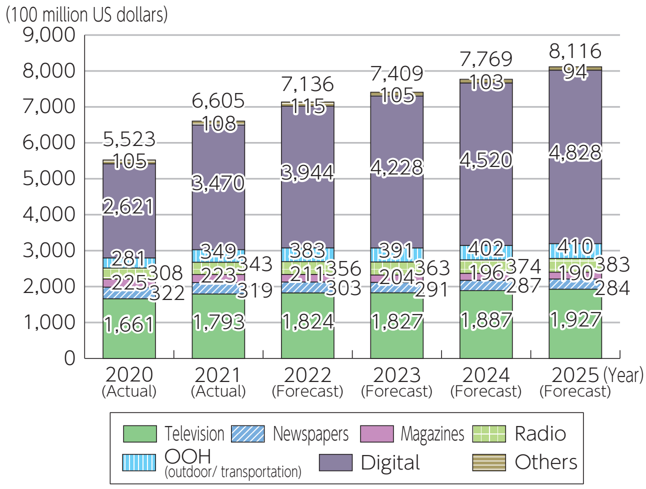


(Source) MIC Institute for Information and Communications Policy "Survey on Media/Software Production and Distribution"

(2) Advertising

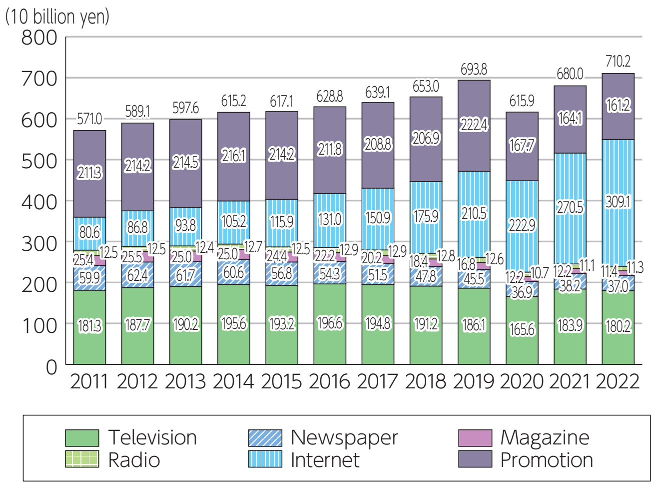
Looking at the global advertising market, digital advertising is expected to reach $394.4 billion in 2022, up 13.7% from the previous year, and increase to 55.3% of total advertisement spending **(Figure 4-3-2-7)**. The Japanese digital advertising market is also growing significantly. In 2022, Internet advertising was 3.912 trillion yen and advertising in the four formats of the mass media[8] was 2.3985 trillion yen, with the difference widening after Internet advertising overtook mass media advertising for the first time in 2021 **(Figure 4-3-2-8)**.

Figure 4-3-2-7 Changes and forecast in global advertising expenditures by media type



(Source) Prepared based on Dentsu Group's "Global Advertisement Spend Growth Rate Forecast (2022 to 2025)"

Figure 4-3-2-8 Changes in advertising expenditure by media in Japan[9]



(Source) Prepared based on Dentsu's "Advertising expenditure in Japan (each year)"[10]

Figure (related data) Changes in global total advertising expenditure
Source: Dentsu Group "Global Advertisement Spend Growth Rate Forecast (2022 to 2025)"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00161
(Data collection)

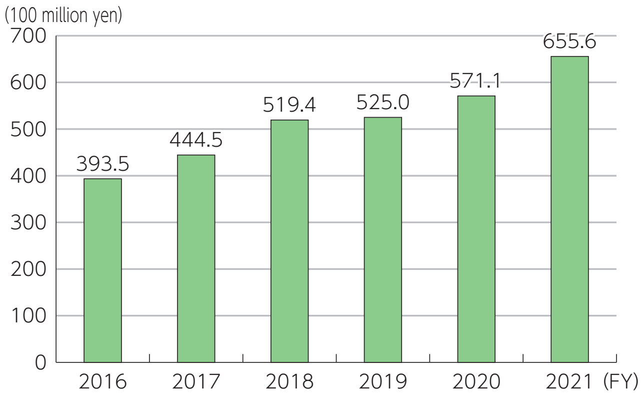
[8] Television media, newspapers, magazines, radio.
[9] Since 2019, advertisements on EC platforms for selling goods and the event field are included in the advertisement expenditure in Japan to estimate the advertisement market. Data for 2018 and before is not retroactively adjusted.
[10] https://www.dentsu.co.jp/knowledge/ad_cost/index.html

(3) Trends in the export of broadcasting content from Japan

In fiscal 2021, the value of broadcasting content exports continued to increase and reached 65.56 billion yen **(Figure 4-3-2-9)**.

With the growth of video streaming services, the value of program broadcasting rights and video release rights, etc. decreased, while the percentage of Internet distribution rights increased.

Figure 4-3-2-9 Changes in the value of broadcasting content exports from Japan



*1 Value of broadcasting content exports: Total sales to overseas of program broadcasting rights, Internet distribution rights, video/DVD rights, program format remake rights, and merchandising rights, etc.

*2 Calculated based on questionnaire responses submitted by NHK, key private broadcasting stations, semi-key private broadcasting stations, local stations, satellite broadcasters, CATV operators, and production companies, etc.

(Source) Prepared based on the MIC "Analysis of the Current Status of Overseas Expansion of Broadcasting Content"

Figure (related data) Changes in the value of Japan's broadcasting content exports by rights
(Source) Prepared based on the MIC "Analysis of the Current Status of Overseas Expansion of Broadcasting Content"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00163
(Data collection)

Figure (related data) Changes in the value of Japan's broadcasting content exports by entity
(Source) Prepared based on the MIC "Analysis of the Current Status of Overseas Expansion of Broadcasting Content"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00164
(Data collection)

Section 4 Trends of radio wave usage in Japan

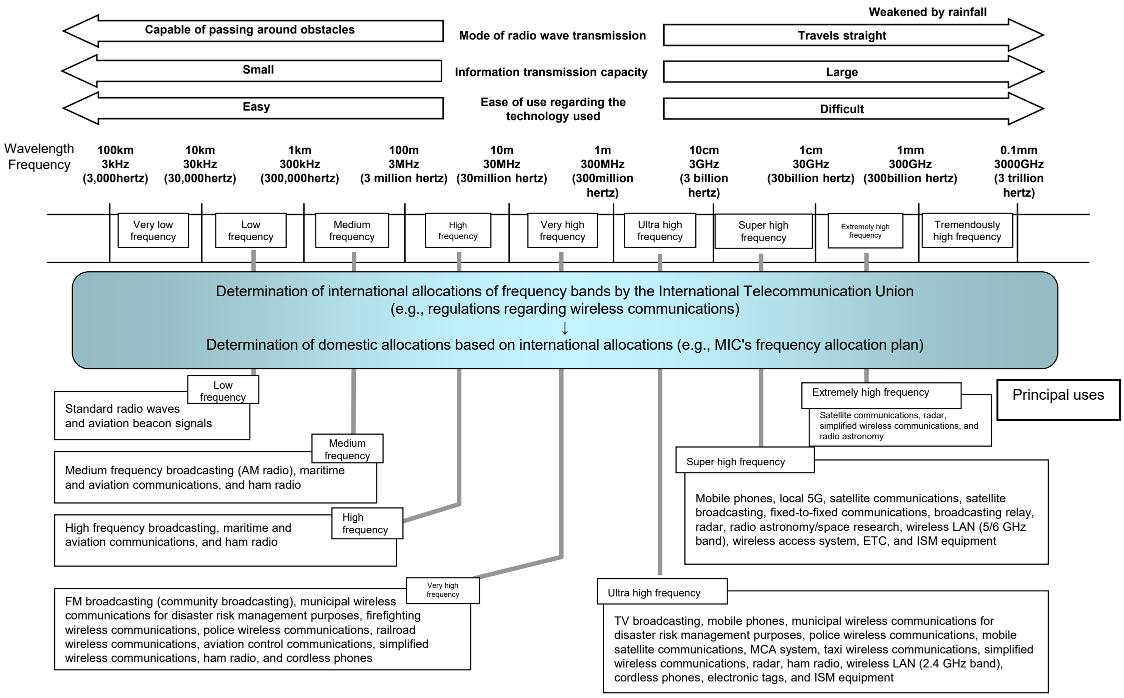
1. Principal use by frequency band

Regarding frequency, the radio regulations stipulated by the International Telecommunication Union (ITU) Convention establishes the allocation of international frequencies by dividing the world into three regions and defines the category of operations for each frequency band.

In order to help applications for radio station licenses, etc., MIC has established the Frequency Assignment Plan[1] based on international allocation and the Radio Act, which defines the frequencies that can be assigned, category of operations, purposes, conditions, etc. When establishing or changing a plan, the Radio Regulatory Council is consulted.

The main uses and characteristics of each frequency band in Japan are shown in (**Figure 4-4-1-1**).

Figure 4-4-1-1 Main uses and characteristics of each frequency band in Japan



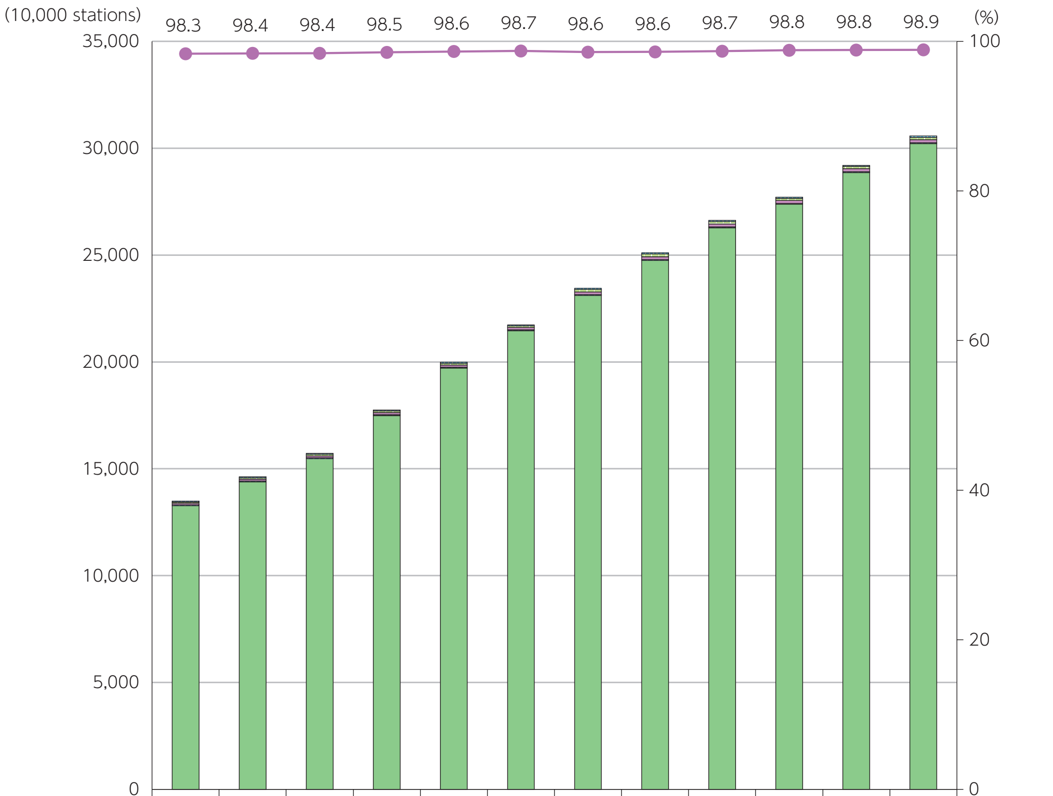
Spectrum	Wave length	Characteristics
Very low frequency	10 to 100km	Propagating along ground surface, waves of this spectrum can go over low hills. Being capable of propagating in water, the spectrum can be used for seabed exploration
Low frequency	1 to 10km	Being capable of propagating to very distant places, the spectrum is used by standard frequency stations to inform radio clock, etc. of time and frequency standard.
Medium frequency	100 to 1000m	Capable of propagating through reflection off the E-layer of the ionosphere that is formed at the height of about 100km, the spectrum is used mainly for radio broadcasting.
High frequency	10 to 100m	Capable of reaching the other side of the globe by being reflected off the F-layer of the ionosphere that is formed at the height of about 200 to 400km and by repeating reflection between F-layer and the ground surface. Widely used for ocean ship and international flight plane communication, international broadcasting and amateur radio.
Very high frequency	1to 10m	Waves of this spectrum propagate rather straight and are not easily reflected off the ionosphere, butare capable of reachingthe other side of mountains and buildings to a certain extent. The spectrum is widely used for a variety of mobile communications including emergency and fire emergency radio.
Ultra high frequency	10cm to 1m	Waves of this spectrum have stronger tendency to propagate straight compared with very high frequency, butare capable of reachingthe other side of mountains and buildings to a certain extent. The spectrum is widely used mostly for a variety of mobile communication systems including mobile phones, and digital television broadcasting and microwave ovens.
Super high frequency	1to 10cm	Due to the strong tendency to propagate straight, this spectrum is suitable for emission to a specific direction. It is mainly used for fixed trunk circuits, satellite communication, satellite broadcasting and wireless LAN.
Extremely high frequency	1mm to 10mm	With strong tendency to propagate straight, waves of the spectrum can transmit very large information quantity, but not very far in bad weather due to rain or fog. For this reason, the spectrum is used for relatively short-distance radio access communication and image transmission systems, simplicity radio, car collision prevention radar and radio telescopes for astronomical observation.
Tremendously high frequency	0.1mm to 1mm	The spectrum has nature similar tolight. It is rarely used for communication but used for radio telescopes for astronomical observation as is the case of Extremely high frequency.

[1] Frequency Assignment Plan: https://www.tele.soumu.go.jp/j/adm/freq/search/share/index.htm

2. Changes in the number of radio stations

The number of radio stations (excluding license-free radio stations such as wireless LAN terminals) at the end of fiscal 2022 was 305.67 million, an increase of 4.7% from the previous year, including 302.19 million mobile phones and other land mobile stations (increase of 4.7% from the previous fiscal year). At 98.9%, the percentage of mobile phones and other land mobile stations is at a high level. The number of convenience radio stations also increased to 1.43 million (up by 0.9% from the previous fiscal year) **(Figure 4-4-2-1)**.

Figure 4-4-2-1 Changes in the number of radio stations



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Other	43	46	50	50	55	49	49	55	59	61	51	55
Base stations	58	63	68	71	70	73	125	132	117	95	108	112
Convenience stations*2	77	84	90	97	105	112	118	125	132	137	142	143
Amateur stations	44	44	44	44	44	43	43	41	40	39	38	37
Land mobile stations*1	13,266	14,388	15,472	17,493	19,711	21,457	23,109	24,748	26,278	27,379	28,859	30,219
Percentage of land mobile stations	98.3	98.4	98.4	98.5	98.6	98.7	98.6	98.6	98.7	98.8	98.8	98.9

*1 Land mobile station: A radio station (such as a mobile phone devices) operated while moving on land or stopped at an unspecified point.
*2 Convenience radio station: A radio station that performs simple radio communication.

3. Satellites

In the field of satellite communications, Japan is working to powerfully advance social implementation and international standardization of the results of the development for realizing the expansion of communication coverage for seamless connection of land, sea and air (non-terrestrial network (NTN) technology that includes satellites and HAPS).

Due to their wide coverage, high broadcast possibilities, disaster resistance and other advantages, communication satellites including geostationary satellites and non-geostationary satellites are used for in-house channels, communications with mountainous regions and isolated islands where use of terrestrial channels is difficult, mobile satellite communications services for ships and aircraft, and communications at the time of disaster. Some communication satellites are used for satellite broadcasting (CS broadcasting).

(1) Geostationary satellites

Rotating in a geosynchronous orbit at a height of 36,000 km above the equator with an orbital period matching the Earth's rotation period, geostationary satellites appear to maintain a fixed position when observed from the earth. The high position enables three geostationary satellites to cover the entire earth except for the polar regions, and these satellites are used for fixed and mobile satellite communications. Due to the long distance from the earth to satellites, the transmission delay is long and high output is required from terminals, which makes terminal downsizing difficult.

Figure (related data) Major geostationary satellites used for communications services in Japan (at the end of fiscal 2022)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00167
(Data collection)

(2) Non-geostationary satellites

Non-geostationary satellites travel in an orbit that is not geostationary and is generally at a lower altitude than geostationary orbits. For this reason, the transmission delay of non-geostationary satellites is shorter and terminal output is smaller, which makes it possible to make the terminals smaller and mobile. Communication in polar regions is possible, which is difficult in a geostationary orbit on the equator. However, as satellites pass over an area in a short period of time, it is necessary to simultaneously operate a large number of satellites in order to cover a wide area while ensuring communicable time.

Figure (related data) Major non-geostationary satellites used for communications services in Japan (at the end of fiscal 2022)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00168
(Data collection)

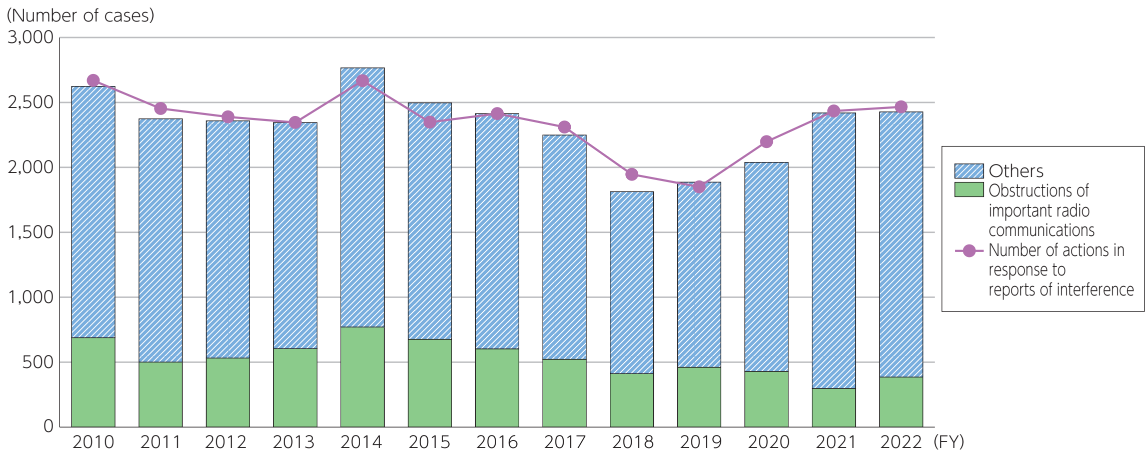
4. Radio wave monitoring to eliminate obstruction of important radio communications, etc.

Using sensor station equipment installed on steel towers and building roofs in major cities across the country and vehicles for searching for unlicensed radio stations, MIC is investigating sources of radio emissions that jam important radio communications including fire/emergency radio, aeronautical/maritime radio and mobile phones and is cracking down on unlicensed radio stations. In addition, MIC has established DEURAS, which is a system that detects emission sources of radio waves including unlicensed radio stations that cause obstructions in the radio usage environment, and is using it to monitor radio waves.[2]

In fiscal 2022, there were 2,432 reports of jamming and obstruction, an increase of 13 from the previous fiscal year, including 385 reports of obstructions to important radio communications, an increase of 87 (up 29.2%) from the previous fiscal year. In fiscal 2022, the number of actions[3] taken for jamming and obstruction reports was 2,466 (**Figure 4-4-4-1**).

Additionally, the number of unlicensed radio stations found in fiscal 2022 was 4,481, down 4,053 (30.5% decrease) compared to the previous year. The number of actions taken in fiscal 2022[4] increased by 297 (up 35.8%) from the previous year to 1,098 actions taken, which breaks down is 94 prosecutions (6.1% of all actions taken) and 1,004 guidance actions (93.9% of all actions taken) (**Figure 4-4-4-2**).

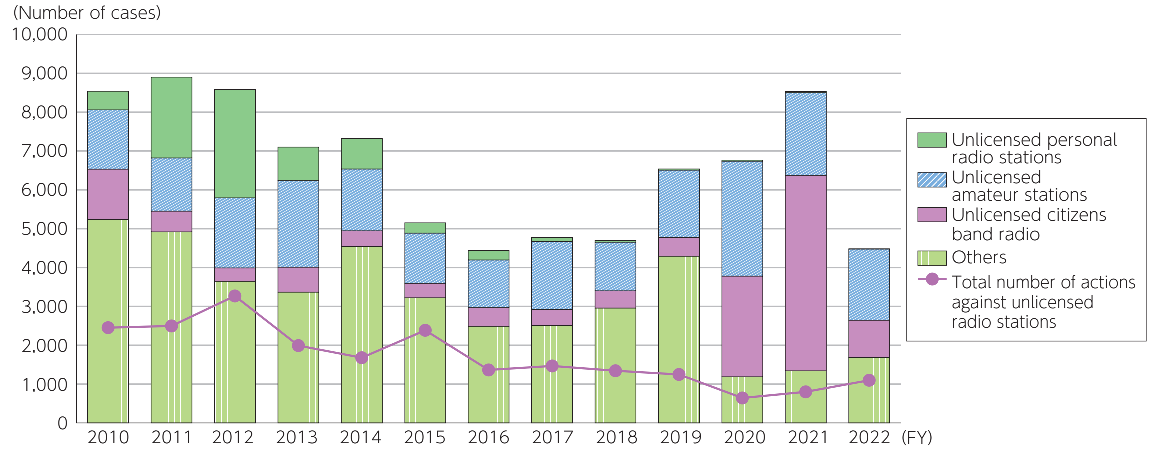
Figure 4-4-4-1 Changes in the number of reports of jamming and obstruction of radio stations and the number of actions taken



Number of reports of interference or obstruction	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022 (FY)
Obstructions of important radio communications	689	501	532	605	771	676	603	522	412	461	429	298	385
Others	1,934	1,873	1,826	1,740	1,995	1,821	1,811	1,727	1,401	1,425	1,610	2,121	2,047
Total	2,623	2,374	2,358	2,345	2,766	2,497	2,414	2,249	1,813	1,886	2,039	2,419	2,432
Number of actions in response to reports of interference or obstructions													
Number of actions in response to reports of interference	2,669	2,453	2,389	2,346	2,667	2,348	2,414	2,310	1,946	1,850	2,198	2,434	2,466

[2] Regarding obstructions to important radio communications, in fiscal 2010, DEURAS established a 24-hour system for receiving obstruction reports and have been working to promptly eliminate them. As an international radio wave monitoring facility registered with the International Telecommunication Union (ITU), DEURAS plays a role in HF and cosmic radio wave monitoring.
[3] The number of actions taken includes actions in response to reports made in the previous fiscal year, for which action had not previously been taken.
[4] The number of actions taken includes actions in response to reports made in the previous fiscal year, for which action had not previously been taken.

Figure 4-4-4-2 Changes in the number of reports of unlicensed radio stations and the number of actions taken



Number of unlicensed radio stations found		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Stations found	Unlicensed personal radio stations	479	2,081	2,788	865	784	265	245	99	40	28	25	32	3
	Unlicensed amateur stations	1,525	1,367	1,803	2,225	1,592	1,291	1,229	1,749	1,253	1,739	2,959	2,126	1,831
	Unlicensed citizens band radio	1,295	538	342	642	404	375	478	414	443	477	2,594	5,035	958
	Others	5,239	4,917	3,648	3,369	4,541	3,221	2,489	2,508	2,958	4,293	1,187	1,341	1,689
	Total	8,538	8,903	8,581	7,101	7,321	5,152	4,441	4,770	4,694	6,537	6,765	8,534	4,481
Number of actions against unlicensed radio stations														
Number of actions	Prosecution	262	249	231	228	215	230	168	168	208	189	62	49	94
	Guidance	2,190	2,247	3,038	1,764	1,465	2,156	1,196	1,300	1,136	1,058	581	752	1,004
	Total	2,452	2,496	3,269	1,992	1,680	2,386	1,364	1,468	1,344	1,247	643	801	1,098

(FY)

Section 5 Trends related to ICT equipment and devices in Japan and overseas

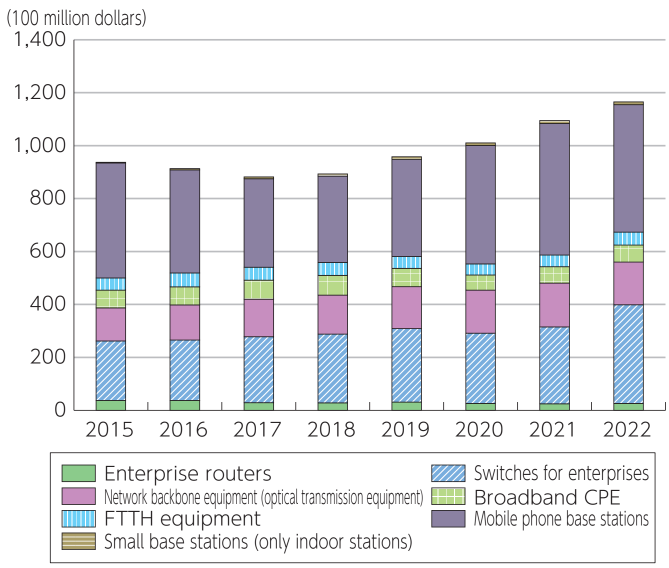
1. Trends in the ICT equipment market in Japan and overseas

(1) Market size

The value of global shipments of network equipment has been increasing since 2017 and reached 15.3287 trillion yen (up 27.6% from the previous year) in 2022 (**Figure 4-5-1-1**). Mobile phone base stations and switches for enterprises accounted for a major part of shipments.

Japan's production of network equipment had been decreasing from the first half of the 2000s, but it started to gradually increase in 2018, and then started to decrease again in 2021, and in 2022 it decreased to 660.7 billion yen (down 14.7% from the previous year). Looking at the breakdown, production of telephone application equipment[1] and exchangers decreased with the shift from fixed telephones to mobile and IP telephones, and today, wireless application devices[2] and other wireless communications equipment[3] are major segments. Production of base station communication equipment has fluctuated greatly. It stagnated from 2016 when investments in 4G came to an end, but increased in 2020, then decreased again in 2022. Production of network connection equipment used for IP communications[4] started to increase in 2019 but decreased from 2021. Production of conveyance equipment[5] increased mainly due to digital transmission equipment from 2019, but started to decrease from 2021.

Figure 4-5-1-1 Changes in the value of global network equipment shipments



(Source) Omdia

(2) Market change by equipment type

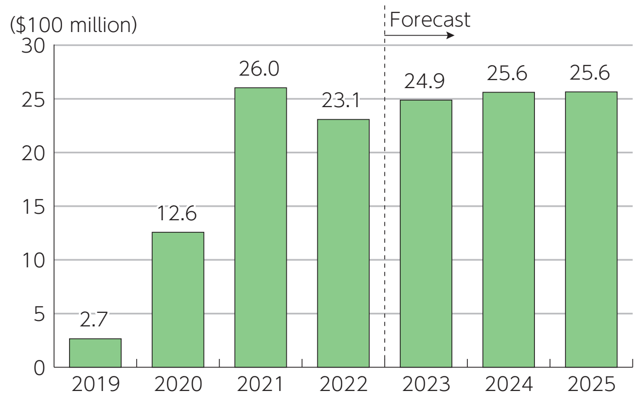
a 5G base stations

In 2022, the size (value of shipments) of the global market for 5G base stations (macrocells) was 3.9876 trillion yen (up 23.5% from the previous year), and 303.5 billion yen in Japan (up 6.2% from the previous year)[6] (**Figure 4-5-1-2**). Both markets are expected to peak moderately but remain high. Furthermore, in 2022, in terms of market share (value of shipments) of 5G base stations (macrocells), Huawei had the greatest share with 29.8%, followed by Ericsson with 25.1%, and Nokia with 15.3%. As such, major overseas companies accounted for a major share of the 5G base stations (macrocells) market (value of shipments), and the international competitiveness of Japanese companies is low.

However, as of 2021, Japanese companies are expected to account for 34% of the global market (in terms of sales) for electronic components embedded in cell phone base stations and smartphones, indicating that they have the potential to compete regarding Beyond 5G (**Figure 4-5-1-3**).

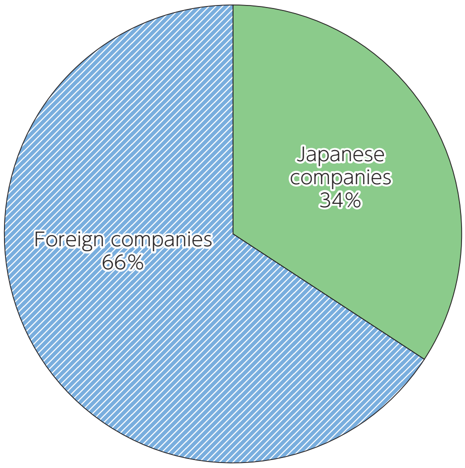
[1] Key telephone systems and interphones
[2] Maritime/aeronautical radars, wireless location measuring devices, telemeter/telecontrol apparatus, etc.
[3] Satellite/terrestrial fixed communications equipment, maritime/aeronautical communications equipment, transceivers, etc.
[4] Routers, hubs, gateways, etc.
[5] Digital transmission devices, power line carrier devices, CATV carrier devices, optical transmission devices, etc.
[6] In dollar terms, the market was down 11.3% from the previous year.

Figure 4-5-1-2 Size (value of shipments) of the Japanese 5G base stations (macrocells) market



(Source) Omdia

Figure 4-5-1-3 Share of global electronic components market (in terms of sales) (2021)



(Source) Omdia

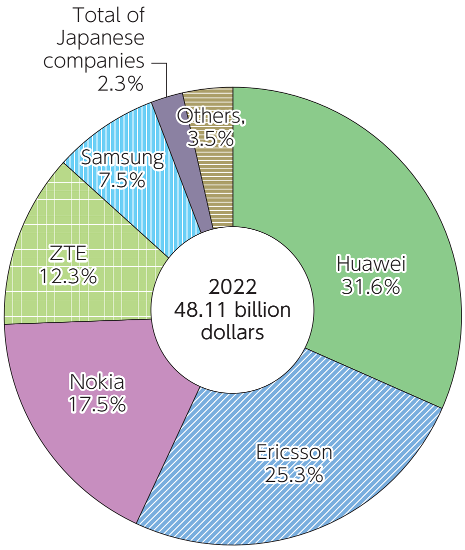
Figure (related data) Global 5G base stations (macrocells) market size (value of shipments)
Source: Omdia
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00173
(Data collection)

Figure (related data) Global 5G base stations (macrocells) market share (value of shipments)
Source: Omdia
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00175
(Data collection)

b　Macrocell base stations (including 5G)

In terms of the value of shipments in the global market in 2022, Huawei led the market with 31.6%, followed by Ericsson with 25.3%, and Nokia with 17.5%, while Japanese companies accounted for a total of 2.3%. (**Figure 4-5-1-4**).

Figure 4-5-1-4　Share of the global macrocell base station market (value of shipments in 2022)



(Source) Omdia

c　Enterprise routers

In terms of the value of shipments in the global market in 2022, Cisco led the market with 66.3%, followed by H3C with 9.0% and Huawei with 6.0%.

In terms of the value of shipments in the Japanese market in 2022, Cisco led the market with 35.1%, followed by NEC with 26.6%, and Yamaha with 23.3%.

Figure (related data) Global enterprise router market share
Source: Omdia
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00178
(Data collection)

Figure (related data) Japanese enterprise router market share
Source: Omdia
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00179
(Data collection)

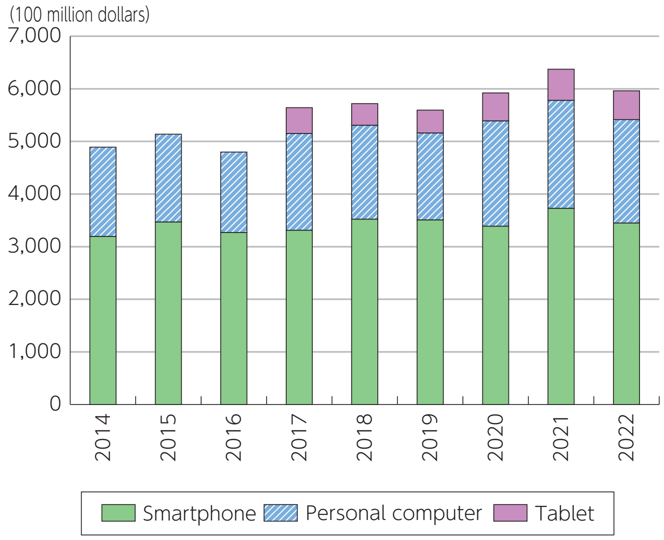
2. Trends in the ICT device market in Japan and overseas

(1) Market size

The value of global shipments of information devices has been increasing since 2016 and reached 92.2574 trillion yen (up 15.8% from the previous year) in 2022[7] (**Figure 4-5-2-1**). In breakdown, smartphones and personal computers account for a major part.

The value of Japan's production of information devices was on the decrease up to 2017, then increased again 2018, but started to decrease again in 2020 and fell to 956.7 billion yen (down 7.7% from the previous year[8]) in 2022. In breakdown, PHS and mobile phones[9] accounted for the major part of the market up to the mid-2010s, but decreased thereafter, and currently desktop computers, laptop computers and information devices[10] form the major part of the market.

Figure 4-5-2-1 Changes in the value of global information device shipments



*Tablets have been counted since 2017

(Source) Omdia

(2) Change in the market by device type

a Smartphones (5G)

Global shipments volume of 5G smartphones totaled 584.52 million units in 2021, accounting for 46% of all smartphones (1,276.34 million units). From 2028, 100% of smartphones is expected to support 5G, and the number of smartphones is forecasted to grow to 1.55 billion units by 2030 (**Figure 4-5-2-2**).

Shipments of 5G smartphones in Japan totaled 17.53 million units in 2021, up 67.7% from the previous year. From 2024, 100% of smartphones will support 5G, and the number of smartphones is forecasted to grow to 32.18 million by fiscal 2027 (**Figure 4-5-2-3**).

---

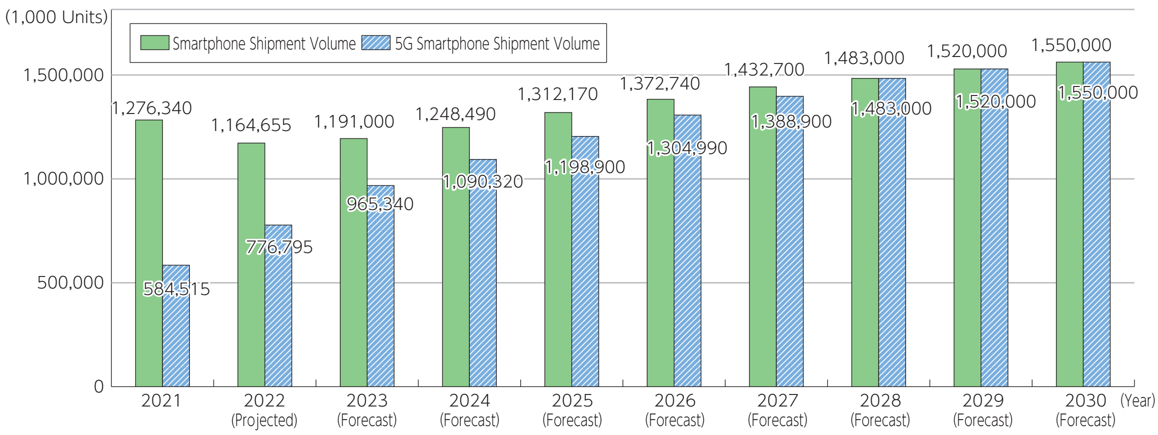
[7] In dollar terms, the market was down 3.3% from the previous year.

[8] This is affected by the fact that the value of PHS and mobile phones can no longer be calculated so is not recorded.

[9] Since fiscal 2019, the value of mobile phone and PHS production is no longer disclosed, so the values for radio communications equipment (including satellite communications equipment) are used after deducting the values of broadcasting equipment, fixed communications equipment (satellite and terrestrial), other terrestrial mobile communications equipment, maritime/aeronautical mobile communications equipment, base station communications equipment, other radio communications equipment and associated radio equipment.

[10] External memories, printers, monitors, etc. Information kiosk terminal devices are excluded because their production was not disclosed in some years.

Figure 4-5-2-2 Transition and Forecast of Global Shipment Volume of Smartphones & 5G Smartphones



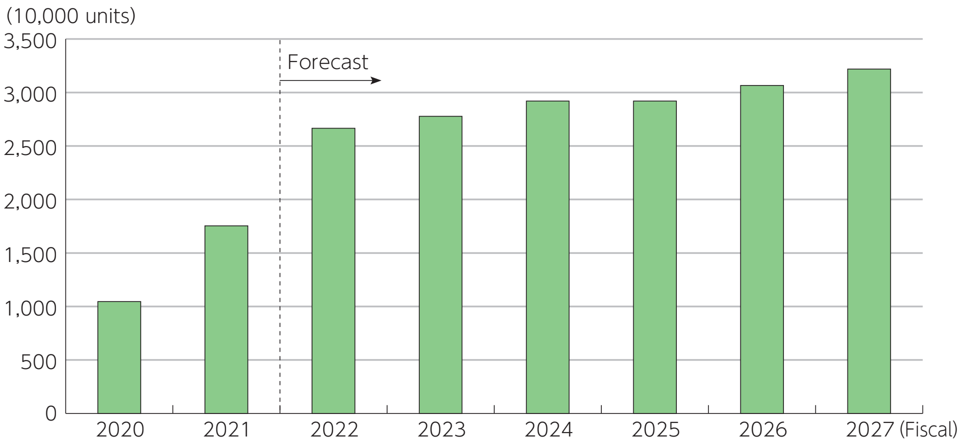
*1 Based on the shipment volume at manufacturers.

*2 The values for 2022 are those projected, and the values after 2023 are those forecasted.

*3 Number of 5G smartphones are included in the number of smartphones.

(Source) Yano Research Institute Ltd., "Global Market of Mobile Phone Subscriptions and Shipment Volume: Key Research Findings 2022", February 7, 2023

Figure 4-5-2-3 Shipments of 5G smartphones in Japan



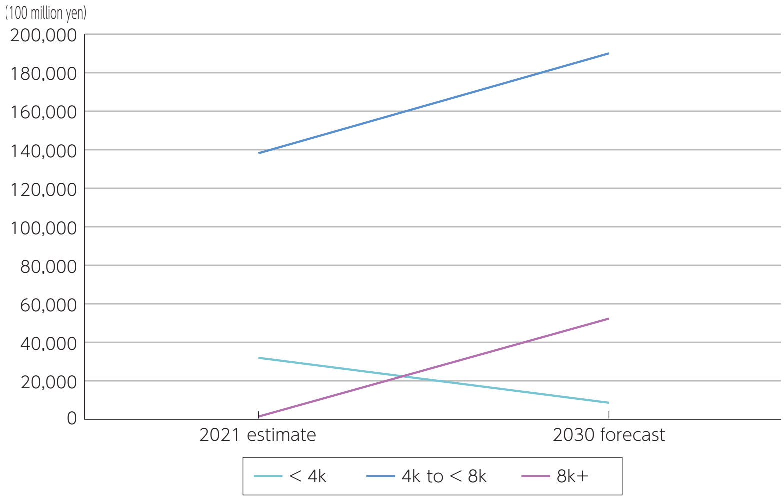
(Source) CIAJ "Medium-Term Demand Forecast for Communications Devices [Fiscal 2022 to Fiscal 2027]"

b 4K and 8K televisions

Regarding the value of global shipments of 4K and 8K televisions, in 2021 it is expected to be a large 13.9 trillion yen for televisions that are 4K or higher but less than 8K, and this is forecasted to increase to 19 trillion yen by 2030. For televisions that are less than 4K, it is expected to be 3.17 trillion yen in 2021, and is forecasted to shrink to 770 billion yen in 2030. In comparison, for televisions that are 8K or higher, it is expected to be a small 140 billion yen in 2021, but is forecasted to increase to 5.2 trillion yen in 2030 **(Figure 4-5-2-4)**.

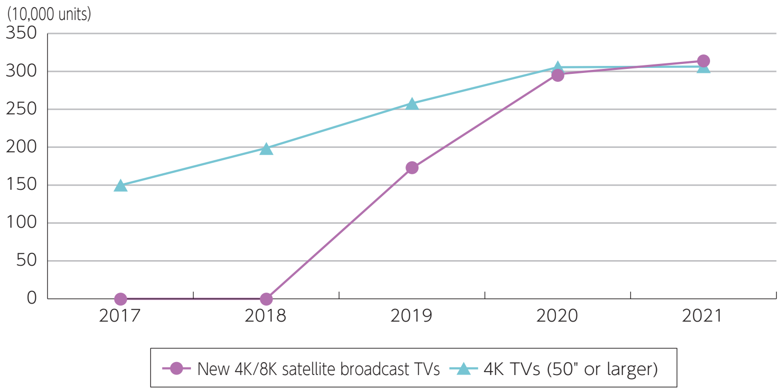
In 2021 in Japan, the number of 4K televisions (50-inch or larger) shipped was 3.06 million units (up 0.3% year on year), and the number of new 4K and 8K satellite broadcast televisions shipped was 3.14 million units (up 5.9% year on year), with growth decelerating for both types in 2021 (**Figure 4-5-2-5**).

Figure 4-5-2-4 Value of global shipments of 4K and 8K televisions



(Source) Fuji Chimera Research Institute, Inc. "5G/8K business future outlook survey 2022"

Figure 4-5-2-5 Number of 4K and 8K televisions shipped in Japan



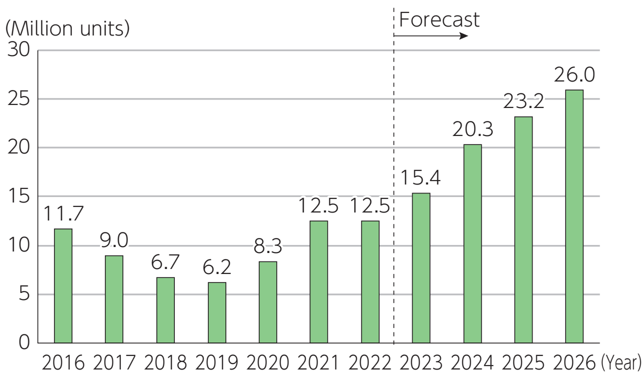
(Source) JEITA "Domestic Shipments of Consumer Electronic Devices"

c VR•AR

Global shipments of VR headsets have continued to increase since 2020, reaching 12.53 million units in 2022 (up 0.3% year on year), and are forecasted to grow 4.2x to 25.98 million units in 2026 compared to 2019 (**Figure 4-5-2-6**).

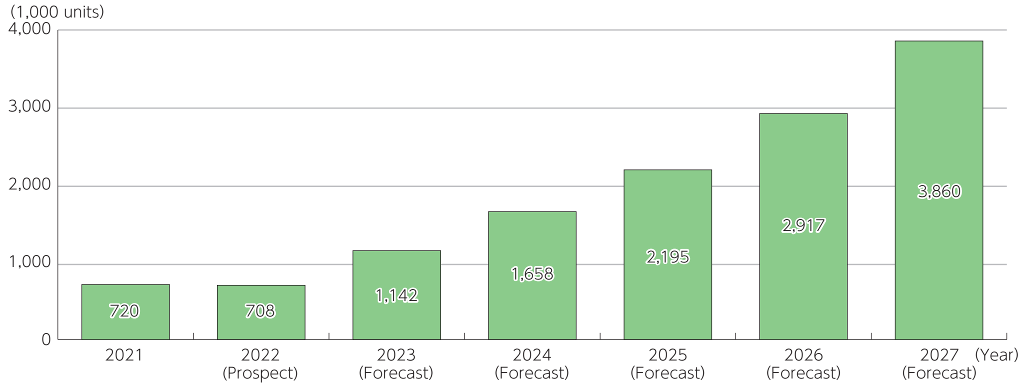
In Japan, the number of XR (Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR)) and 360° video-compatible head-mounted display (HMD) units shipped in Japan was 720,000 in 2021, and is forecasted to reach 3.86 million in 2027 (**Figure 4-5-2-7**).

Figure 4-5-2-6 Changes and forecast in global VR headset shipments



(Source) Omdia

Figure 4-5-2-7 Forecast on Domestic Shipment Volume of HMDs for XR (VR/AR/MR) & 360-Degree Videos



*1 Based on the shipment volume at manufacturers.

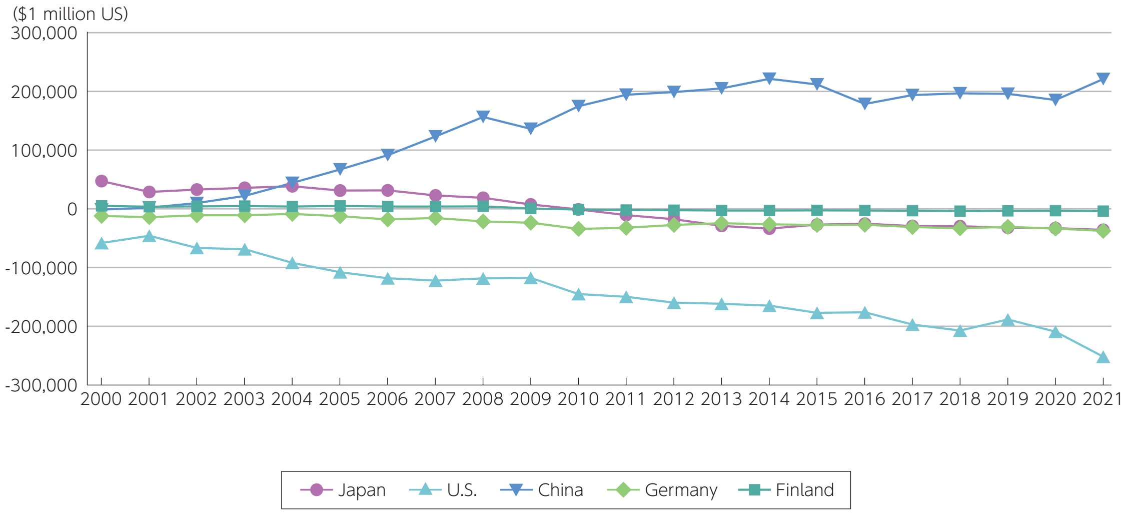
*2 The value in 2022 was the prospect, and the values in and after 2023 are the forecasts.

(Source) Yano Research Institute Ltd., "The Market of HMDs (Head Mounted Displays) for XR (VR/AR/MR) and 360-Degree Videos: Key Research Findings 2021" , May 11, 2022

3. Trends in the import and export of ICT equipment and devices by country

Japan has had an import surplus since 2010, and while the value of Japan's exports of ICT equipment and devices[11] increased to 7.1562 trillion yen (up 17.6% from the previous year) in 2021 due to the progress of the shift to digitalization resulting from the spread of COVID-19 globally, the value of imports was 11.0829 trillion yen (up 15.7% increase the previous year), resulting in an import surplus of 3.9267 trillion yen (up 12.4% from the previous year). In addition, in 2021 the U.S. had an import surplus of 27.6249 trillion yen (up 23.8% from the previous year), while the China had an export surplus of 24.2585 trillion yen (up 22.6% from the previous year) **(Figure 4-5-3-1)**.

Figure 4-5-3-1 Changes in the value of the export surplus of ICT equipment and devices by country



(Source) UNCTAD "UNCTAD STAT"[12]

Figure (related data) Changes in the value of exports of ICT equipment and devices by country
(Source) UNCTAD "UNCTAD STAT"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00189
(Data collection)

Figure (related data) Changes in the value of imports of ICT equipment and devices by country
(Source) UNCTAD "UNCTAD STAT"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00190
(Data collection)

[11] Computers, communications equipment, consumer electronics, electronic components, etc.
[12] https://unctadstat.unctad.org/EN/Index.html

4. Trends in the semiconductor[13] market

The global semiconductor market (value of shipments) has been on an upward trend since 2015, reaching 12.5493 trillion yen in 2022 (up 32.1% from the previous year). Looking at the breakdown, discrete semiconductors account for the largest share. Imaging sensors and MCUs have experienced significant growth in recent years, with a Japanese company (Sony Semiconductor Solutions) accounting for 48.3% of the market share.

The Japanese semiconductor market (value of shipments) had been decreasing since 2018, but it started to increase in 2021, and in 2022 it increased to 1.0145 trillion yen (up 36.9% from the previous year). Looking at the breakdown, as per the global market, discrete semiconductors account for the largest share of the market.

Figure (related data) Changes in global semiconductor market (value of shipments)
Source: Omdia
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00191
(Data collection)

Figure (related data) Changes in Global imaging sensor market share (value of shipments in 2022)
Source: Omdia
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00192
(Data collection)

Figure (related data) Changes in Japan's semiconductor market (value of shipments)
Source: Omdia
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00193
(Data collection)

[13] In this section, this means the discrete semiconductors used for the imaging sensors, MCUs, MEMS sensors and indispensable power sources that are positioned as key devices in the electronic equipment implementing IoT and AI, which are being introduced as part of the digital transformation (DX).

Section 6 Trends with platforms

1. Market trends

Looking at the market capitalization of the major players in the global ICT-related market in 2023, Meta Platforms (Facebook), which was in 5th place in 2022, declined significantly in market capitalization and retreated due to a decline in advertising revenue and the rise of latecomer social media such as TikTok. Other top companies have not changed significantly from the previous fiscal year and companies involved in cloud services, social media, security, etc. are being evaluated on the stock market (**Figure 4-6-1-1**).

Figure 4-6-1-1 Change in the top 15 companies by market capitalization in the global ICT market

2022

Company name	Major business	Country	"Market capitalization (100 million dollars)"
Apple	Hardware, software, services	US	28,282
Microsoft	Cloud service	US	23,584
Alphabet/Google	Search engine	US	18,215
Amazon.com	Cloud service, e-commerce	US	16,353
Meta Platforms/ Facebook	SNS	US	9,267
NVIDIA	Semiconductor	US	6,817
Taiwan Semiconductor Manufacturing	Semiconductor	Taiwan	5,946
Tencent	SNS		5,465
Visa	Payment	US	4,588
Samsung Electronics	Hardware	Korea	4,473
Mastercard	Payment	US	3,637
Alibaba	e-commerce		3,589
Walt Disney	Media	US	2,811
Cisco Systems	Hardware, security	US	2,578
Broadcom	Hardware, semiconductor	US	2,557

2023

	Company name	Major business	Country	"Market capitalization (100 million dollars)"
	Apple	Hardware, software, services	US	25,470
	Microsoft	Cloud service	US	20,890
	Alphabet/Google	Search engine	US	13,030
	Amazon.com	Cloud service, e-commerce	US	10,270
↑	NVIDIA	Semiconductor	US	6,650
↓	Meta Platforms/ Facebook	SNS	US	5,370
↑	Tencent	SNS		4,690
↑	Visa	Payment	US	4,600
↓	Taiwan Semiconductor Manufacturing	Semiconductor	Taiwan	4,530
↑	Mastercard	Payment	US	3,440
↓	Samsung Electronics	Hardware	Korea	3,280
↑	Broadcom	Hardware, semiconductor	US	2,610
↓	Alibaba	e-commerce		2,570
new	Oracle	Cloud service	US	2,450
↓	Cisco Systems	Hardware, security	US	2,100

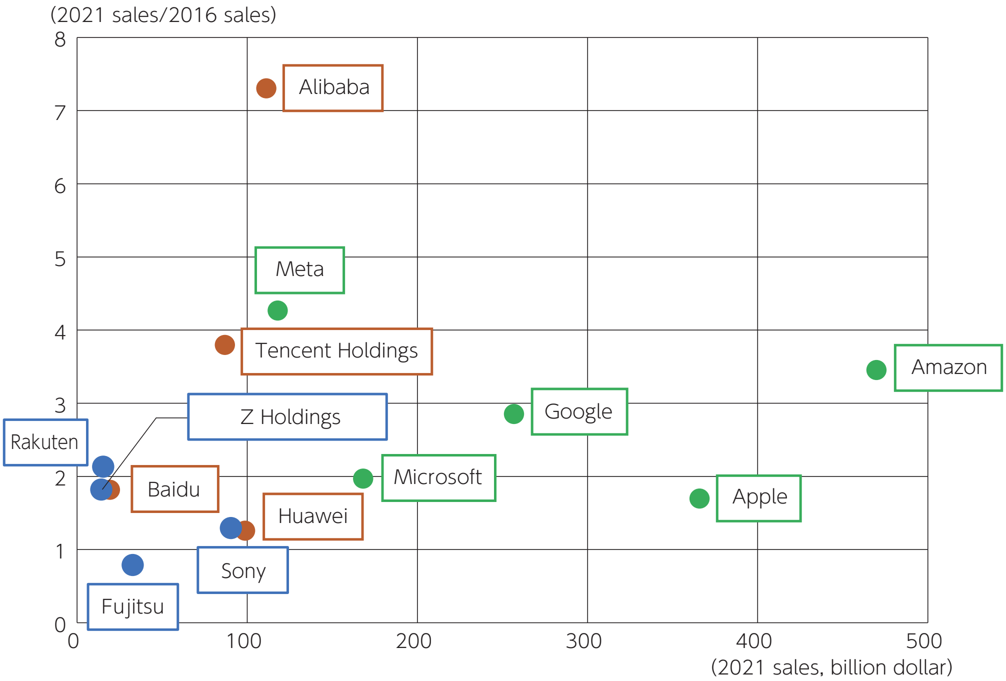
*The figures for 2022 are as of January 14, 2022, and the figures for 2023 are as of March 31, 2023.

(Source) Acquired from Wright Investors' Service, Inc.[1]

Comparing the sales[2] of major platform providers in Japan, the U.S. and China in 2021, the largest was Amazon, with sales of about 51.5648 trillion yen, 3.5x higher than in 2016 (**Figure 4-6-1-2**). China's Alibaba (12.2080 trillion yen) has grown very quick with sales 7.3x higher than in 2016. In comparison, Japanese companies are smaller in scale, and also inferior in terms of growth with Rakuten at 2.1x, Z Holdings at 1.8x, Sony at 1.3x, and Fujitsu at 0.8x.

[1] https://www.corporateinformation.com/#/tophundred
[2] Sales of Japanese and Chinese companies were converted to dollars by using the average rate of the respective year.

Figure 4-6-1-2 Sales of platform providers in Japan, the U.S. and China



(Source) Prepared based on Statista data

2. Trends with major platform providers

Leading US and Chinese platform providers are leveraging their strengths and focusing on new fields and businesses, including generative AI and metaverses. In particular, several platform providers are focusing on the development of generative AI, and competition for leadership is expected to intensify in the future (**Figure 4-6-2-1**).

Figure 4-6-2-1 Trends with major platform providers in the U.S. and China

<U.S.>

Key areas	Company	Business overview and areas	New areas and businesses
Advertising, search	Alphabet (Google)	Provides the largest search engine service in the world, and is developing a massive economic sphere including cloud and devices focused mainly insearch advertising.	Recognizing the threat of generative AI to search engines, the company has been strengthening its search engine using AI technology, including the launch of the "Bard" chat AI linked with Google search.
E-commerce	Amazon	One of the largest e-commerce operators in the world, with a huge economic sphere centered on cloud services (AWS).	The company is strengthening its cloud services and advertising services on e-commerce sites.
Social media, apps	Meta (Facebook)	The company provides one of the world's largest social media services, and in 2021 changed its name to Meta Platforms to promote its metaversebusiness.	The company is focusing on its metaverse business as a pillar of its future amid a slight slowdown in advertising revenue on social media.
Communications devices and terminals	Apple	The world's largest manufacturer and retailer of Internet and digital home appliances, the company has developed a massive economic sphere centered on iPhones and other devices.	The company is expanding its business with the iPhone at its core, and in recent years has focused on expanding in the healthcare area with Apple Watch.
Terminals, cloud	Microsoft	One of the largest software vendors in the world, the company has a massive economic sphere centered on software and cloud services such as Windows and Office.	The company is focusing on using generative AI, including expanding its partnership with OpenAI.

<China>

Key areas	Company	Business overview and areas	New areas and businesses
Advertising, search	Baidu	The largest search engine operator in China, the company is now focusing on artificial intelligence (AI) technology based on search engines and expanding into areas such as deep learning, autonomous driving, and AI chips.	On March 16, 2023, the company announced the "ERNIE Bot" generative AI technology based on the latest large language model. It now plans to implement generative AI to own products and other's.
E-commerce	Alibaba	The world's largest e-commerce operator based on gross merchandise volume, the company is now leveraging data technology to provide services ranging from marketing to logistics and payments.	On April 11, 2023, Alibaba Cloud, a group company, announced "Tongyi Qianwen," a new AI language model for companies, and is currently developing its AI business.
Social media, apps	Tencent	China's largest social media app platformer, the company has built a massive ecosystem to provide payment services, games, and other service based on "WeChat."	On November 30, 2022, the company announced the "Kurumazukumo" cloud solution specializing in smart mobility, and then began providing mapping services necessary for autonomous driving, in order tofocus on the mobility field.
Communications devices and terminals	Huawei	A leading global communications device vendor with operations in four key areas: telecom networks, IT, smart devices, and cloud services.	In June 2021, Huawei Digital Power Technologies, a subsidiary providing digital energy products and solutions, was established to expand into the energy field, including green power generation.

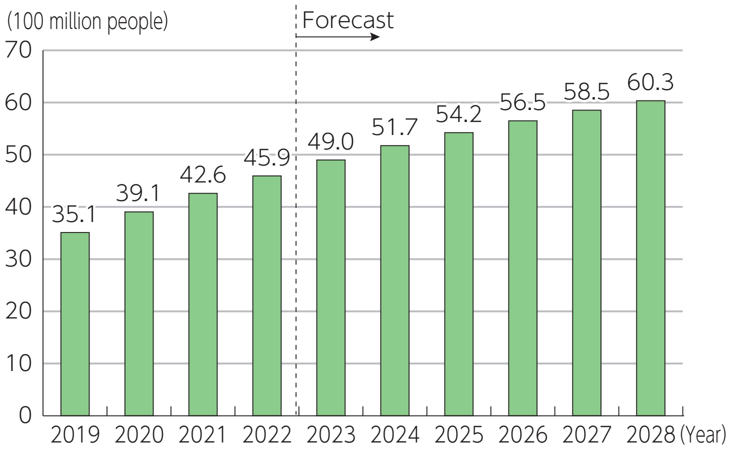
Figure (related data) Sales of major platform providers in the U.S. and China by business
Source: Prepared based on financial results material released by each company
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00219
(Data collection)

Section 7 Trends in the ICT services and contents & application services markets

1. Social media

The number of social media users globally[1] is forecasted to increase from 4.59 billion in 2022 to 6.03 billion in 2028, and besides its use as a communication tool, its use for social commerce, which combines social media and e-commerce, and the demand for e-commerce, such as live commerce, which expanded due to the COVID-19 pandemic, are driving the expansion of its use. In addition, short video content, such as TikTok and Instagram stories and reels, has become popular, and by extension, AR and VR content on social media is expected to become popular (**Figure 4-7-1-1**).

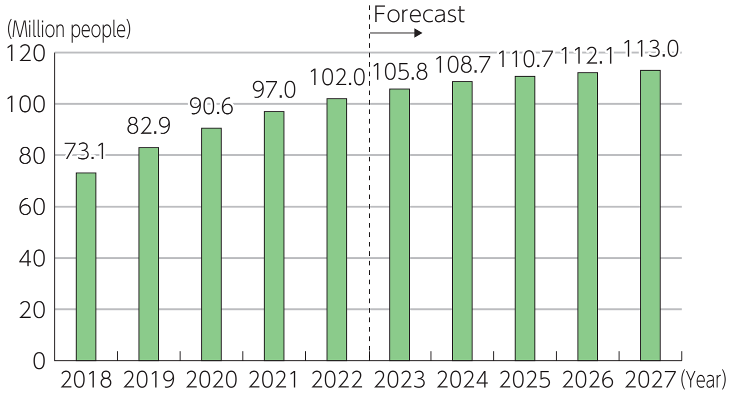
Figure 4-7-1-1 Changes and forecast in the number of global social media users



(Source) Statista[2]

The number of social media users in Japan is forecasted to increase from 102 million in 2022 to 113 million in 2027 (**Figure 4-7-1-2**).

Figure 4-7-1-2 Changes and forecast in the number of social media users in Japan



*Number of people who use social media sites and applications at least once a month, with or without an account

(Source) Statista[3]

2. EC

Sales in the global EC market have been on an upward trend and are forecasted to increase to 751.8 trillion yen (up 31.4% from the previous year) in 2022.

By country, the compound annual growth rate from 2023 to 2027 will be high in Brazil and India, followed by China, the U.S. and Japan. European countries (UK, France and Germany) are forecasted to grow by 8%, while South Korea is forecasted to grow by as little as 3.5%.

[1] Internet users who use social media sites through some kind of device at least once a month
[2] https://www.statista.com/forecasts/1146659/social-media-users-in-the-world
[3] https://www.statista.com/statistics/278994/number-of-social-network-users-in-japan/

Figure (related data) Changes and forecast in sales in the global EC market
Source: Statista (eMarketer)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00222
(Data collection)

Figure (related data) Growth rate of EC market by country (2023 to 2027)
Source: Statista [Statista Digital Market Insights]
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00223
(Data collection)

3. Search services

While Google has a strong share of the global desktop search engine market, it has gradually declined in recent years and in December 2022 its share was 84.1%, with Bing growing to 9.0%. Google also maintains a very high share of the global mobile search engine market, and all other search engines remain at less than 2%.

In Japan, as of September 2022, Google has the highest share for personal computers, and as of December 2022, its share is 70% or higher for both smartphones and tablets. There are also differences between devices, with Bing's share of the PC market in excess of 15% and Yahoo!'s share of the smartphone and tablet market at around 20%.

Figure (related data) Changes in global market share of search engines (Desktop)
Source: Statista (StatCounter)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00226
(Data collection)

Figure (related data) Changes in global market share of search engines (mobile)
Source: Statista (StatCounter)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00227
(Data collection)

Figure (related data) Market share of search engines in Japan
Source: Statista (StatCounter)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00228
(Data collection)

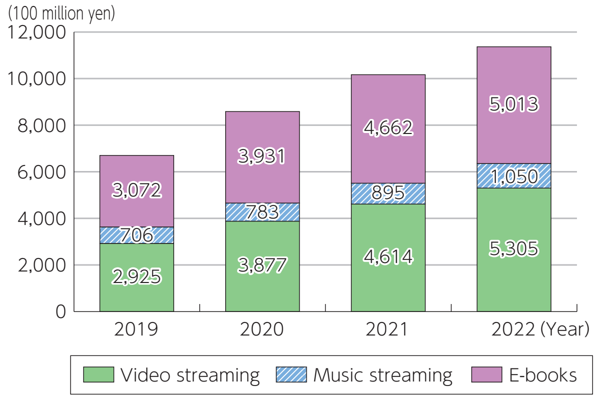
4. Video streaming, music streaming and e-books

The global video streaming, music streaming, and e-book markets have maintained and expanded demand captured by the spread of flat-rate services and the increase in the number of hours spent at home due to the spread of COVID-19, and in 2022, the markets totaled 19.865 trillion yen (up 37.3% from the previous year).

Figure (related data) Changes and forecast in size of global video streaming, music streaming and E-book market
Source: Omdia, Statista
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00229
(Data collection)

In addition, like the global market, the markets in Japan also grew, and in 2022 the video streaming market was 530.5 billion yen (up 15.0% from the previous year), the music streaming market was 105.0 billion yen (up 17.3% from the previous year), and the e-book market was 501.3 billion yen (up 7.5% from the previous year) (**Figure 4-7-4-1**).

Figure 4-7-4-1 Changes in the size of the Japanese video streaming, music streaming, and e-book markets



(Source) Prepared based on GEM Partners' "Video Streaming (VOD) Market Forecast for Five Years (2022 - 2026) Report,"[4] the Recording Industry Association of Japan's "Japan Recording Industry 2023,"[5] and the All Japan Magazine and Book Publisher's and Editor's Association and Research Institute for Publications' (2023) "Publishing Monthly Report."[6]

5. New trends in ICT services and content and application services markets

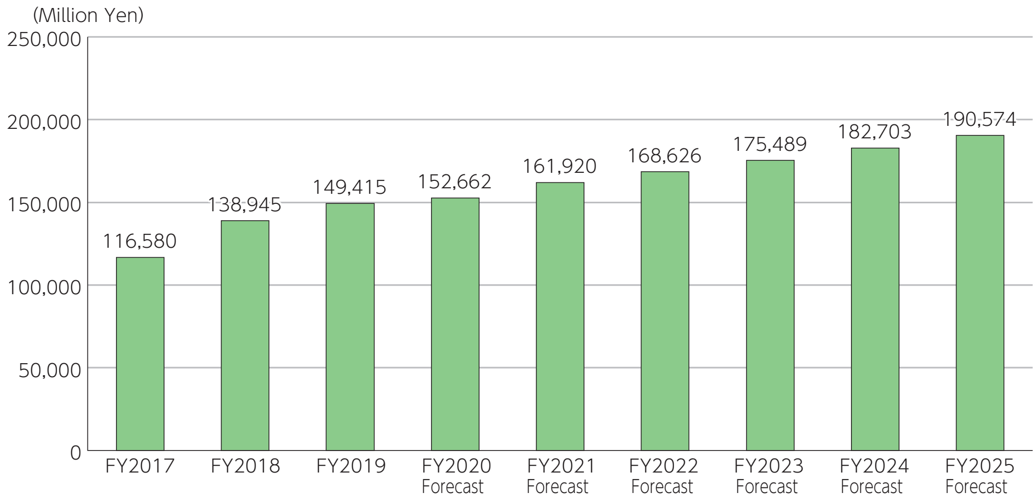
(1) Services using location information (spatial information)

Services that utilize location information (spatial information) are widely used, and include map apps, car navigation, marketing, people flow tracking, taxi dispatch apps, games that utilize location information, and apps that share location information with family and friends.

The size of the market for (outdoor) location and geographic information in Japan was 152.7 billion yen in fiscal 2020 and is forecasted to increase to 190.6 billion yen in fiscal 2025 (**Figure 4-7-5-1**).

In addition, driven by office demand due to the spread of hot-desking and other work style reforms, the size of indoor positioning solutions market is forecasted to increase to approximately 7.6 billion yen in fiscal 2024, and although the size of the market is smaller than the outdoor market, it is expected to grow by approximately 20% annually from fiscal 2021 onward (**Figure 4-7-5-2**).

Figure 4-7-5-1 Transition and Forecast of Domestic Location and Geographic Information Service Market Size



*1 Based on sales by business operators.

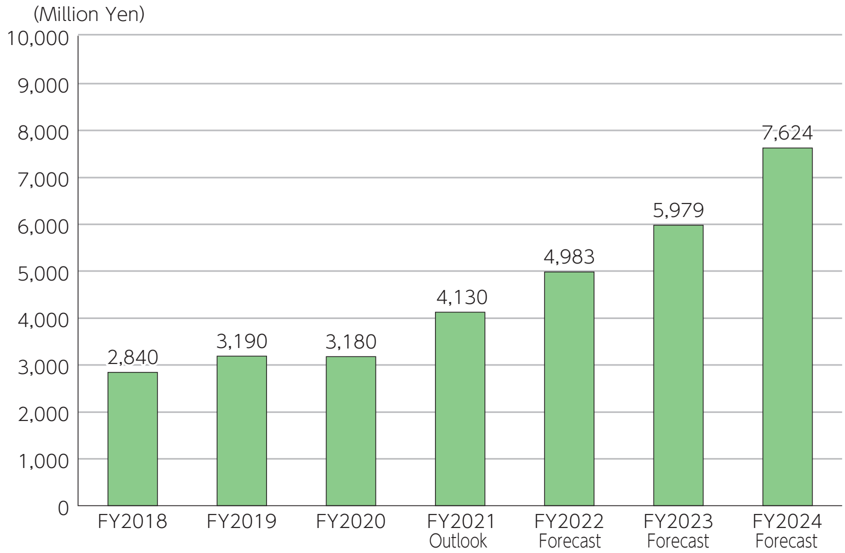
*2 The values for fiscal 2020 and later are forecasts.

*3 Market size was calculated based on (1) map databases, (2) GIS engines, and various GIS applications ((3) traffic related location applications, (4) store development/location advertisements, (5) spot store information/coupons/check-in, (6) location game applications, (7) IoT location applications, (8) delivery/logistics related location applications, (9) Industrial location applications, (10) location applications for infrastructure development, (11) traffic jam prevention location applications, (12) disaster prevention location applications).

(Source) Yano Research Institute Ltd., "Location and Geographic Information Service Market in Japan: Key Research Findings 2020", November 5, 2020

[4] https://gem-standard.com/columns/674
[5] https://www.riaj.or.jp/f/pdf/issue/industry/RIAJ2023.pdf
[6] https://shuppankagaku.com/wp/wp-content/uploads/2023/01/%E3%83%8B%E3%83%A5%E3%83%BC%E3%82%B9%E3%83%AA%E3%83%AA%E3%83%BC%E3%82%B92301%E3%80%80.pdf

Figure 4-7-5-2 Transition and Forecast of Indoor Positioning Solutions Market Size



*1 Based on the sales of indoor location information service and solution providers

*2 Market size was calculated based on services and solutions that utilize indoor location information utilization using indoor positioning technology and indoor map information.

*3 The value for fiscal 2021 is an estimate, and the values for fiscal 2022 and later are forecasts.

(Source) Yano Research Institute Ltd., "Indoor Positioning Solutions Market in Japan: Key Research Finding 2021", January 7, 2022

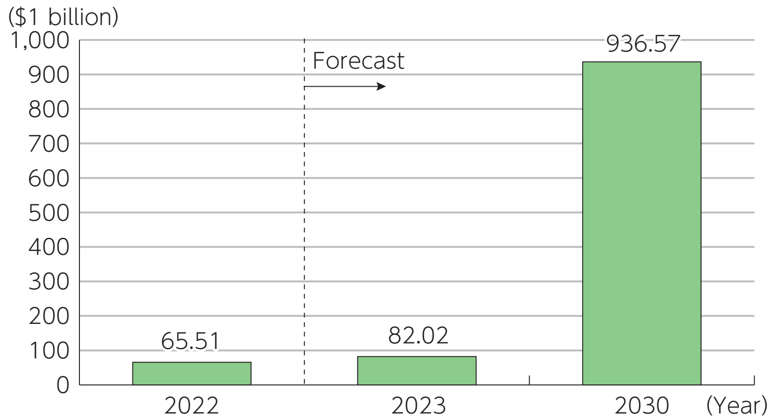
(2) Metaverses

As the speed of communications and the rendering performance of computers have improved, virtual spaces on the Internet called metaverses,[7] where users can communicate, have started to spread, and economic activities such as the purchasing of goods in metaverses are attracting considerable attention.

The global metaverse market (total of infrastructure, hardware, software, and services) is forecasted to expand from 8.6144 trillion yen in 2022 to 123.9738 trillion yen[8] in 2030 **(Figure 4-7-5-3)**.

The Japanese metaverse market (total for metaverse platforms, non-platforms (content, infrastructure), and XR (VR, AR, MR) devices) is expected to reach 182.5 billion yen in fiscal 2022 (up 145.3% from the previous fiscal year) and is forecasted to expand to 1.0042 trillion yen in fiscal 2026 **(Figure 4-7-5-4)**. Due to the continuation of the COVID-19 pandemic, its use is expanding for purposes such as virtual exhibitions that provide virtual spaces for corporations, online events such as in-house events, education and training, and customer service and shopping experiences in online shopping.

Figure 4-7-5-3 Changes and forecast in the size of the global metaverse market



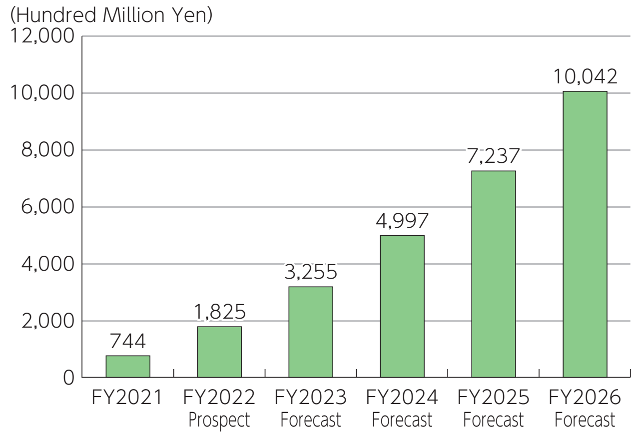
(Source) Statista[9]

[7] Interim Summary of the MIC Study Group on the Utilization of Metaverse Towards Web3 Era (summary of discussions so far) https://www.soumu.go.jp/main_content/000860618.pdf

[8] Calculated using the average exchange rate for January to March 2023.

[9] https://www.statista.com/statistics/1295784/metaverse-market-size/

Figure 4-7-5-4 Domestic Metaverse Market Size Forecast



*1 Based on sales by business operators.

*2 The value for fiscal 2022 is an estimate, and the values for fiscal 2023 and later are forecasts.

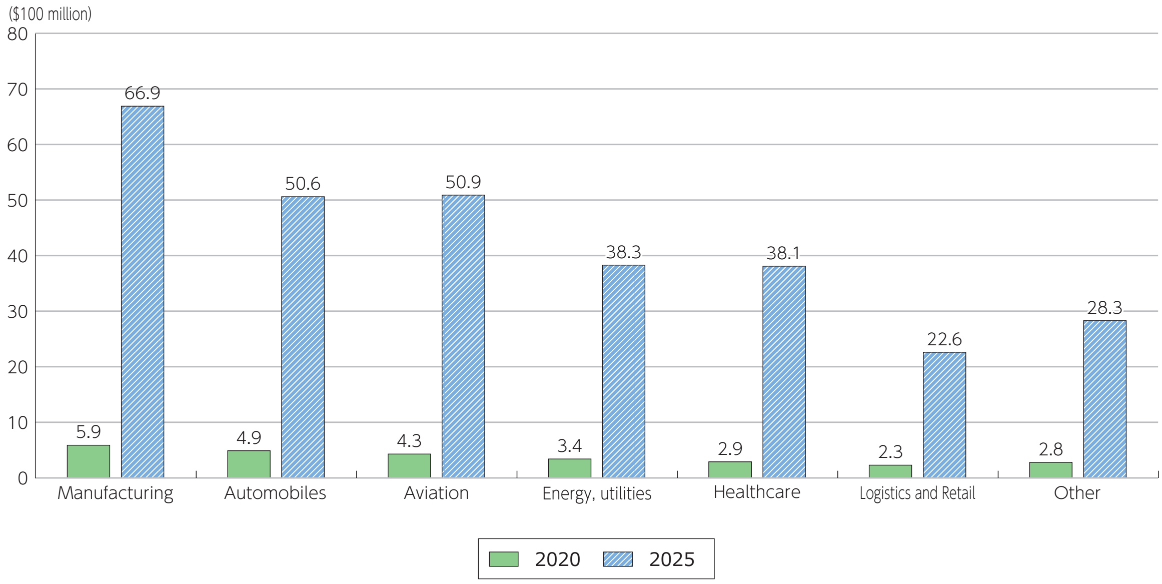
*3 The total market size is the sum of metaverse platforms, non-platforms (content, infrastructure, etc.), and XR (VR, AR, MR) equipment. Note that XR (VR, AR, MR) equipment is calculated on a sales price basis.

(Source) Yano Research Institute Ltd., "Metaverse Market in Japan: Key Research Findings 2022, September 21", 2022

(3) Digital twins

A digital twin is a virtual twin of an object or situation in real space recreated in a virtual space.[10] Digital twins are increasingly being used for simulation, optimization, and evaluation of effects, impacts, and risks in a variety of fields including manufacturing and healthcare, and the size of the global digital twin market is forecasted to grow from 283.0 billion yen in 2020 to 3.9142 trillion yen[11] in 2025 (**Figure 4-7-5-5**).

Figure 4-7-5-5 Size of the global digital twin market (by industry)



(Source) Statista (BIS Research)[12]

[10] Interim Summary of the MIC Study Group on the Utilization of Metaverse Towards Web3 Era (summary of discussions so far) https://www.soumu.go.jp/main_content/000860618.pdf
[11] Calculated using the average exchange rate for January to March 2023.
[12] https://www.statista.com/statistics/1296187/global-digital-twin-market-by-industry/

Section 8 Trends in the data center market and cloud services market

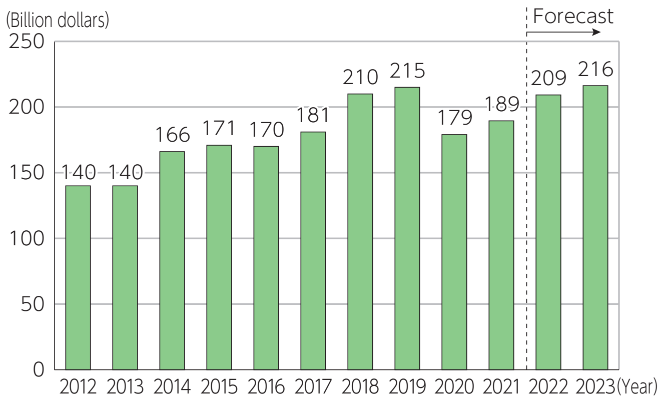
1. Data centers

The number of large data centers globally exceeded 800 at the end of the second quarter of 2022[1] and continues to grow. Regarding the share of the global data center capacity, the U.S. accounts for over half at 53%, followed by Europe, the Middle East and Africa (16%), China (15%) and the Asia Pacific Region excluding China (11%).

The size (in terms of expenditure) of the global data center systems market was 27.5081 trillion yen (up 32.3% from the previous year) in 2022 (**Figure 4-8-1-1**). After a brief decline in 2020 due to the spread of COVID-19, it has been on an upward trend since then and is forecasted to grow larger than it was in 2019 in 2023.

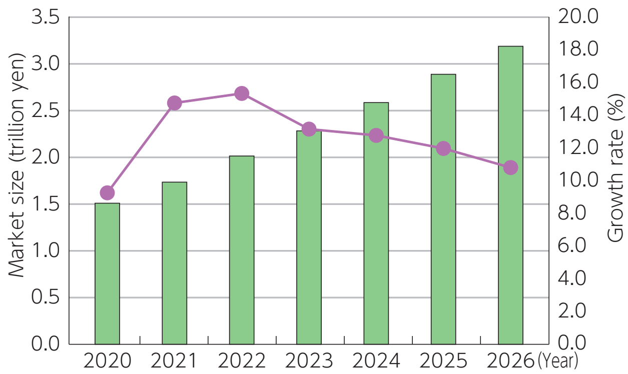
The size (in terms of sales) of the Japanese data center services market is expected to reach 2.0275 trillion yen in 2022 (up 15.3% from the previous year), and exceed 2 trillion yen for the first time (**Figure 4-8-1-2**).

Figure 4-8-1-1 Changes and forecast in the size of the global data center systems market (in terms of expenditure)



(Source) Statista (Gartner)[2]

Figure 4-8-1-2 Changes and forecast in the size (in terms of sales) of the Japanese data center services market



*2022 is an estimate, and 2023 and beyond are forecasts.

(Source) IDC "Japan Datacenter Services Forecast" (August 29, 2022)[3]

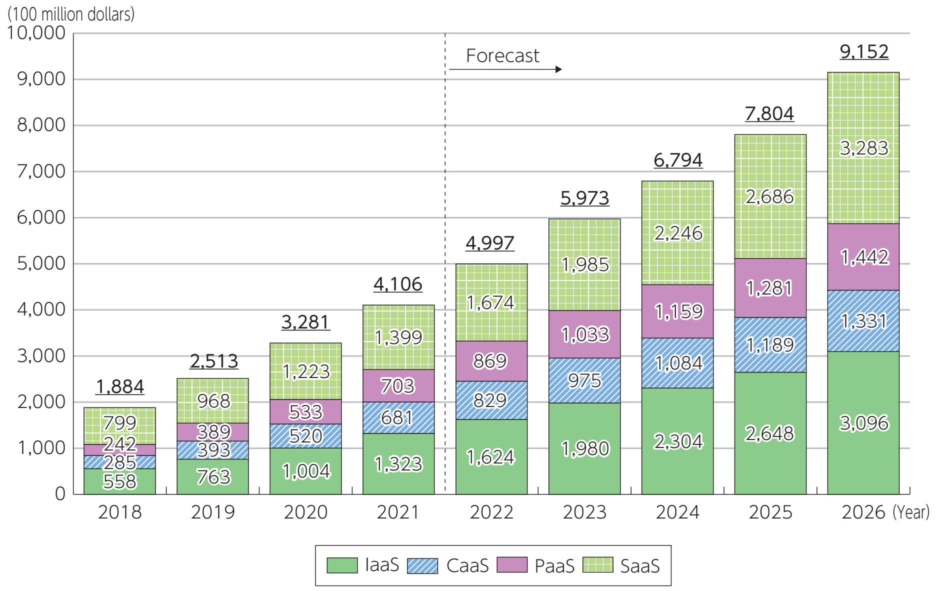
Figure (related data) Share of global large-scale data center market by region (data capacity)
Source: Synergy "Virginia Still Has More Hyperscale Data Center Capacity Than Either Europe or China"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00245
(Data collection)

[1] https://www.srgresearch.com/articles/virginia-still-has-more-hyperscale-data-center-capacity-than-either-europe-or-china
[2] https://www.statista.com/statistics/268938/global-it-spending-by-segment/
[3] https://www.idc.com/getdoc.jsp?containerId=prJPJ49623222

2. Cloud services

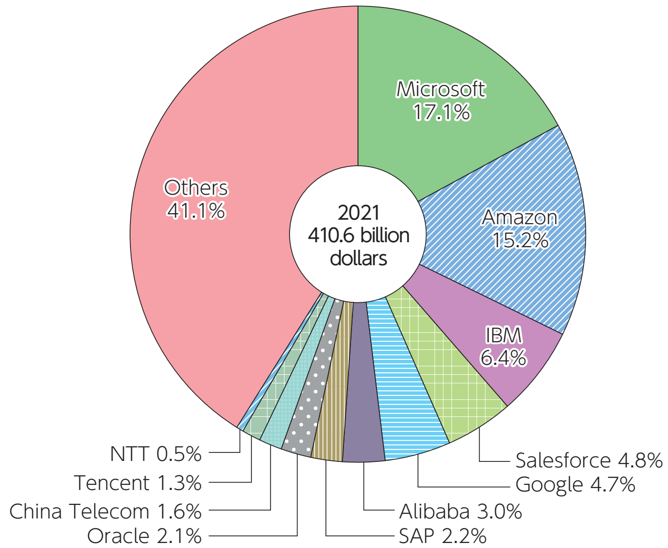
The global public cloud services market[4] was 45.0621 trillion yen in 2021, up 28.6% from the previous year. For example, PaaS is expected to continue to grow rapidly as service providers continue improving convenience and users tend to continue to use it (**Figure 4-8-2-1**). Looking at market share, the top five U.S. companies (Microsoft, Amazon, IBM, Salesforce, Google) account for about half of the total, so the market is in an oligopoly situation (**Figure 4-8-2-2**).

Figure 4-8-2-1 Changes and forecast in the size (in terms of sales) of the global public cloud service market



(Source) Omdia

Figure 4-8-2-2 Share of the global public cloud services market



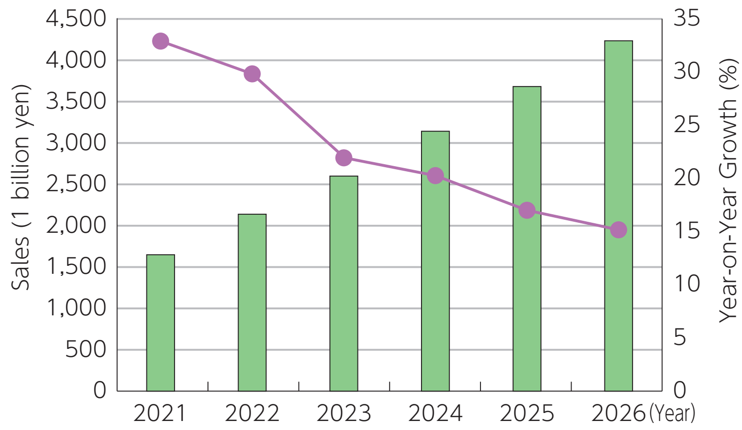
(Source) Omdia

The Japanese public cloud services market[5] is expected to increase to 2.1594 trillion yen in 2022 (up 29.8% from the previous year) mainly due to the shift from on-premises environments to the cloud due to the continuing impact of COVID-19 (**Figure 4-8-2-3**).

In Japan's PaaS and IaaS markets, the high usage rate of major cloud services (AWS (Amazon), Azure (Microsoft), GCP (Google)) stands out. In particular, AWS accounts for more than half of PaaS/IaaS enterprises, up more than 10 percentage points from the previous year.

[4] Services provided by third parties via a public or private network, such as computer and other hardware, software, databases, storage, etc.
[5] Cloud services that specialize in IT-related functions provided to a wide range of users without special regulations or restrictions.

Figure 4-8-2-3 Changes and forecast in the size (in terms of sales) of the Japanese public cloud service market



(Source) IDC "Japan Public IT Cloud Services Forecast" (September 15, 2022)[6]

3. Edge computing and edge infrastructure

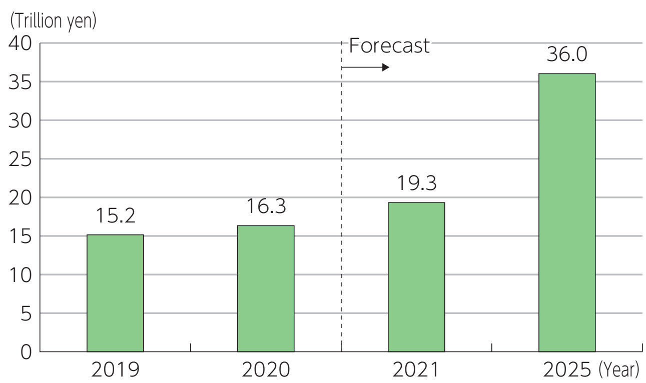
The size (revenue) of the global edge computing market was 16.3 trillion yen in 2020, and is forecasted to grow to 36 trillion yen in 2025 (**Figure 4-8-3-1**).

The size (in terms of expenditure) of the Japanese edge infrastructure (hardware[7]) market was 429.5 billion yen in 2021 and is forecasted to expand to 729.3 billion yen in 2026 (**Figure 4-8-3-2**).

Use cases by enterprises include applications that require instantaneous decision making utilizing AR/VR or AI, such as machine control and monitoring in manufacturing operations, video streaming, drone control, autonomous driving, and remote surgery, and it is also expected to be used for the primary processing of large volumes of data in areas that are physically far from data centers.

In recent years, a system called edge AI that performs AI processing using edge computing to reduce communications with the cloud as much as possible is attracting attention. In the past, AI processing has mainly been done by sending data to an on-premises environment or the cloud for processing on the cloud side, but benefits include (1) reduced communication costs, (2) realization of low latency processing, and (3) reduced privacy risks. The Japanese products and services market (in terms of sales) in the edge AI field is expected to be 7.66 billion yen in fiscal 2021, an increase of 70.8% from the previous year, and 11.7 billion yen in fiscal 2022, an increase of 52.7% from the previous year. The annual growth rate is forecasted to be 41.3% until fiscal 2026 to reach 43.1 billion yen in fiscal 2026.

Figure 4-8-3-1 Changes and forecast in the size of the global edge infrastructure market (revenue)

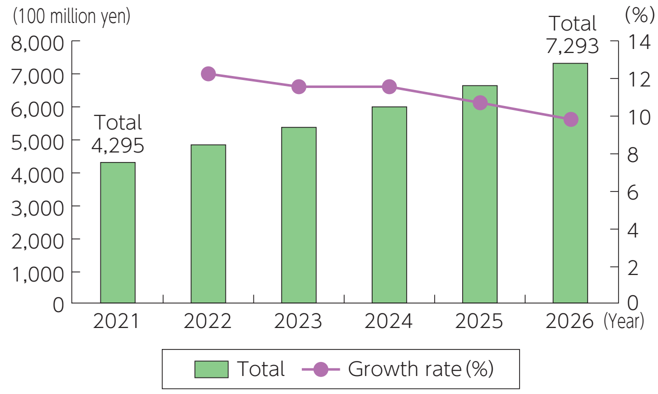


*2025 is calculated at the 2022 exchange rate.

(Source) Statista (IDC)[8]

[6] https://www.idc.com/getdoc.jsp?containerId=prJPJ49684222
[7] Applies to servers, storage, gateways, and network equipment.
[8] https://www.statista.com/statistics/1175706/worldwide-edge-computing-market-revenue/

Figure 4-8-3-2 Changes and forecast in the size (in terms of expenditure) of the Japanese edge infrastructure market



(Source) IDC "Japan Edge Infrastructure Forecast" (January 18, 2023)[9]

Figure (related data) Changes and forecast in the size (in terms of sales) of the Japanese edge AI solutions market
Source: Deloitte Tohmatsu MIC Research Institute "Reality and Future Prospects of Edge AI Computing Market" (October 24, 2022)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00255
(Data collection)

[9] https://www.idc.com/getdoc.jsp?containerId=prJPJ50045223

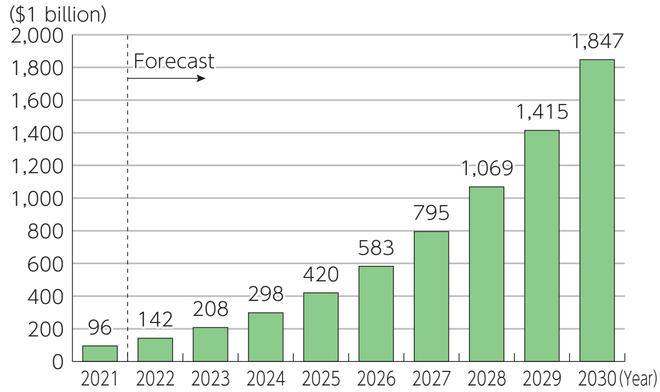
Section 9 Trends in AI

1. Market overview

The size (in terms of sales) of the global AI market is expected to grow to 18.7148 trillion yen in 2022, up 78.4% from the previous year, and is then forecasted to grow at a moderately accelerating pace until 2030 (**Figure 4-9-1-1**).

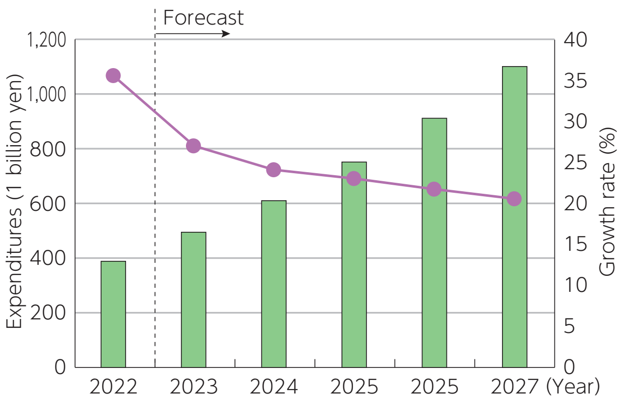
The size (in terms of expenditure) of the Japanese AI systems[1] market was 388.367 billion yen in 2022 (up 35.5% from the previous year), and is forecasted to continue to grow and expand to 1,103.477 billion yen in 2027 (**Figure 4-9-1-2**).

Figure 4-9-1-1 Changes and forecast in the size (in terms of sales) of the global AI market



(Source) Statista (Next Move Strategy Consulting)[2]

Figure 4-9-1-2 Size (in terms of expenditure) of the Japanese AI systems market and forecast



(Source) IDC "Japan Artificial Intelligence Systems Forecast" (April 27, 2023)[3]

2. Trends in AI in various countries

Thundermark Capital's AI Research Ranking, which is published annually, lists the countries, companies and universities that are leading research based on the number of papers published. Looking at countries, since 2020 the top three countries are the U.S., China, and the UK in that order, and while Japan has been in the top 10 every year, its ranking has been declining year by year.

Looking at organizations, Google topped the list in 2022, ahead of universities and companies around the world, with Microsoft and Facebook also ranking in the top 10. The private companies ranked lower than top 10 include Amazon (U.S.), IBM (U.S.), Huawei (China), Alibaba (China), NVIDIA (U.S.), Tencent (China), Samsung (South Korea), Baidu (China), NTT (Japan), Apple U.S.), and OpenAI (U.S.), and while companies with large sales are at the top of the ICT market, OpenAI, which specializes in AI, is making rapid progress.

[1] Hardware and software platforms for using AI functions and IT services related to the construction of AI systems
[2] https://www.statista.com/statistics/1365145/artificial-intelligence-market-size/
[3] https://www.idc.com/getdoc.jsp?containerId=prJPJ50603323

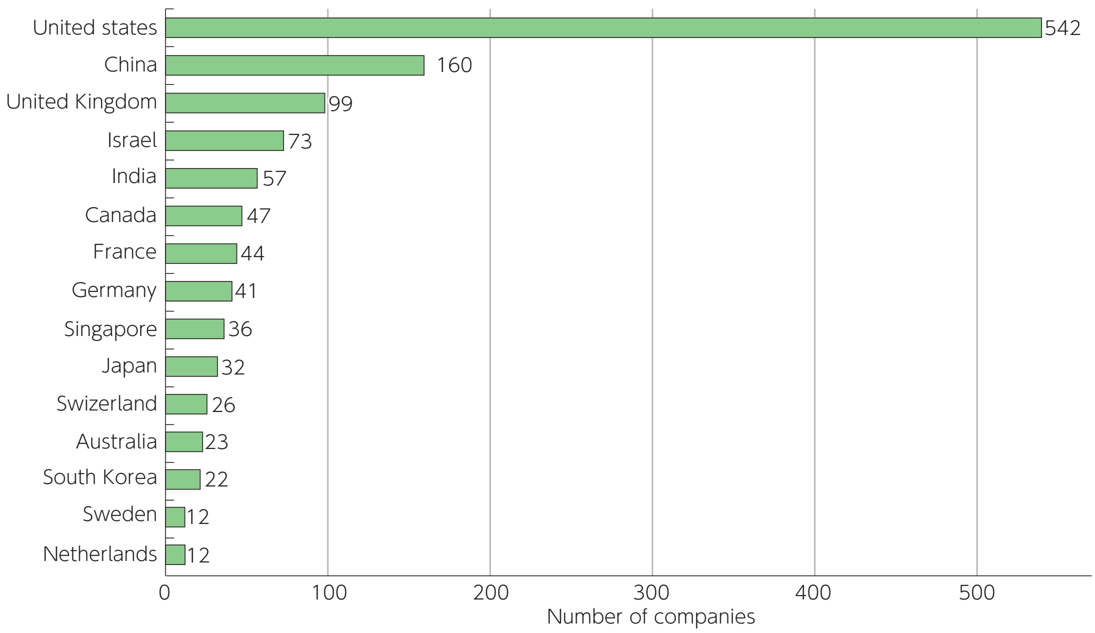
Figure (related data) Changes in AI rankings by country (top 10)
Source: Prepared based on Thundermark Capital's AI Research Ranking 2022
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00259
(Data collection)

Figure (related data) Changes in AI rankings by organization (top 10)
Source: Prepared based on Thundermark Capital's AI Research Ranking 2022
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00260
(Data collection)

Figure (related data) China's AI market expenditure forecast
Source: IDC "China's Artificial Intelligence Market Will Exceed US$26.7 Billion by 2026, according to IDC" (October 4, 2022)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00261
(Data collection)

In recent years, social implementation of AI has advanced, and so-called generative AI, which generates sentences, images, sounds, etc., such as ChatGPT, Stable Diffusion, CeVIO AI, etc., is attracting attention. Investments in AI-related companies are increasingly active, and according to the "Artificial Intelligence Index Report 2023" published by Stanford University, the U.S. leads the number of newly funded AI companies in 2022 with 542, followed by China with 160, and Japan is 10th with 32 (**Figure 4-9-2-1**).

Figure 4-9-2-1 Number of newly funded AI companies by country (2022)



(Source) Stanford University "Artificial Intelligence Index Report 2023"[4]

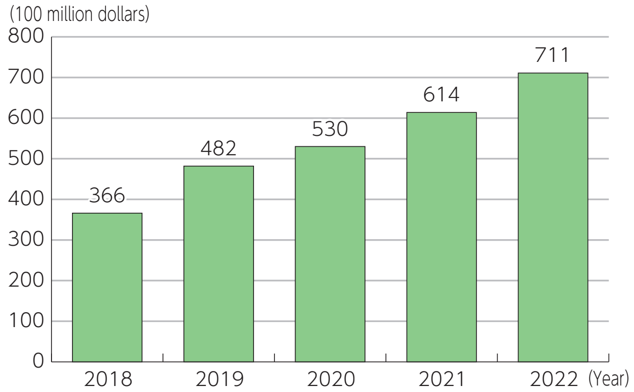
[4] https://aiindex.stanford.edu/wp-content/uploads/2023/04/HAI_AI-Index_Report_2023.pdf

Section 10 Cybersecurity Trends

1. Market overview

The global cybersecurity market (sales) continues to be strong and is expected to grow by 9.3495 trillion yen (38.7% increase) in 2022 (**Figure 4-10-1-1**). By security product category, network security spending was the highest as of the fourth quarter of 2022, accounting for 27.6% of total spending.

Figure 4-10-1-1 Changes in global cybersecurity market size (sales)



(Source) Based on Canalys estimates[1]

Figure (related data) Global cybersecurity market size (by product category)
Source: Based on Canalys "Strong channel sales propel the cybersecurity market to US$20 billion in Q4 2022"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00263
(Data collection)

Cisco, Palo Alto Networks, Check Point, Symantec, and Fortinet were the top five companies in the cybersecurity market in the world from 2018 to 2019, but Trellix replaced Symantec in 2020 and took 3.1% of the market in 2022. Palo Alto Networks has the largest share at only 8.2% of the market, and its share of the global cybersecurity market remains dispersed.

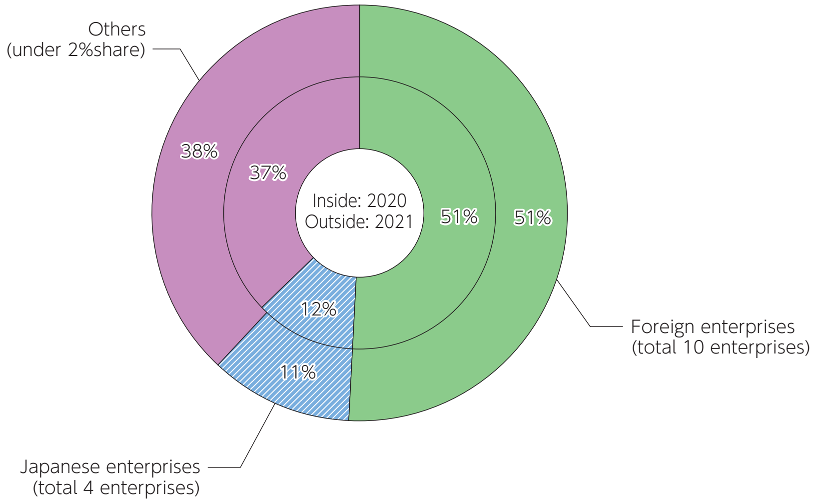
Figure (related data) Major global cybersecurity companies
Source: Based on Canalys data
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00264
(Data collection)

In 2021, the domestic information security products market (sales) increased 16% from the previous year to 436.015 billion yen. By security product function market segment, the security software market (which includes endpoint security software and network security software) accounted for 84.1% of the total sales at 315.942 billion yen in 2021, while the security appliance market (which includes content management, UTM, and VPN) accounted for 15.9% of the total at 349 million yen.

We divided enterprises with over 2% share (in sales) in the domestic information security products market in 2021 into foreign enterprises and domestic enterprises, and totalized their sales in 2020 and 2021. Foreign enterprises account for more than 50% of sales both in 2020 and 2021. Japan continues to heavily rely on overseas enterprises for cybersecurity products **(Figure 4-10-1-2)**.

[1] https://www.canalys.com/newsroom/cybersecurity-market-grows-9-in-2018-to-reach-us37-billion
https://canalys.com/newsroom/cybersecurity-investment-2020
https://canalys.com/newsroom/cybersecurity-market-2022

Figure 4-10-1-2 Domestic information security products market share (sales), 2020-2021



(Source) Based on IDC Japan, July 2022 "Japan IT Security Products Market Shares, 2021: External Threat Measures and Internal Threat Measures" (JPJ47880222)

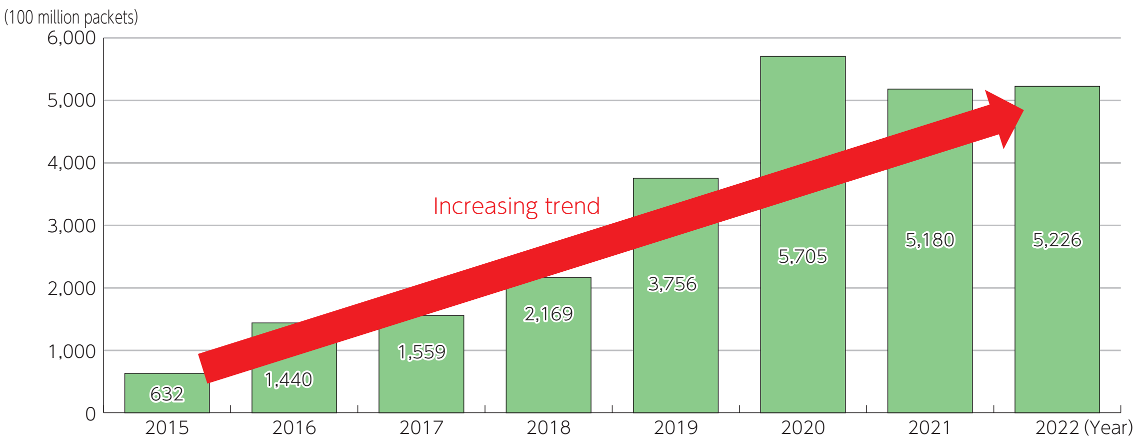
2. State of cybersecurity

(1) Increasing threat to cybersecurity

The number of cyberattack-related communications (about 522.6 billion packets) observed by the Network Incident analysis Center for Tactical Emergency Response (NICTER) operated by NICT in 2022 was 8.3 times higher than in 2015 (about 63.2 billion packets), and many attack-related communications are still being observed (**Figure 4-10-2-1**). The number of cyberattack-related communications observed in 2022 is equivalent to one attack per 17 seconds on each IP address.

The number observed decreased from 2020. The factors include the absence of specific phenomena (large-scale backscatter[2] and a huge quantity of concentrated communications that is thought to be sent from specific senders for the purpose of survey) found in 2022.

Figure 4-10-2-1 Changes in the number of cyberattack-related communications detected by NICTER

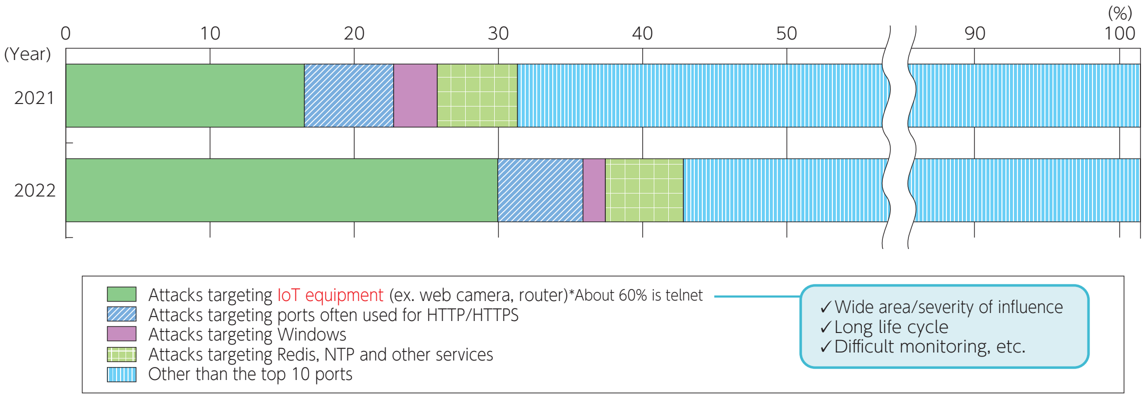


(Source) Based on NICT "NICTER Observation Report 2022"

With regard to cyberattack-related communications in NICTER, communications targeting IoT devices increased significantly from 2021, accounting for 30% of all cyberattack-related communications. Attacks on ports used for HTTP and HTTPS have been observed at a similar rate to last year **(Figure 4-10-2-2)**.

[2] An answer (SYN-ACK) packet from a server that is under DoS attack (SYN-flood attack) with a spoofed send-side IP address. Because a large quantity of response packets reaches the darknet from the servers targeted by DoS attack if IP addresses are randomly spoofed, the DoS attack can be detected.

Figure 4-10-2-2 Targets of cyberattack-related communications detected by NICTER



(Source) Based on "NICTER Observation Report 2022" of National Institute of Information and Communications Technology

There were 522 arrests for violation of the Act on Prohibition of Unauthorized Computer Access (hereinafter referred to as "Unauthorized Access Prohibition Act") in 2022, an increase of 93 compared with the previous year.

Figure (related data) Changes in arrests for violation of the Unauthorized Access Prohibition Act
Source: Based on NPA/MIC/METI "Unauthorized Access Activities and Status of Research and Development of Access Control Technology"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00270
(Data collection)

In recent years, cyberattacks caused by ransomware have continued to target various companies and medical institutions in Japan and overseas, affecting people's lives and the social economy. In March 2023, the resumption of Emotet activities was confirmed, and in the same month, the Information-Technology Promotion Agency (IPA) and JPCERT/CC issued an alert. Recently, DDoS attacks targeting the websites of Japanese government agencies, local governments, and companies have had an impact on business continuity. Everyone is now facing concerns with cyberattacks.

In light of the cybersecurity risks posed by major holidays, METI, MIC, the NPA, and NISC issued a warning in April 2023 about the measures they would like to see implemented in preparation for the spring holidays.

(2) Economic losses caused by cybersecurity issues

Various organizations have published studies and analyses of the economic losses caused by cybersecurity issues (**Figure 4-10-2-3**). The figures vary depending on the scope of losses considered. For example, according to a survey conducted by Trend Micro, the average annual damage per organization caused by security incidents in Japan over the course of fiscal 2021 is estimated to be approximately 328.5 million yen.

Figure 4-10-2-3 Economic losses caused by cybersecurity issues

Investigation/ analysis entity	Target area	Period covered	Overview of economic loss	Loss amount
Trend Micro	Japan	Fiscal 2021	Average annual damage per organization resulting from security incidents	328.5 million yen
National Police Agency	Japan	First half of 2022	Total investigation and recovery costs associated with ransomware damage	20%: < 1 million yen 14%: 1 million to < 5 million yen 10%: 5 million to < 10 million yen 37%: 10 million yen to < 50 million yen 18%: 50 million yen or more
FBI	U.S.	2021	Total amount of damage reported for cybercrime incidents	$6.9 billion
NFIB	UK	2022	Total amount of damage reported for cybercrime	£6.3 million
Sophos	31 countries	2021	Average annual cost per organization to recover from most recent ransomware attack	$1.4 million
IBM	World	2022	Global average cost of single data breach for an organization	$4.35 million
Cybersecurity Ventures	World	2023 [expected]	Cost of cybercrime	$8 trillion
McAfee, CSIS	World	2020	Cost of cybercrime	$945 billion

(Source) Based on the published materials of each company

Chapter 4

(3) Wireless LAN security trends

According to an attitude survey conducted by MIC in November 2022 to understand the security awareness of wireless LAN users, most respondents are aware of the existence of public wireless LAN (approximately 94%), but only about half of them are actually using it. "Security concerns" was the leading reason for not using public wireless LAN far ahead of other reasons. About 90% of public wireless LAN users feel anxiety about security, but half of them answered that they feel a "vague sense of unease."

(4) Introduction of sender domain authentication technologies

With regard to introducing sender domain authentication technologies for preventing spoofed emails in JP domains, SPF and DMARC accounted for approximately 77.2% and 2.7% of technologies introduced, respectively, as of December 2022, and both of them are slightly increasing.

Figure (related data) Introduction of sender domain authentication technologies for JP domains
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00277
(Data collection)

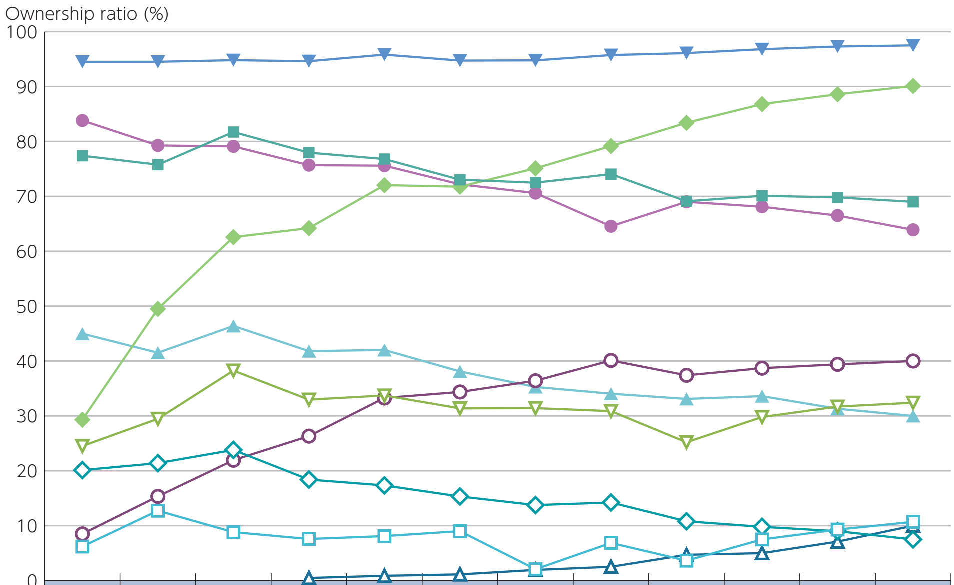
Section 11 Digital Usage Trends

1. Digital usage trends in the daily life of the public

(1) ICT devices and terminals

The Internet is now crucial in order to make use of digital technologies. In 2022, the household ownership rate of ICT devices for connecting to the Internet was 97.5% for "mobile devices" including 90.1% for "smartphones." The rate was 69.0% for PCs (**Figure 4-11-1-1**).

Figure 4-11-1-1 Changes in household ownership of ICT devices



	2011 (n=16,530)	2012 (n=20,418)	2013 (n=15,599)	2014 (n=16,529)	2015 (n=14,765)	2016 (n=17,040)	2017 (n=16,117)	2018 (n=16,255)	2019 (n=15,410)	2020 (n=17,345)	2021 (n=17,365)	2022 (n=15,951)
Fixed-line telephone	83.8	79.3	79.1	75.7	75.6	72.2	70.6	64.5	69.0	68.1	66.5	63.9
FAX	45.0	41.5	46.4	41.8	42.0	38.1	35.3	34.0	33.1	33.6	31.3	30.0
Mobile devices (overall)	94.5	94.5	94.8	94.6	95.8	94.7	94.8	95.7	96.1	96.8	97.3	97.5
Smartphones	29.3	49.5	62.6	64.2	72.0	71.8	75.1	79.2	83.4	86.8	88.6	90.1
Computers	77.4	75.8	81.7	78.0	76.8	73.0	72.5	74.0	69.1	70.1	69.8	69.0
Tablets	8.5	15.3	21.9	26.3	33.3	34.4	36.4	40.1	37.4	38.7	39.4	40.0
Wearable devices	–	–	–	0.5	0.9	1.1	1.9	2.5	4.7	5.0	7.1	10.0
Home game consoles	24.5	29.5	38.3	33.0	33.7	31.4	31.4	30.9	25.2	29.8	31.7	32.4
Portable music players	20.1	21.4	23.8	18.4	17.3	15.3	13.8	14.2	10.8	9.8	9.0	7.5
Smart appliances	6.2	12.7	8.8	7.6	8.1	9.0	2.1	6.9	3.6	7.5	9.3	10.7

(Source) MIC "Communications Usage Trend Survey"[1]

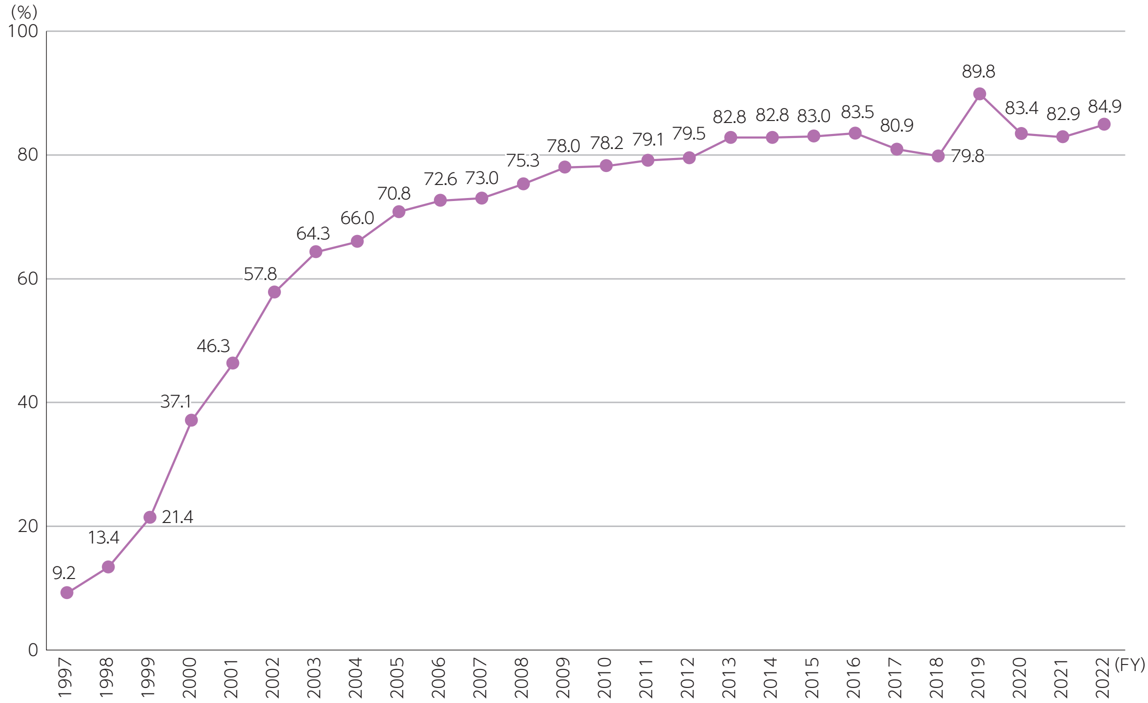
[1] https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

(2) Internet

a Usage

In 2022, the Internet usage rate for individuals was 84.9% (**Figure 4-11-1-2**), and the Internet usage rate for individual devices was 22.6 percentage points higher for smartphones (71.2%) than for PCs (48.5%).

Figure 4-11-1-2 Changes in Internet usage rate (individuals)[2]



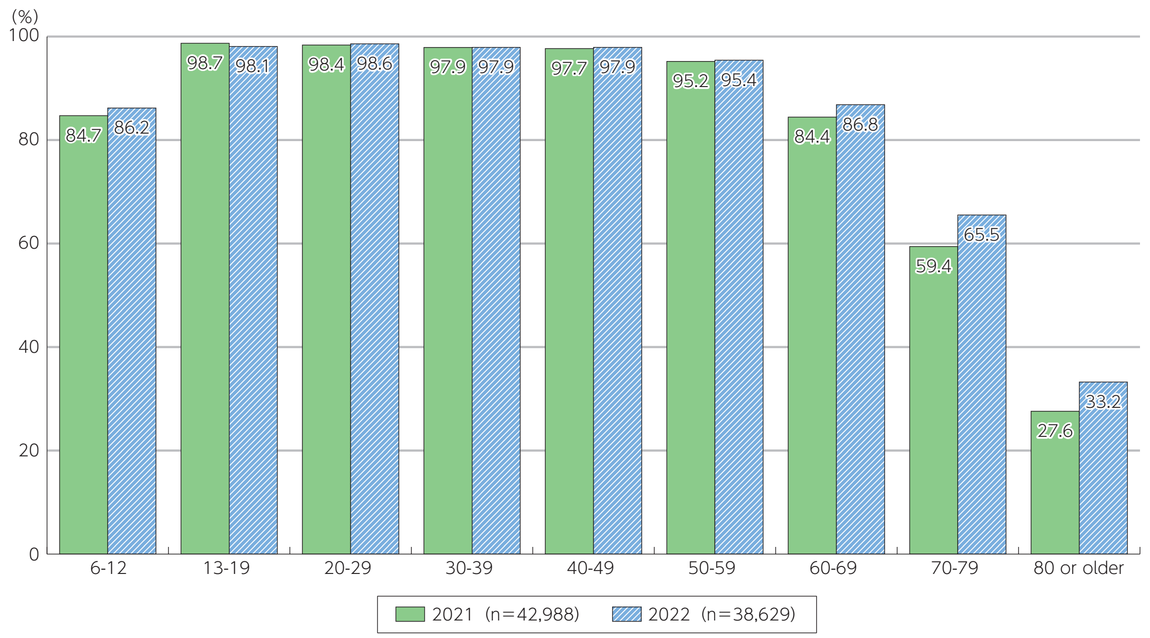
(Source) MIC "Communications Usage Trend Survey"

Figure (related data) Types of Internet devices (individual)
Source: MIC "Communications Usage Trend Survey"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00281
(Data collection)

Looking at Internet usage by age group of individuals reveals that the rate exceeds 90% in each age group from 13 to 59 years old, but tends to decrease after 60 years old **(Figure 4-11-1-3)**. Internet usage by annual household income also exceeded 80% in each category of four million yen or more **(Figure 4-11-1-4)**. By prefecture, Internet usage exceeds 80% in 34 prefectures, and smartphone usage exceeds 50% in all prefectures.

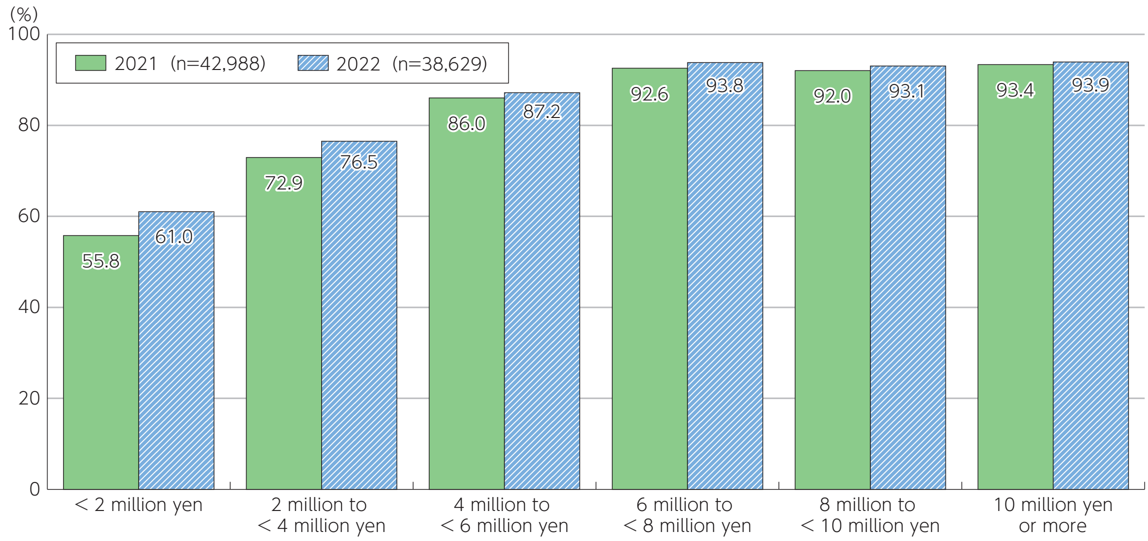
[2] The design of the questionnaire in the 2019 survey was partially different from that in previous years, so care should be taken when comparing over the years.

Figure 4-11-1-3 Internet usage by age group



(Source) MIC "Communications Usage Trend Survey"

Figure 4-11-1-4 Internet usage by annual household income



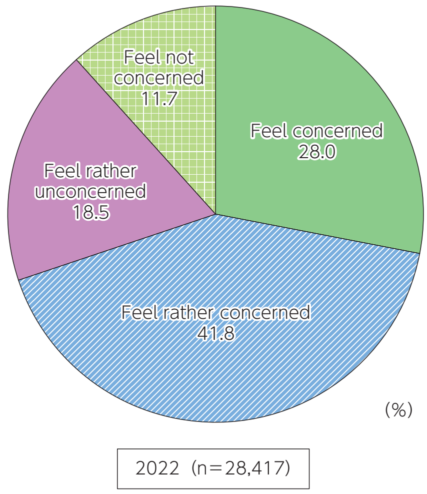
(Source) MIC "Communications Usage Trend Survey"

Figure (related data) Internet usage by prefecture and usage by device (individual) (2022)
Source: MIC "Communications Usage Trend Survey"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00284
(Data collection)

b Anxiety over using the Internet

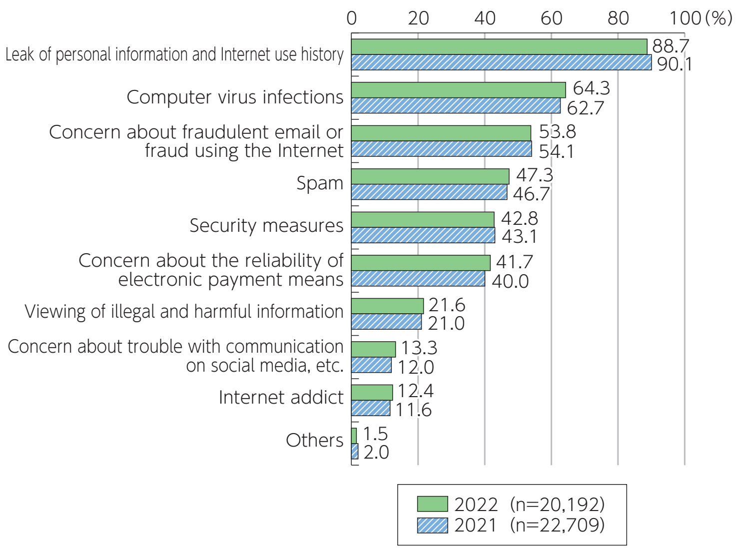
Approximately 70% of Internet users feel some kind of anxiety when using the Internet (**Figure 4-11-1-5**). When asked why, the largest number of chose "leaks of personal information and internet usage history" at 88.7%, followed by "computer virus infections" (64.3%) and "fraudulent billing or fraud using Internet" (53.8%) (**Figure 4-11-1-6**).

Figure 4-11-1-5 Percentage of individuals who feel anxiety when using the Internet



(Source) MIC "Communications Usage Trend Survey"

Figure 4-11-1-6 Anxiety felt when using the Internet (multiple answers allowed)



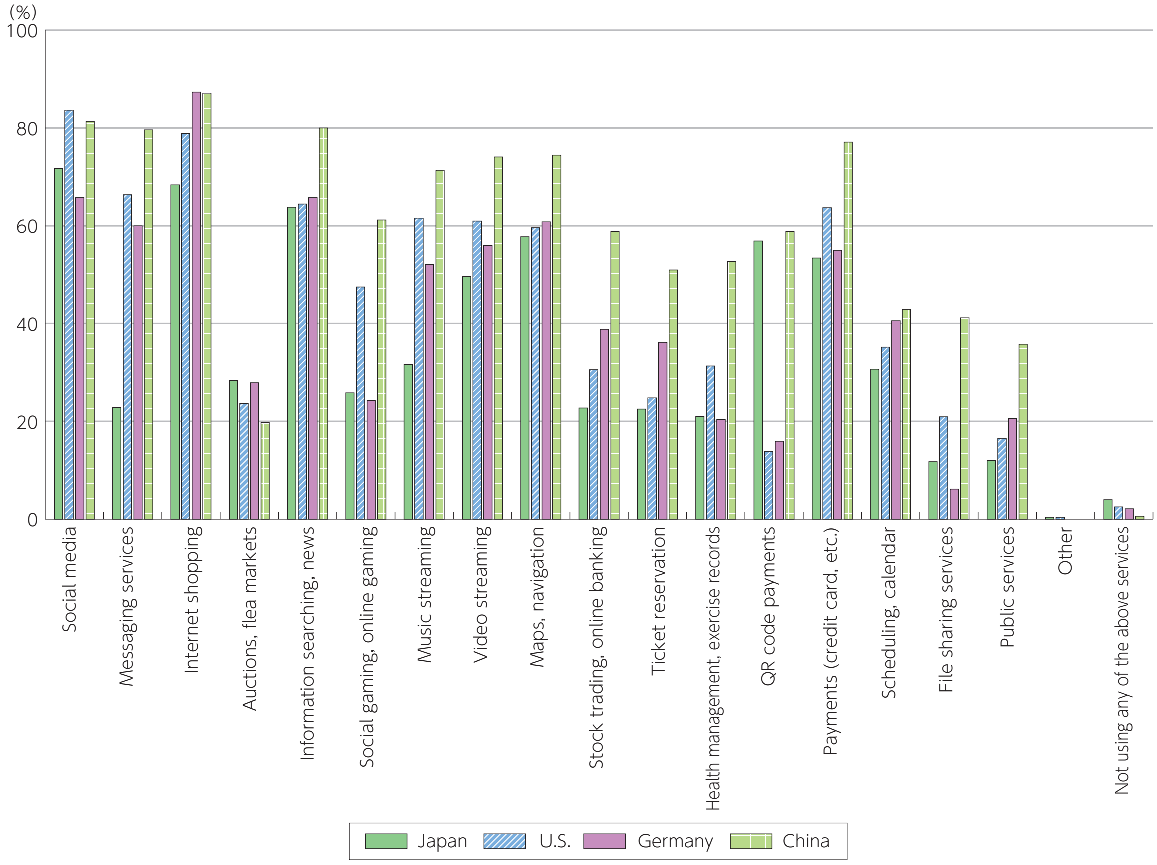
(Source) MIC "Communications Usage Trend Survey"

(3) Utilization of digital services (international comparison)

a Overall usage of digital services

Questionnaire surveys conducted in Japan, the U.S., Germany, and China on digital services regularly being used found that respondents in China were overall more likely to use each service than those in other countries. In Japan, more than 60% of respondents use services such as "social media," "Internet shopping," and "information searching and news," which is higher than that of other services **(Figure 4-11-1-7)**.

Figure 4-11-1-7 Overall usage of digital services

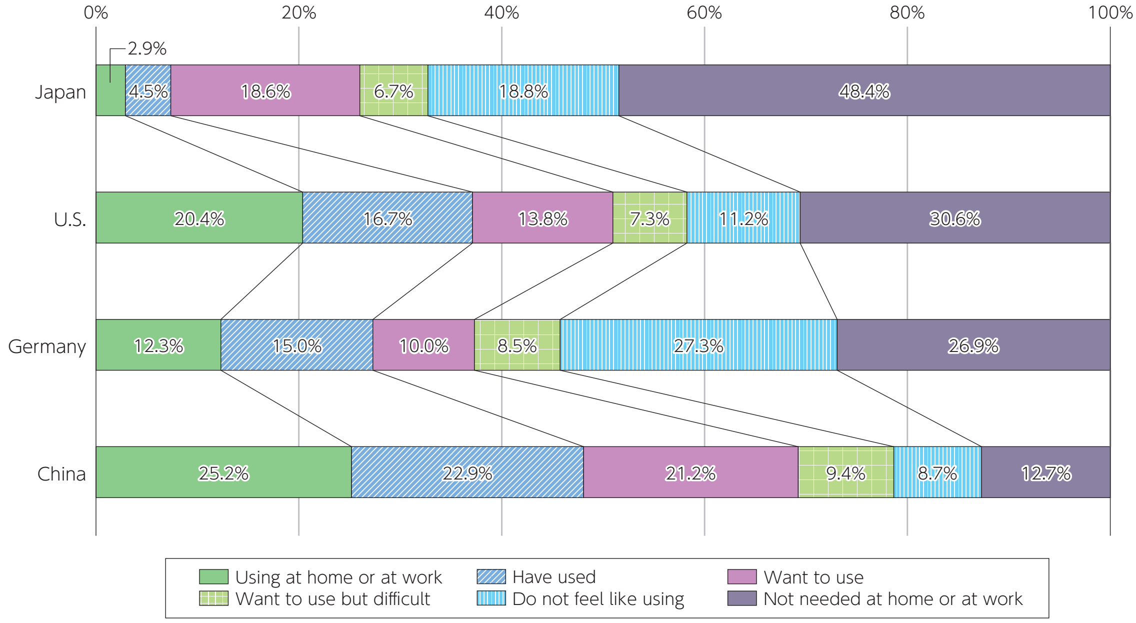


(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

b Digital service usage in virtual spaces (XR content)

Between 20% and 30% of respondents in the U.S. and Germany, more than 50% of respondents in China, and only 7.4% of respondents in Japan answered that they had used XR content[3] (**Figure 4-11-1-8**). Looking at usage in Japan by age group reveals that those in their 20s had the highest usage (12.6%) and also the highest rate responding with "want to use" (30.6%).

Figure 4-11-1-8 Usage of interactive entertainment services in virtual spaces (comparison by country)



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

Figure (related data) Usage of interactive entertainment services in virtual spaces (by age)
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00289
(Data collection)

Figure (related data) Reasons why entertainment services in virtual spaces are unavailable
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00290
(Data collection)

[3] XR content (interactive entertainment services in virtual space) is a type of service in which users have interactive relationships with others in real-time, such as online games and virtual events.

c Media usage time

Since 2012, the MIC Institute for Information and Communications Policy has conducted research studies on the usage time, time slots of usage, purpose, and reliability of information and communications media, as joint research with Professor Yoshiaki Hashimoto (School of Arts and Science, Tokyo Woman's Christian University) and others.[4,5] Below is an overview of the usage time, etc. of information and communications media based on the survey result[6] of fiscal 2022.

(a) Average usage time for major media[7] and user ratio[8]

The average usage time and user ratio for "television viewing (real-time),"[9] "television viewing (recorded program)," "Internet use,"[10] "newspaper reading," and "radio listening" are shown in (**Figure 4-11-1-9**).

The average usage time for "television viewing (real-time)" and "Internet use" tended to be long on both weekdays and holidays for all ages, but "Internet use" exceeded "television viewing (real-time)" for the third year in a row on weekdays and (for the first time) on holidays. The user ratio for "television viewing (real-time)" is lower than the ratio of "Internet use," on both weekdays and holidays.

By age group, average usage time for "Internet use" decreased or remained almost unchanged on weekdays except for those in their 30s, and increased on holidays except for those in their 30s and 40s. The user ratio for "Internet use" among users in their teens to 50s (weekdays) and teens to 40s (holidays) exceeds the user ratio for "television viewing (real-time)." For "newspaper reading," the user ratio increases with age.

---

4 Professor Satoshi Kitamura (Faculty of Communication Studies, Tokyo Keizai University) and Project Assistant Professor Daisuke Kawai (Center for Integrated Disaster Information Research (CIDIR), Interfaculty Initiative in Information Studies, the University of Tokyo).

5 "Survey on Usage Time of Information and Communications Media and Information Behavior": 1,500 men and women aged 13 to 69 (selected by sex and age group [in 10 year increments] in proportion to the actual situation in the Basic Resident Register; the register of January 2022 was used for the fiscal 2022 survey) were visited and received questionnaires based on random location quota sampling.

6 The fiscal 2022 survey was conducted from November 5 to November 11, 2022.

7 The total number of hours of all people surveyed for a particular information behavior per survey day, divided by the number of people surveyed. The average time is calculated by including the respondents who did not do the activity throughout the day.

8 For weekdays, the ratio of people who performed a particular information behavior for each day of the two survey days was calculated and averaged over the two days. For holidays, this is the ratio of survey days.

9 Television viewing (real-time): Real-time television viewing with any device not limited to TV receiver

10 Internet use: The use of services over an Internet connection, including email, websites, social media, video sites, and online games, regardless of device.

Figure 4-11-1-9 Average usage time for major media and user ratio

<Weekday (one day)>

		Average usage time (minute)					Doers' ratio				
		Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening	Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening
All age groups	2018	156.7	20.3	112.4	8.7	13.0	79.3	18.7	82.0	26.6	6.5
	2019	161.2	20.3	126.2	8.4	12.4	81.6	19.9	85.5	26.1	7.2
	2020	163.2	20.2	168.4	8.5	13.4	81.8	19.7	87.8	25.5	7.7
	2021	146.0	17.8	176.8	7.2	12.2	74.4	18.6	89.6	22.1	6.2
	2022	135.5	18.2	175.2	6.0	8.1	73.7	17.5	90.4	19.2	6.0
10s	2018	71.8	12.7	167.5	0.3	0.2	63.1	15.2	89.0	2.5	1.1
	2019	69.0	14.7	167.9	0.3	4.1	61.6	19.4	92.6	2.1	1.8
	2020	73.1	12.2	224.2	1.4	2.3	59.9	14.8	90.1	2.5	1.8
	2021	57.3	12.1	191.5	0.4	3.3	56.7	16.3	91.5	1.1	0.7
	2022	46.0	6.9	195.0	0.9	0.8	50.7	10.0	94.3	2.1	1.8
20s	2018	105.9	18.7	149.8	1.2	0.9	67.5	16.5	91.4	5.3	0.7
	2019	101.8	15.6	177.7	1.8	3.4	65.9	14.7	93.4	5.7	3.3
	2020	88.0	14.6	255.4	1.7	4.0	65.7	13.6	96.0	6.3	3.1
	2021	71.2	15.1	275.0	0.9	7.0	51.9	13.7	96.5	2.6	3.0
	2022	72.9	14.8	264.8	0.4	2.1	54.4	11.8	97.7	2.8	2.3
30s	2018	124.4	17.4	110.7	3.0	9.4	74.1	19.1	91.1	13.0	4.3
	2019	124.2	24.5	154.1	2.2	5.0	76.7	21.9	91.9	10.5	2.2
	2020	135.4	19.3	188.6	1.9	8.4	78.2	19.4	95.0	8.8	6.0
	2021	107.4	18.9	188.2	1.5	4.8	65.8	20.9	94.9	5.9	3.2
	2022	104.4	14.6	202.9	1.2	4.1	67.1	14.9	95.7	4.1	3.9
40s	2018	150.3	20.2	119.7	4.8	16.6	79.2	18.8	87.0	23.1	7.4
	2019	145.9	17.8	114.1	5.3	9.5	84.0	18.9	91.3	23.6	6.0
	2020	151.0	20.3	160.2	5.5	11.7	86.2	23.0	92.6	24.1	6.0
	2021	132.8	13.6	176.8	4.3	12.9	77.8	15.3	94.6	17.9	5.4
	2022	124.1	17.2	176.1	4.1	5.5	75.7	18.0	91.5	16.5	6.3
50s	2018	176.9	20.8	104.3	12.9	17.2	88.5	20.6	82.0	43.9	9.3
	2019	201.4	22.5	114.0	12.0	18.3	92.8	21.9	84.2	38.5	12.2
	2020	195.6	23.4	130.0	11.9	26.9	91.8	20.7	85.0	39.4	13.4
	2021	187.7	18.7	153.6	9.1	23.6	86.4	20.9	89.4	33.8	11.1
	2022	160.7	18.6	143.5	7.8	14.0	84.0	19.5	88.8	29.6	8.6
60s	2018	248.7	27.3	60.9	23.1	22.8	91.6	19.7	59.0	52.8	11.7
	2019	260.3	23.2	69.4	22.5	27.2	93.6	21.2	65.7	57.2	13.4
	2020	271.4	25.7	105.5	23.2	18.5	92.9	22.3	71.3	53.7	12.1
	2021	254.6	25.8	107.4	22.0	14.4	92.0	23.0	72.8	55.1	10.0
	2022	244.2	30.5	103.2	17.7	16.7	92.8	25.2	78.5	46.1	9.9

<Holiday (one day)>

		Average usage time (minute)					Doers' ratio				
		Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening	Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening
All age groups	2018	219.8	31.3	145.8	10.3	7.5	82.2	23.7	84.5	27.6	5.1
	2019	215.9	33.0	131.5	8.5	6.4	81.2	23.3	81.0	23.5	4.6
	2020	223.3	39.6	174.9	8.3	7.6	80.5	27.6	84.6	22.8	4.7
	2021	193.6	26.3	176.5	7.3	7.0	75.0	21.3	86.7	19.3	4.2
	2022	182.9	30.2	187.3	5.6	5.5	72.2	22.7	88.5	17.7	4.1
10s	2018	113.4	28.6	271.0	0.9	0.7	67.4	27.7	91.5	3.5	2.1
	2019	87.4	21.3	238.5	0.1	0.0	52.8	17.6	90.1	0.7	0.0
	2020	93.9	29.8	290.8	0.9	0.0	54.9	25.4	91.5	1.4	0.0
	2021	73.9	12.3	253.8	0.0	0.0	57.4	14.9	90.8	0.0	0.0
	2022	69.3	17.4	285.0	1.0	2.8	46.4	19.3	92.9	2.1	2.1
20s	2018	151.0	32.8	212.9	2.1	2.1	66.5	24.9	95.7	6.2	2.4
	2019	138.5	23.0	223.2	0.9	1.2	69.7	19.9	91.0	3.3	1.9
	2020	132.3	26.5	293.8	2.0	1.9	64.3	20.2	97.7	6.6	2.3
	2021	90.8	17.2	303.1	0.7	1.8	49.3	14.0	97.2	2.3	1.4
	2022	89.6	25.1	330.3	0.5	1.0	48.4	16.1	96.8	2.3	1.4
30s	2018	187.2	26.6	150.2	3.5	3.9	79.8	19.1	92.6	11.7	3.5
	2019	168.2	31.0	149.5	2.5	2.0	78.3	23.3	90.1	9.9	2.0
	2020	198.1	45.0	191.3	1.6	7.4	77.2	31.6	91.2	5.6	3.2
	2021	147.6	30.3	212.3	1.5	3.2	69.6	22.7	92.3	4.0	1.2
	2022	152.5	25.9	199.9	0.8	6.9	63.3	19.6	92.7	3.3	4.1
40s	2018	213.9	39.0	145.3	6.4	8.2	82.7	25.9	90.4	25.3	3.4
	2019	216.2	37.5	98.8	6.0	5.0	83.7	25.5	84.7	20.2	3.7
	2020	232.7	41.5	154.5	5.2	4.2	85.3	28.5	89.3	19.9	3.1
	2021	191.1	28.5	155.7	4.9	6.3	79.0	21.0	91.0	14.8	3.4
	2022	191.0	29.7	157.5	4.6	4.8	76.5	22.9	89.0	16.3	2.8
50s	2018	260.8	22.9	115.0	15.3	10.4	91.9	21.5	80.7	42.2	7.0
	2019	277.5	48.0	107.9	12.9	6.6	90.3	30.6	77.3	37.4	6.5
	2020	256.5	49.8	127.8	12.5	16.3	91.6	31.4	81.5	36.6	7.7
	2021	242.6	28.9	119.0	9.2	14.2	84.8	24.9	82.2	29.6	8.1
	2022	220.5	33.0	134.9	7.6	5.6	85.7	24.8	85.3	24.4	4.6
60s	2018	315.3	34.6	64.3	26.1	14.1	93.0	24.4	63.2	56.9	10.0
	2019	317.6	28.1	56.1	21.8	18.5	94.5	19.0	60.7	51.7	10.3
	2020	334.7	37.2	83.7	22.0	10.9	91.8	25.9	63.1	50.4	9.2
	2021	326.1	31.4	92.7	22.3	11.2	93.5	25.4	71.0	50.4	8.0
	2022	291.4	42.2	105.4	15.0	10.1	92.3	29.8	78.7	45.2	8.5

(Source) MIC Institute for Information and Communications Policy "Fiscal 2022 Survey on Information and Communications Media Usage Time and Information Behavior"

(b) Positioning of the Internet as media

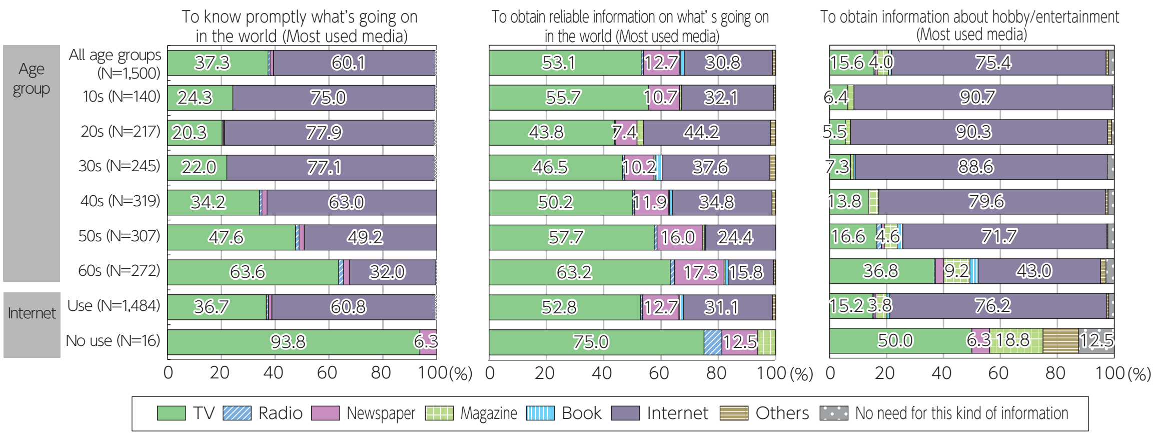
A comparison of the use of Internet as media with other media for each purpose of use is provided in (**Figure 4-11-1-10**).

The most used media “to know promptly what's going on in the world” of all respondents is “Internet.” By age group, those in their teens to 50s use the “Internet” the most, while those in their 60s use “television” the most.

The most used media “to obtain reliable information on what's going on in the world” is “television” for all age groups in total, and this is also true for each age group excluding those in their 20s. “Newspapers” are used by people in their 60s more than the “Internet.”

The most used media “to obtain information about hobby/entertainment” is the “Internet” in all age groups in total, as well as in each age group. The ratio is around 90% among respondents in their teens through 30s.

Figure 4-11-1-10 Media used by purpose (most used media; for all age groups, by age group, and by using or not using the Internet)



(Source) MIC Institute for Information and Communications Policy “Fiscal 2022 Survey on Information and Communications Media Usage Time and Information Behavior”

2. Trends in utilization in corporate activities

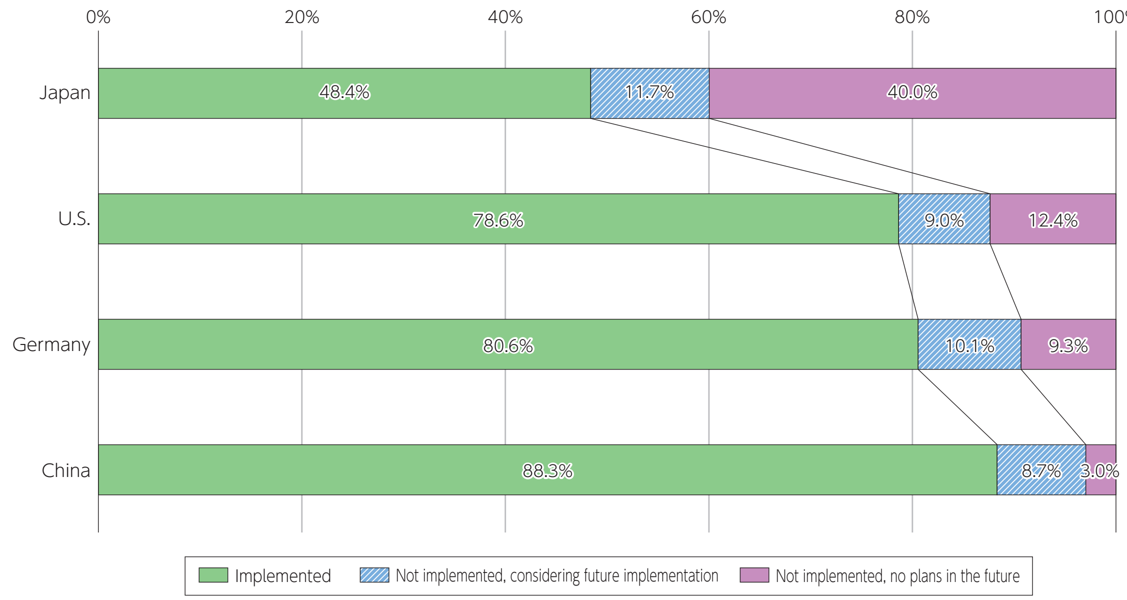
(1) Status of digitalization among enterprises in each country

a Digitalization

Regarding the ratio of digitalization implementation among enterprises in Japan, the U.S., Germany, and China, more than 50% of Japanese companies answered that they had not yet begun to implement digitalization. Looking at the status of initiatives in Japan by enterprise size reveals that approximately 25% of large enterprises and more than 70% of small-to-medium-sized enterprises answered that they had not implemented such initiatives, indicating that digitalization efforts vary depending on the size of the enterprise **(Figure 4-11-2-1)**.

With regard to specific measures taken to promote digitalization, the most common responses in Japan were “improving/reforming business processes,” “reducing labor,” and “realizing new work styles.” In other countries, the most common responses were “creating/improving customer experiences” and “enhancing added value of existing products/services,” in addition to reforming work styles and businesses **(Figure 4-11-2-2)**.

Figure 4-11-2-1 Status of digitalization (comparison by country)

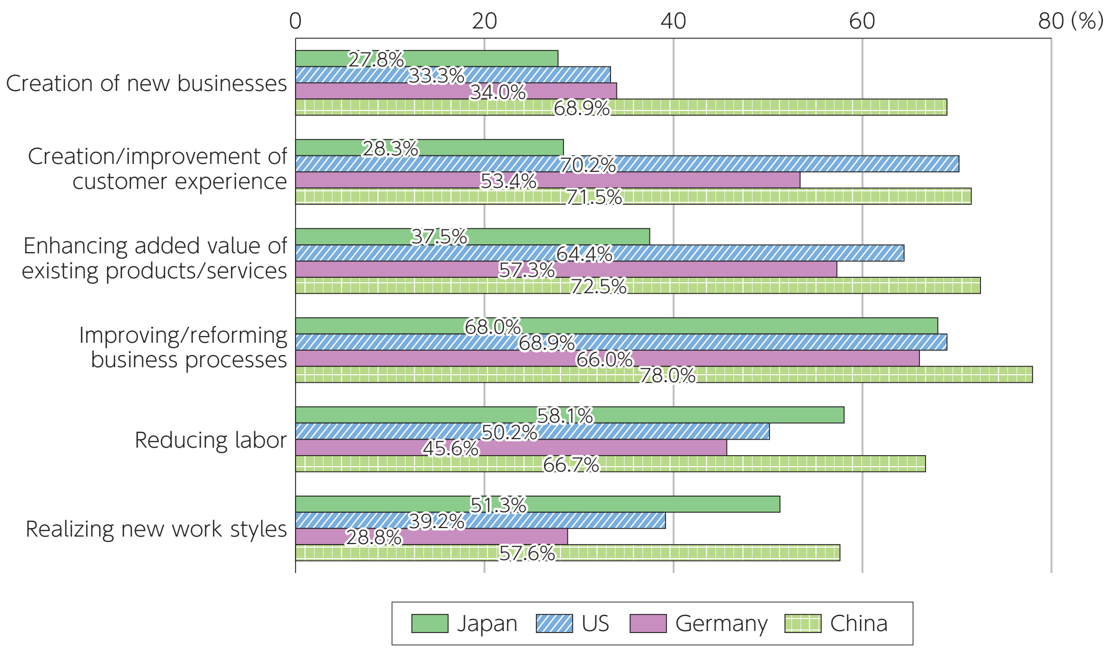


*Based on the results of a screening survey conducted to identify companies engaged in digitalization

(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

Figure (related data) Status of digitalization (Japan: Comparison by company size)
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00304
(Data collection)

Figure 4-11-2-2 Initiatives to promote digitalization (comparison by country)



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

b Results of digitalization

Surveying the results of promoting digitalization from the viewpoints of "creating new business," "creating/improving customer experiences," "enhancing added value of existing products/services," "improving/reforming business processes," "reducing labor," and "realizing new work styles" reveals that Japanese respondents selected "greater than expected" the least and "not having the desired effect" the most for all viewpoints, among the four countries.

Figure (Related Data) Results of digitalization in creating new business
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00306
(Data collection)

Figure (related data) Results of digitalization in creating/improving customer experiences
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00307
(Data collection)

Figure (related data) Results of digitalization in enhancing added value of existing products/services
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00308
(Data collection)

Figure (related data) Results of digitalization in improving/reforming business processes
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00309
(Data collection)

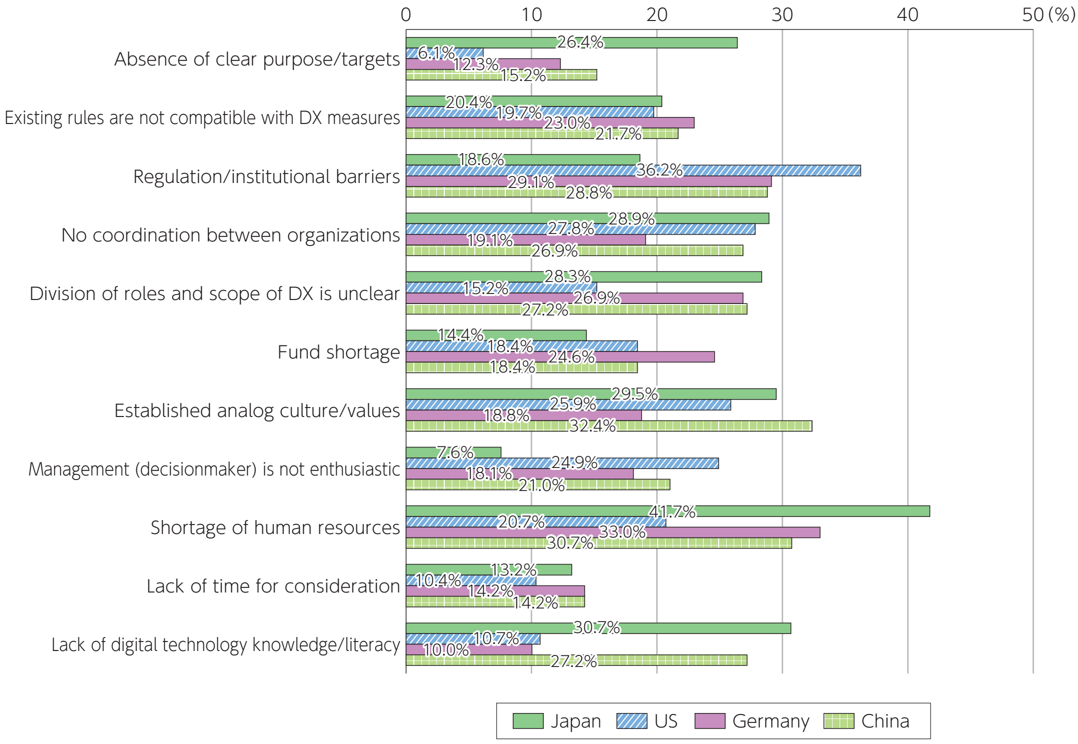
Figure (related data) Results of digitalization in reducing labor
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00310
(Data collection)

Figure (related data) Results of digitalization in realizing new work styles
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00311
(Data collection)

c Challenges in promoting digitalization

As for the challenges and barriers in the way of digitalization, many more Japanese companies indicated "shortage of human resources" (41.7%) compared to respondents in the U.S., China, and Germany, followed by "lack of digital technology knowledge/literacy" (30.7%). As in the survey conducted for the 2022 White Paper on Information and Communications in Japan, there were many challenges and barriers related to human resources **(Figure 4-11-2-3)**.

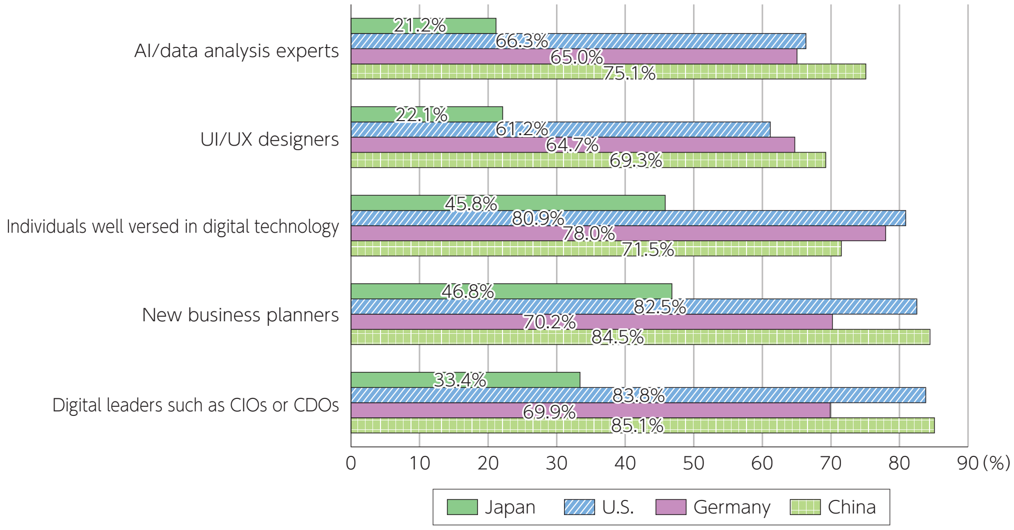
Figure 4-11-2-3 Challenges in promoting digitalization (comparison by country)



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

Companies in Japan actually have an overall shortage of digital human resources (such as CIOs, CDOs, and other digital technology leaders) compared to companies in other countries. In particular, only 21.2% of companies have "AI/data analysis experts" on staff, and the shortage is serious compared to the other three countries with more than 60% of companies **(Figure 4-11-2-4)**. Among the companies that responded that they use personal data or information other than personal data, 26.8% and 29.2% of the companies, respectively, indicated that they have "AI/data analysis experts" on staff, which is much lower than in the other three countries.

Figure 4-11-2-4 Specialized digital human resources on staff



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

Figure (related data) "AI/data analysis experts" in companies making use of personal data
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00314
(Data collection

Figure (related data) "AI/data analysis experts" in companies making use of information other than personal data
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00315
(Data collection)

Figure (related data) Initiatives to secure digital human resources (by country; individuals capable of integrating digital human resources with business division personnel to build systems for DX)
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00320 (Data collection)

Figure (related data) Initiatives to secure digital human resources (by country; AI/data analysis experts)
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00321
(Data collection)

When asked about the status of in-house system development, about 44% of Japanese companies indicated that they are developing their own systems, while approximately 80% of companies in other countries are, which make a big difference. As stated in the 2019 White Paper on Information and Communications in Japan, Japan is highly dependent on external vendors, and user companies are unlikely to be able to develop and secure ICT human resources within their organizations.

Figure (related data) In-house development of systems (comparison by country)
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00316
(Data collection)

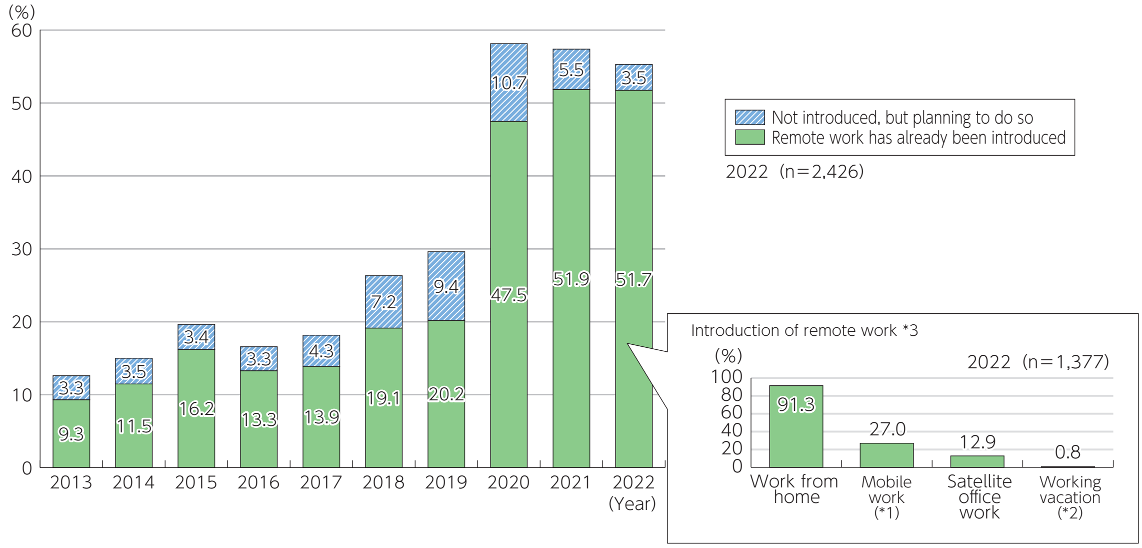
(2) Remote work and online meetings

a Remote work in Japanese companies

Private companies began to rapidly introduce remote work following the COVID-19 outbreak in 2020.

According to the Communications Usage Trend Survey conducted by MIC in 2022, more than 50% of companies have introduced remote work **(Figure 4-11-2-5)**.

Figure 4-11-2-5 Changes in introducing remote work



*1 Working outside of the office for sales activities and other similar work, including work such as checking email and writing daily reports during commutes or at locations such as cafes.

*2 Remote work performed in a location other than the usual workplace or the home, combined with personal time.

*3 Total includes entities that provided no response to introduction type.

(Source) MIC "Communications Usage Trend Survey"

Figure (related data) Purpose for introducing remote work (multiple answers allowed)
Source: MIC "Communications Usage Trend Survey"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00323
(Data collection)

Figure (related data) Challenges for introducing remote work (multiple answers allowed)
Source: Based on MIC "Fiscal 2022 Result of Survey on Actual Condition of Telework Security"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00328
(Data collection)

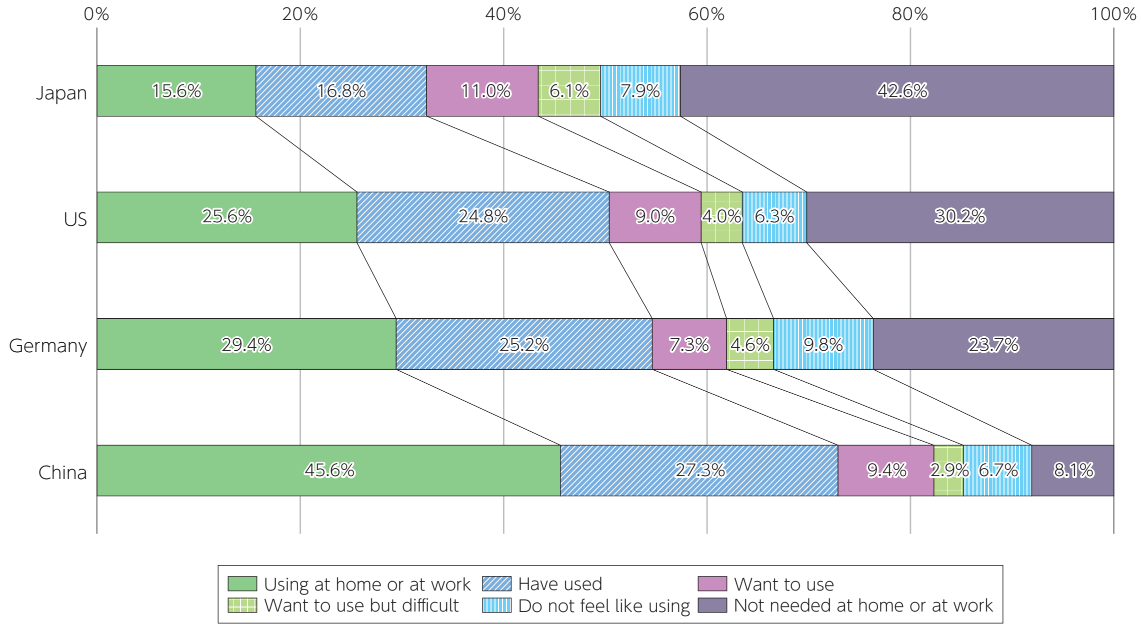
b Usage of remote work and online meetings (individuals; international comparison)

We conducted a questionnaire on the usage of remote work and online meetings ("remote work, etc.") among individuals in Japan, the U.S., China, and Germany.

More than 50% of respondents in the U.S. and Germany, more than 70% of respondents in China, and only around 30% of respondents in Japan answered that they had made use of remote work, etc. **(Figure 4-11-2-6)**. In Japan, the most frequently cited reason for difficulty introducing remote work, etc., was "not interested in any services" within the company" (35.7%).

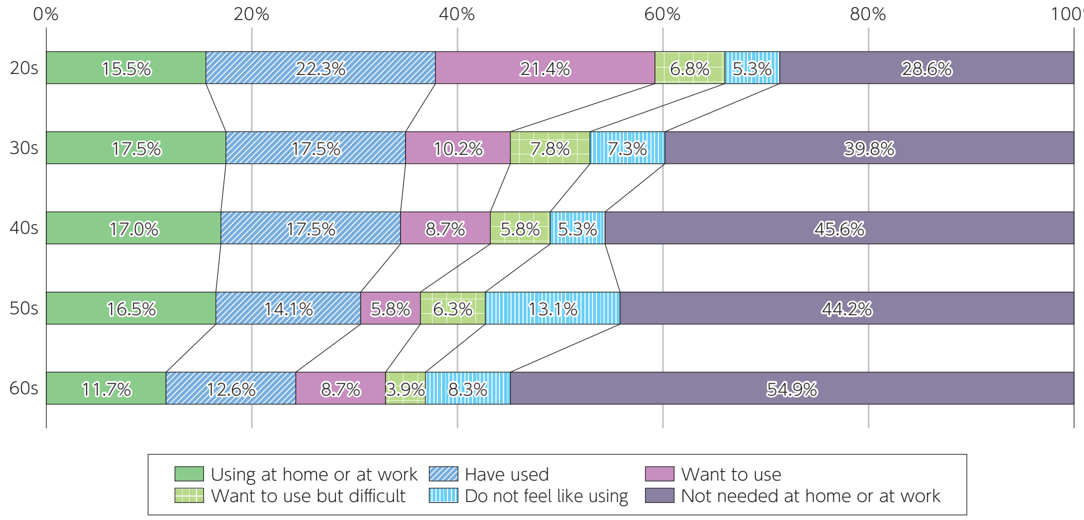
Looking at remote work usage in Japan by age group reveals that younger people tend to be more positive about remote work. The largest percentage of individuals with experience using remote work were those in their 20s (37.8%), while the same group made up the smallest percentage of respondents indicating that it was "not needed at home or at work" (28.6%) **(Figure 4-11-2-7)**.

Figure 4-11-2-6 Usage of remote work and online meetings (international comparison)



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

Figure 4-11-2-7 Usage of remote work and online meetings (Japan; by age)



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

Figure (related data) Reasons why remote work or online meetings are unavailable
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00326
(Data collection)

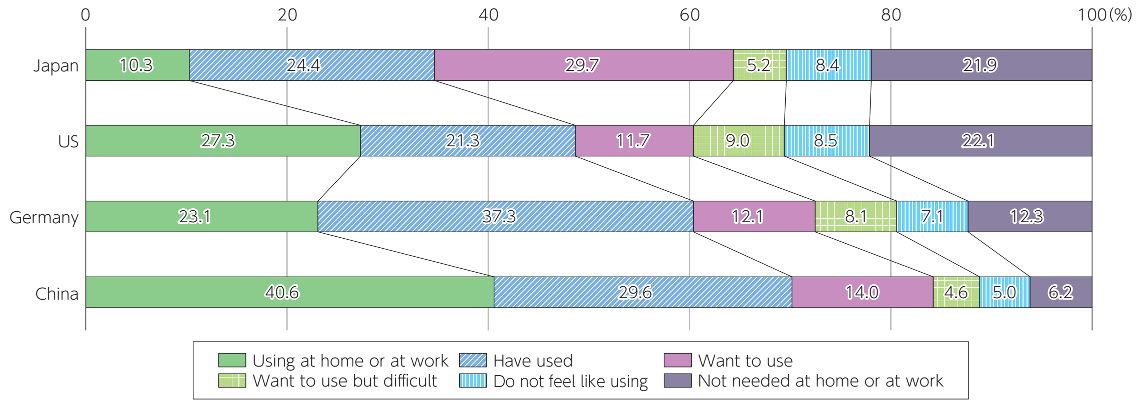
3. Trends in regard to digital usage in administration

(1) Usage of digital administrative services (electronic applications, electronic filing, and electronic notifications)

Only about 35% of individuals in Japan have used digital administrative services (electronic applications, electronic filing, and electronic notifications). Despite an increase over the previous survey (approximately 24%)[11], it is still lower than in the other three countries **(Figure 4-11-3-1)**. "Security concerns" was cited as a major reason for not using services in all four countries. Additionally, in Japan, many respondents indicated that they "do not know how to use the device or application" or are "not interested in any services." On the other hand, Japan had the lowest rate (9.2%) for "Internet connection slow or unstable" which was often cited in the other three countries.

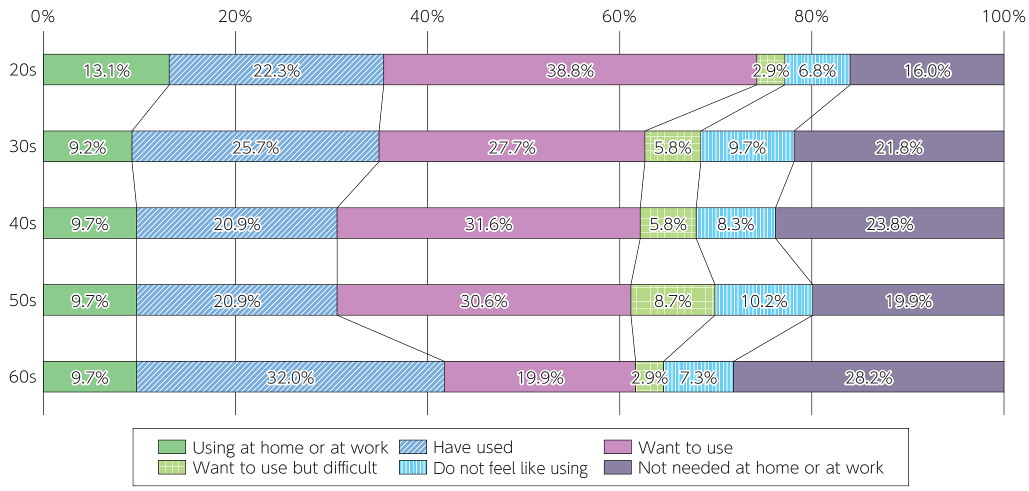
Looking at usage in Japan by age group reveals that the number of people who have used digital administrative services ranged from 30% to 40% in all age groups, up from 20% to 25% in all age groups in the previous survey. In particular, 41.7% of those in their 60s had experience using such services (highest among all age groups), while "not needed at home or at work" was most often selected at 28.2% **(Figure 4-11-3-2)**.

Figure 4-11-3-1 Usage of digital administrative services (by country)



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

Figure 4-11-3-2 Usage of digital administrative services (Japan; by age)



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

Figure (related data) Reason why public digital services are unavailable (by country)
Source: MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00331
(Data collection)

[11] 2022 White Paper on Information and Communications in Japan MIC (2022) "Survey Research on R&D on the Latest Information and Communications Developments and Trends of Use of Digital Technologies in Japan and Abroad"

(2) Promotion of digital government in Japan

a International indicators

This section provides an overview of Japan's global position on the use of digital technologies in the public sector based on international indicators.

(a) United Nations Department of Economic and Social Affairs (UNDESA) "World E-Government Ranking"

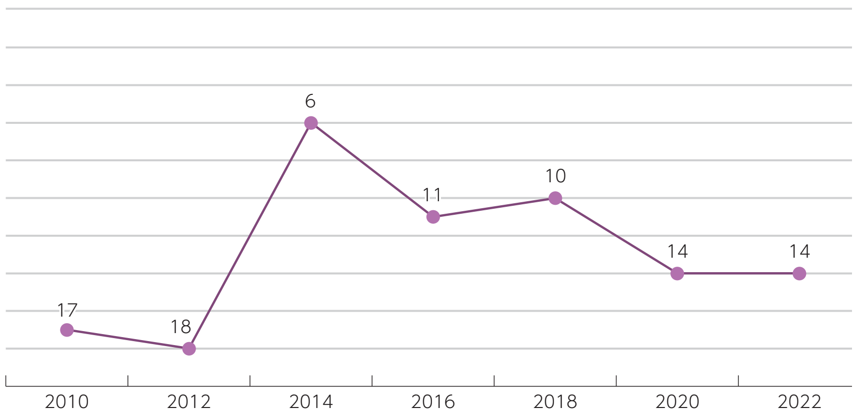
The United Nations Department of Economic and Social Affairs (UNDESA) began conducting e-government surveys in 2003, and has been conducting these surveys every two years since 2008. The goal of the survey is to improve the transparency and accountability of public policies through ICT in UN member countries and encourage public participation in public policies. The survey produces an averaged E-Government Development Index (EGDI) based on an Online Service Index, Human Capital Index, and Telecommunications Infrastructure Index, to determine rankings.

In the 2022 World E-Government Ranking, Denmark once again ranked first place (the same result from the previous survey of 2020), followed by Finland, South Korea, New Zealand, and Sweden. Japan ranked 14th place again, but with a higher score than the previous survey. Japan has generally ranked between 18th and 10th place in previous surveys **(Figure 4-11-3-3)**.

Japan ranked first place in the "e-Participation Index" category, up from fourth place last time. According to the e-Participation Index, Japan received high scores in all three areas: "e-information (0.9818)," "e-consultation (1.0000)," and "e-decision-making (1.0000)."

According to the Digital Agency of Japan,[12] Japan rapidly began promoting open government initiatives following the Great East Japan Earthquake in 2011, and had been highly rated even until then (between second to fifth place). This time, the government was highly praised for its efforts on open data, its use of a platform to collect opinions and ideas to create an entry point for dialogue with the public, its leadership, and the fact that it reflected the opinions it received in its plans.

Figure 4-11-3-3 Changes in Japan's ranking in the UN (UNDESA) "World E-Government Ranking"



(Source) Changes in Japan's individual indicator scores in the UN (UNDESA) "World E-Government Ranking" (data collection)

(b) Waseda University "World Digital Government Rankings"

In 2005, the Waseda University Institute of d-Government began publishing yearly "World Digital Government Rankings," which assess the progress of digital government in 64 leading ICT countries using 10 major indicators (and 35 sub-indicators). In 2022, Japan was ranked 10th place, down one place from the previous ranking, with the top three countries being Denmark, New Zealand, and Canada. Several issues and structural weaknesses in Japan were indicated, such as the vertical division of government offices revealed by the response to COVID-19; a lack of digital transformation (DX) and sense of urgency; the complexity of decision-making due to the legal separation of e-government (central) and e-local government (regional); and the widening of administrative, financial, and digital disparities between prefectures and municipalities.

Figure (related data) Changes to Japan's ranking in Waseda University's "World Digital Government Rankings"
Source: Waseda University Institute of d-Government
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00334
(Data collection)

[12] Digital Agency Data Strategy Team "Why Japan is No. 1 in the UN e-Participation Index" (October 4, 2022) (https://data-gov.note.jp/n/nb11a924f4f00)

b Development of data linkage and authentication infrastructure

(a) Individual Number Cards

With regard to spreading the use of Individual Number Cards, the "Basic Policy on Economic and Fiscal Management and Reform 2022 (Outline 2022)" and the "Priority Policy Program for Realizing Digital Society" of June 2022 state that the government aims to have Individual Number Cards available to nearly all citizens by the end of fiscal 2022. Since then, the government has been engaged in efforts to increase the convenience of citizens and conduct public relations, such as expanding the use of Individual Number Cards. As of the end of March 2023, 67.0% of all Individual Number Cards had been issued, a significant improvement from 42.4% at the end of March 2022.

Figure (related data) Individual Number Cards Delivery Status
Source: Based on MIC "Individual Number Card Delivery Status"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00337
(Data collection)

Figure (related data) Changes in registrations of Individual Number Cards for use as health insurance cards
Source: Based on Digital Agency "Policy Data Dashboard (Beta)" (data obtained May 30)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00338
(Data collection)

Figure (related data) Changes in public fund receipt account registrations
Source: Based on Digital Agency "Policy Data Dashboard (Beta)" (data obtained May 30)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00339
(Data collection)

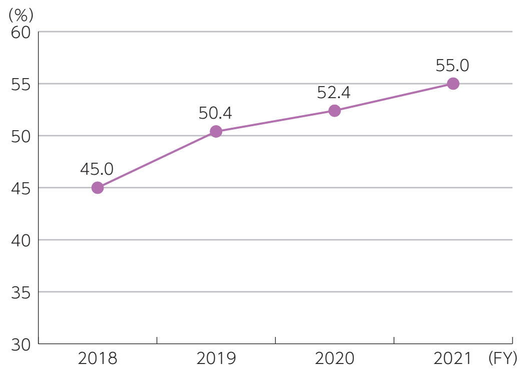
c Efforts to switch to digital at local governments

(a) Current status of online procedures

The "Priority Policy Program for Realizing Digital Society" (approved by the Cabinet on June 7, 2022) lists 59 procedures that local governments should prioritize in taking procedures online. Progress in this area is described below **(Figure 4-11-3-4)**.

Figure 4-11-3-4 Changes in online usage of 59 procedures local governments must prioritize taking online

FY	Annual numver of all procedures (10,000)	Number of online use (10,000)	Online usage (%)
2018	47,749	21,507	45.0
2019	47,635	24,007	50.4
2020	47,287	24,781	52.4
2021	50,595	27,810	55.0



*1 Online usage for fiscal 2020 and fiscal 2019 was calculated based on a resurvey of the 59 procedures that local governments should prioritize in taking procedures online as listed in the "Priority Policy Program for Realizing Digital Society" (approved by the Cabinet on June 7, 2022).

*2 Online usage rate (%) = Number of procedures used online / Total number of procedures per year × 100
The total number of procedures per year is a national estimate based on the total number of procedures and the population of organizations that have already gone online for these procedures.
The number of procedures used online is estimated in the same way as the total number of procedures per year, in order to more precisely calculate online usage.

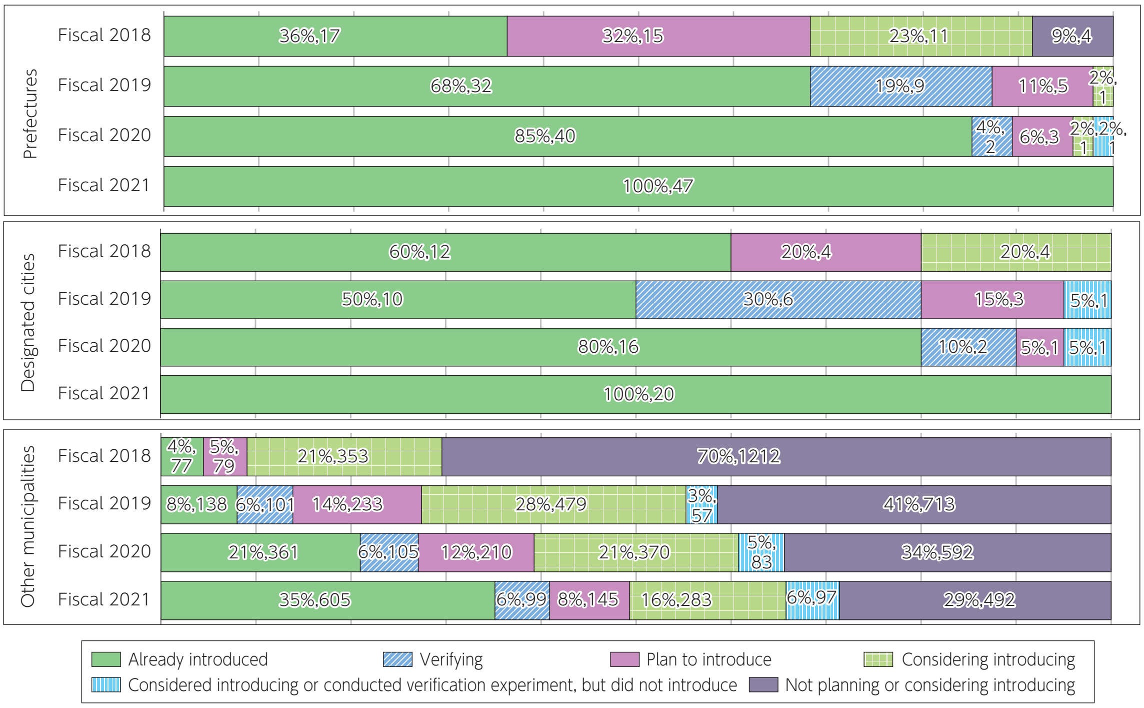
(Source) Based on MIC "Overview of Promotion of DX and Use of Information by Local Governments: Summary of Fiscal 2022 Survey on Promotion of Use of Administrative Information by Local Governments"[13]

[13] https://www.soumu.go.jp/denshijiti/060213_02.html

(b) Promotion of AI/RPA usage

As of fiscal 2021, 100% of prefectures and designated cities had already introduced AI. 35% of other municipalities had also introduced the technology, and roughly 66% of local governments were working toward doing so (including those verifying, planning to introduce, or considering introducing AI) **(Figure 4-11-3-5)**. Looking at functions reveals that the top three areas (voice recognition, character recognition, and chatbot support) are being introduced by local governments of all sizes. Although there were few cases in the bottom four categories (matching, optimal solution display, image/video recognition, and numerical forecasts) even at the prefectural level, the number has been increasing consistently since the survey began.

Figure 4-11-3-5 Introduction of AI in local governments



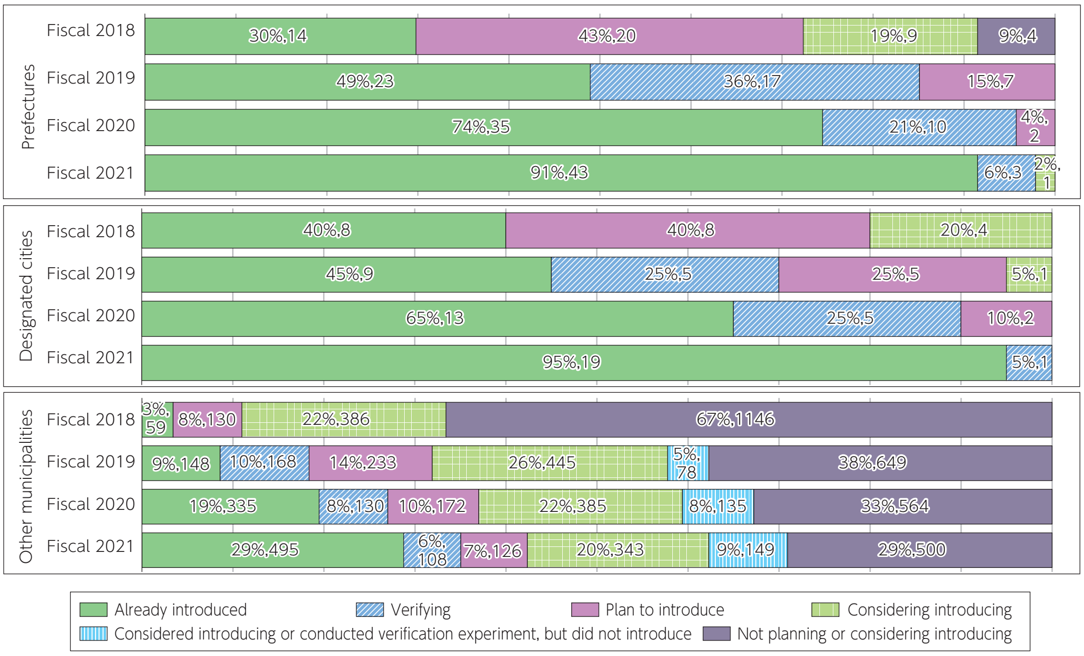
(Source) MIC "Promotion of AI/RPA Usage by Local Governments" (June 27, 2022)[14]

Figure (related data) Status of Introduction of AI in local governments (introduction by AI function)
Source: MIC "Promotion of AI/RPA Usage by Local Governments"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00341
(Data collection)

The number of organizations that have introduced RPA increased to 91% in prefectures and 95% in designated cities. 29% of other municipalities had also introduced the technology, and roughly 62% of local governments were working toward doing so (including those verifying, planning to introduce, or considering introducing RPA) **(Figure 4-11-3-6)**. Looking by field reveals that the technology was introduced mostly into "Finance, accounting, and financial affairs," "child welfare and child care," and "organizations ad employees (including administrative reform)."

[14] https://www.soumu.go.jp/main_content/000822108.pdf

Figure 4-11-3-6 Status of Introduction of RPA in local governments



(Source) MIC "Promotion of AI/RPA Usage by Local Governments" (June 27, 2022)[15]

Figure (related data) Status of Introduction of RPA in local governments (status of introduction by RPA field)
Source: MIC "Promotion of AI/RPA Usage by Local Governments"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00343
(Data collection)

(c) Status of remote work by employees

As of October 2022, this had been adopted by all organizations in prefectures and ordinance-designated cities and by 1,083 organizations in municipalities (62.9%), which represents a steady increase from 849 organizations (49.3%) in the previous year **(Figure 4-11-3-7)**. The most common reasons for not adopting this were "concerns over ensuring information security" and "many employees engaged in duties incompatible with remote work." Meanwhile, the most common benefit of introducing remote work was "ensuring business continuity in the event of an emergency" (76.5%), followed by "reducing/streamlining employee commutes" and "handling employees balancing work and family life."

Figure 4-11-3-7 Status of introducing remote work by employees

(Source) Based on MIC "Survey on Remote Work Initiatives by Local Governments"[16]

[15] https://www.soumu.go.jp/main_content/000822108.pdf
[16] MIC "Survey on Remote Work Initiatives by Local Governments" (October 1, 2019, October 1, 2020, October 1, 2021, and October 1, 2022) (https://www.soumu.go.jp/main_content/000853597.pdf)

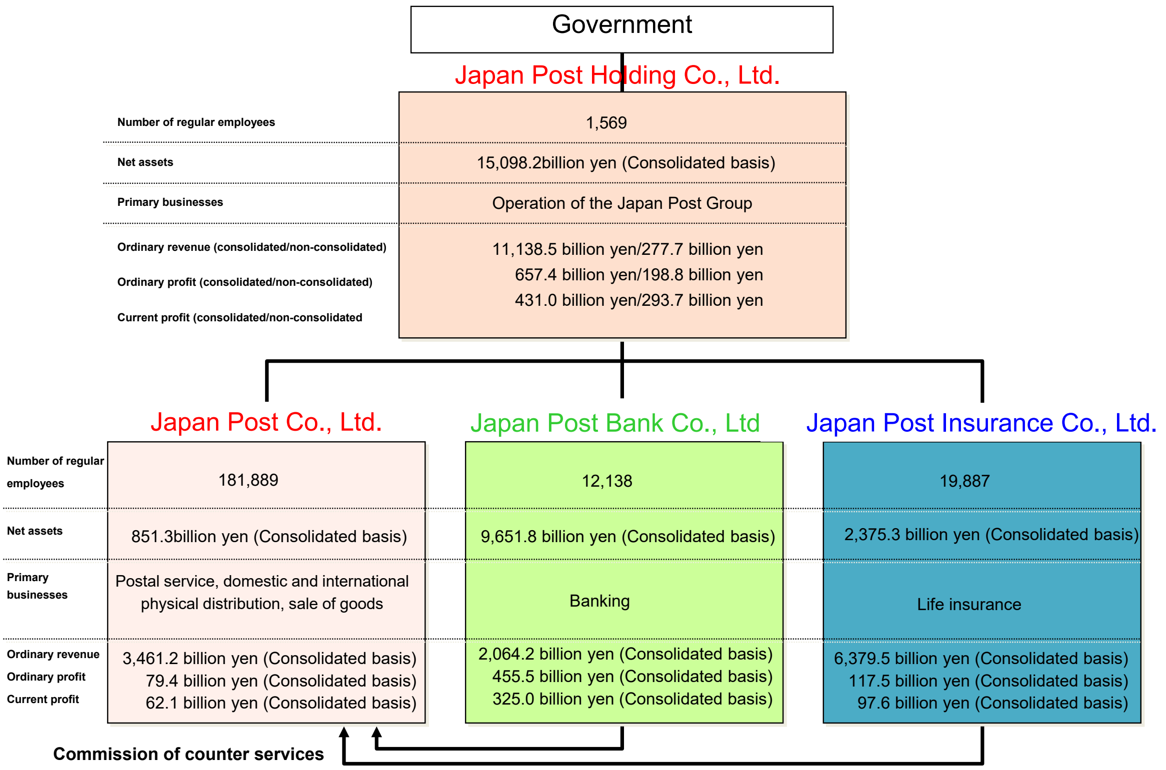
Section 12 Trends in Postal Service and Correspondence Delivery Business

1. Postal service

(1) Japan Post Group

On October 1, 2012, Japan Post Group switched to a four-company structure with Japan Post Holdings Co., Ltd. as a holding company **(Figure 4-12-1-1)**. Japan Post Holdings holds 100% of the issued stocks of Japan Post, 60.6% of proportion of voting rights held of Japan Post Bank, and 49.8% of proportion of voting rights held of Japan Post Insurance (as of the end of March 2023).

Figure 4-12-1-1 Japan Post Group organization chart



*1 Number of employees (regular employees) as of September 30, 2022.
*2 The "current net profit" of each company is the current net profit attributable to parent company shareholders.

(Source) Based on financial results for the period ending March 2023 and disclosure reports (2022)

In the fiscal 2022 consolidated statement of the Japan Post Group, ordinary revenue was about 11.1 trillion yen, while current net profit was 431 billion yen **(Figure 4-12-1-2)**.

Figure 4-12-1-2 Japan Post Group management

(100 million yen)

Fiscal year	2017	2018	2019	2020	2021	2022
Ordinary revenue	129,203	127,749	119,501	117,204	112,647	111,385
Ordinary profit	9,161	8,306	8,644	9,141	9,914	6,574
Current profit	4,606	4,794	4,837	4,182	5,016	4,310

(Source) Based on Japan Post Holdings Co., Ltd. "Overview of Financial Results"

(2) Japan Post Co., Ltd.

a Financial condition

In fiscal 2022, Japan Post (consolidated) operating revenue was 3.4515 trillion yen, operating profit was 83.7 billion yen, ordinary profit was 79.4 billion yen, and current net profit was 62.1 billion yen, for a decrease in both income and profit.

Looking by business reveals that operating revenue for postal service and physical distribution was 1.9978 trillion yen, operating expenses were 1.9649 trillion yen, and operating profit was 32.8 billion yen (a decrease of 69.3 billion yen over the previous term), and operating revenue for post office counter service was 1.74 trillion yen, operating expenses were 1.247 trillion yen, and operating profit was 49.3 billion yen (an increase of 24.7 billion yen over the previous term) **(Figure 4-12-1-3)**.

Figure 4-12-1-3 Changes in Japan Post's (consolidated) operating profit and loss

(100 million yen)

Fiscal year	2017	2018	2019	2020	2021	2022
Postal/physical distribution	419	1,213	1,475	1,237	1,022	328
Post office counter service	397	596	445	377	245	493
International physical distribution	102	103	△ 86	35	287	107
Japan Post (consolidated)	865	1,820	1,790	1,550	1,482	837

*The segment name was changed from "financial counter service" to "post office counter service" during the March 2022 term.

(Source) Based on Japan Post Holdings Co., Ltd. "Overview of Financial Results"

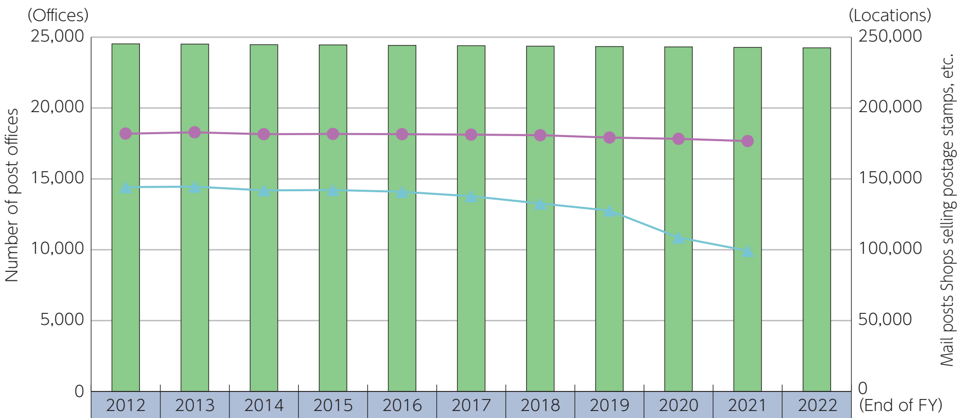
The operating profit for postal service of Japan Post was 7.8 billion yen in fiscal 2021.

Figure (related data) Postal service income and expenditures
Source: Based on Japan Post Co., Ltd. "Postal Service Income and Expenditures"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00348
(Data collection)

b Number of facilities related to postal services

As of the end of fiscal 2022, the number of facilities related to postal services remained almost unchanged at 24,251 post offices **(Figure 4-12-1-4)**.

Figure 4-12-1-4 Changes in the number of facilities related to postal services



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Post offices	24,525	24,511	24,470	24,452	24,421	24,395	24,367	24,341	24,311	24,284	24,251
Mail posts	181,895	182,839	181,521	181,692	181,523	181,221	180774	179,129	178,211	176,683	—
Shops selling postage stamps, etc. and places selling stamps	144,153	144,504	141,888	142,104	140,881	137,790	132613	127,633	108,624	99,244	—

(Source) "Japan Post Group Disclosure Report" Based on Japan Post "Information on the number of postal offices (open data)" website

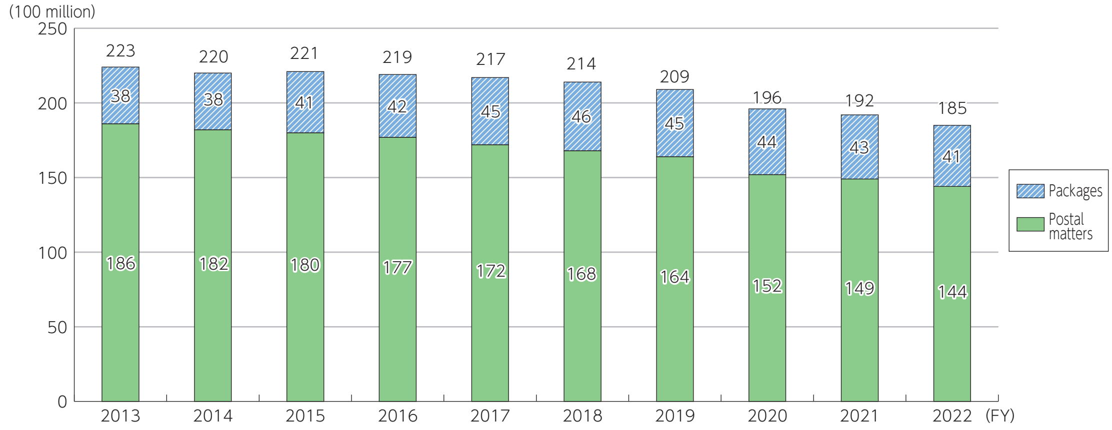
The breakdown of the number of post offices as of the end of fiscal 2022 reveals that there were 20,142 directly managed post offices (including satellite offices and closed locations) and 4,109 simple post offices (including closed locations).

Figure (related data) Breakdown of the number of post offices (as of the end of fiscal 2022)
Source: Based on Japan Post Co., Ltd. "Information on the number of postal offices (open data)" website
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00350
(Data collection)

c Number of postal items accepted

A total of 18.53832 billion postal items were accepted in fiscal 2022 **(Figure 4-12-1-5)**.

Figure 4-12-1-5 Changes in the total number of postal items accepted



*Following the privatization of postal services, Yu-Pack and Yu-Mail are now provided as packages as defined by the Trucking Business Act, and not as parcels as defined by the Postal Act.

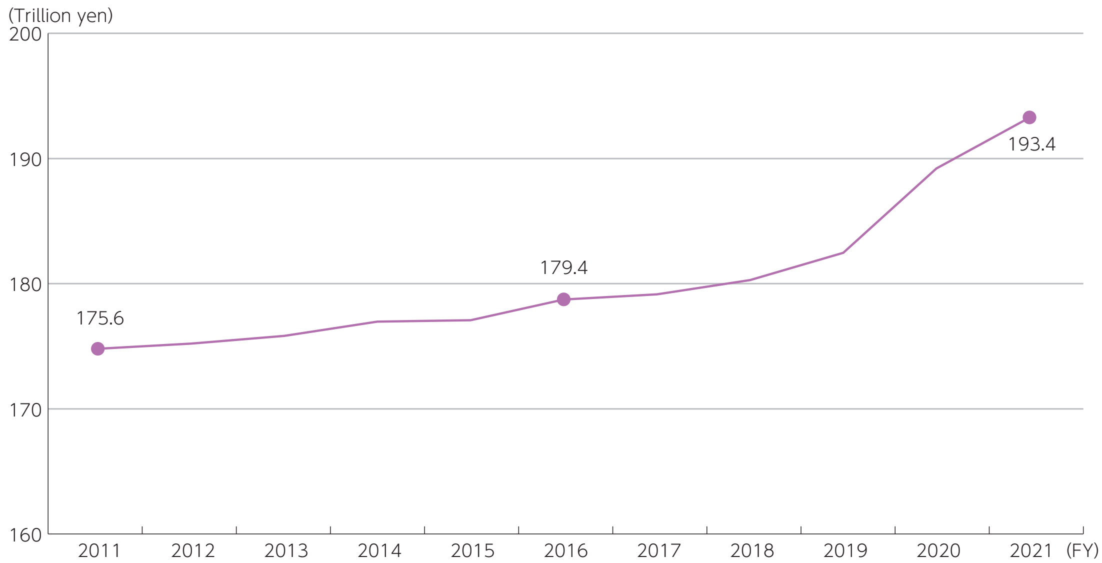
(Source) Based on Japan Post "Number of Postal Items Accepted" material released each fiscal year

(3) Japan Post Bank Co., Ltd.

Japan Post Bank conducts business at 233 directly managed offices, while commissioning bank agency services to about 20,000 post offices.

The balance of deposits of Japan Post Bank (including postal savings from when the organization was managed by the government) was 193.4 trillion yen at the end of fiscal 2021. The balance has decreased 66.6 trillion yen (25.6%) from the peak of 260.0 trillion yen at the end of fiscal 1999 **(Figure 4-12-1-6)**.

Figure 4-12-1-6 Changes in the balance of deposits of Japan Post Bank



*The figure is the sum of savings before and after postal service privatization.

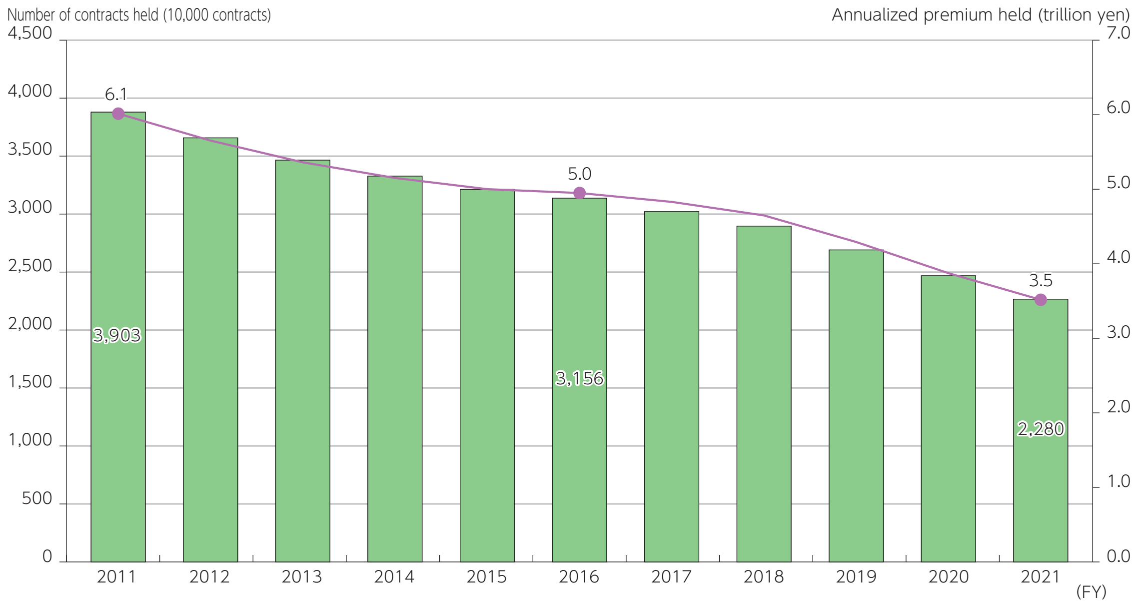
(Source) Based on Japan Post Bank Securities Report

(4) Japan Post Insurance Co., Ltd.

Japan Post Insurance conducts business at 82 branch offices, while commissioning insurance solicitation to about 20,000 post offices.

There were 22.8 million insurance contracts with Japan Post Insurance (including postal life insurance from when the organization was managed by the government) at the end of fiscal 2021. The number has decreased 61.52 million (72.9%) from the peak of 84.32 million at the end of fiscal 1996. Annualized premiums also decreased by 4.2 trillion yen (54.5%) from 7.7 trillion yen at the end of fiscal 2008, to 3.5 trillion yen at the end of fiscal 2021 **(Figure 4-12-1-7)**.

Figure 4-12-1-7 Changes in the number of insurance contracts and annualized premiums for Japan Post Insurance



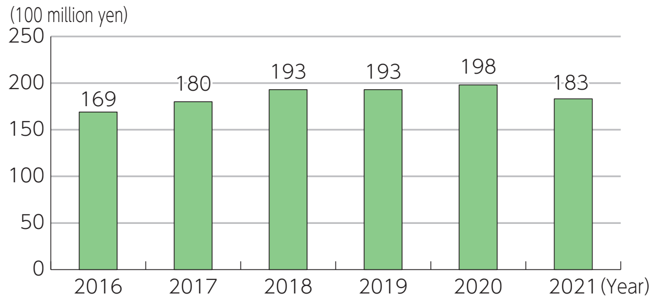
(Source) Based on Japan Post Insurance Securities Report

2. Correspondence delivery service

(1) Sales of correspondence delivery service

In fiscal 2021, sales of specified correspondence delivery service were 18.3 billion yen, a 7.6% decrease from the previous fiscal year **(Figure 4-12-2-1)**.

Figure 4-12-2-1 Changes in correspondence delivery service operator sales



(2) Number of correspondence delivery service operators

Although no operators have entered the general correspondence delivery service business[1] following the enforcement of the Act on Correspondence Delivery by Private Business Operators (Act No. 99 of 2002) in April 2003, 583 operators have entered the specified correspondence delivery service business[2] as of the end of fiscal 2022. Looking at type of provided service reveals that providers of Class 1 services are increasing.

Figure (related data) Changes in the number of specified correspondence delivery service operators
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00355
(Data collection)

Figure (related data) Changes in the number of business operators by type of service provided
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00356
(Data collection)

(3) Correspondence handling record

In fiscal 2021, 20.06 million correspondences were handled (a 4.7% decrease from the previous fiscal year).

Figure (related data) Changes in the number of correspondences accepted
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00357
(Data collection)

[1] "Nationwide full-scale entry" business that can deliver all types of correspondences on condition of providing general correspondence delivery service across the country.
[2] "Specific service type" business with ingenuity. The organization must perform one of three types of specified correspondence delivery service (Class 1 to 3).

Chapter 5

ICT Policy Initiatives in the Ministry of Internal Affairs and Communications

Section 1 Promotion of comprehensive ICT policies

1. Current status and issues

(1) Declining birthrate, and aging/declining population

Japan continues to struggle with a declining birthrate and aging population, and the population is expected to continue to decline. There are concerns that the decline in the working-age population (15 to 64 years old) will affect the economic growth rate due to economy and market contract in the future. It is therefore an urgent matter to improve labor productivity and expand labor force participation. ICT plays a major role in solving such problems. For example, the use of AI and robots is expected to improve the efficiency of operations and distribute labor resources more efficiently, and use of remote work and satellite offices is expected to expand options for working without being restricted by location.

(2) Disasters are growing more frequent and severe, while social infrastructures continues to age

In recent years, severe weather disasters have been frequently occurring in Japan due to the effects of climate change, and large-scale earthquakes, such as Nankai Trough earthquakes, trench-type earthquakes around the Japan Trench and Kuril Trench, and earthquakes directly beneath Tokyo, are also said to be imminent. In the event of such a disaster, it is necessary to collect disaster-related information and provide accurate evacuation information through ICT, and must promptly restore communications and continue to provide continuous communications services.

There are also fears that the infrastructure that had been rapidly developed during the period of high economic growth in Japan will quickly deteriorate in the future, and it is necessary to strategically maintain and renew this infrastructure. However, with the labor supply decreasing due to the declining birthrate and aging population, it will be difficult to devote manpower toward maintaining Japan's infrastructure. Therefore, it is necessary to maintain, update, and manage infrastructure more efficiently by utilizing ICT.

(3) Increasingly complicated international situation

The international situation surrounding Japan is becoming increasingly complex, with the Russian invasion of Ukraine, cross-border cyberattacks on critical infrastructure, and the spread of disinformation. In response, the Act on the Promotion of Ensuring National Security through Integrated Implementation of Economic Measures enacted in May 2022 describes "telecommunications," "broadcasting," and "postal services" as business fields that could be covered by a system to ensure the stable provision of specified social infrastructure services. The Government intends to work toward implementing such a system in the future. In cooperation with the international community, it is necessary to make efforts to build a resilient ICT infrastructure, and to strengthen cybersecurity and supply chains.

In October 2020, Japan declared that it would aim to achieve carbon neutrality by eliminating greenhouse gas emissions as a whole by 2050, as the issue of climate change continues to worsen. In June 2021, the "Action Plan of the Growth Strategy" was formulated to promote two approaches for transitioning ICT industry to a green industry: (1) the promotion of energy demand efficiency and CO2 conservation through digital technologies (Green by ICT) and (2) the conservation of energy and transition to green technology for digital devices and the ICT industry itself (Green of ICT).

Internet traffic in Japan[1] increased approximately 2.3 times as of November 2022 compared with November 2019 before the COVID-19 outbreak. Traffic is expected to continue to increase, and so will the amount of power consumed by ICT-related devices and other equipment. It is also necessary to bring green technology to ICT.

[1] Total download traffic for fixed broadband subscribers

2. Initiatives to promote comprehensive ICT policies

(1) Promotion of initiatives to realize the Digital Garden City Nation Concept

In November 2021, the "Council for the Realization of the Digital Garden City Nation Concept" chaired by the Prime Minister was established, in order to materialize the concept, promote the revitalization of rural areas through digital implementation, and to realize the "Digital Garden City Nation Concept," in which Japan would be connected with the world by promoting the implementation of digital technologies in rural areas, creating a new wave of transformation, and narrowing the gap between rural areas and cities. Based on the discussions of this council, the Cabinet approved the "Basic Policy for the Digital Garden City Nation Concept" in June 2022 and the "Comprehensive Strategy for the Digital Garden City Nation Concept" in December of the same year. This strategy covers a five-year period from fiscal 2023 to fiscal 2027 and presents the medium- to long-term basic direction of the concept.

In November 2021, the Ministry of Internal Affairs and Communications established the "Headquarters for the Promotion of the MIC Digital Garden City Nation Concept" headed by the Minister for Internal Affairs and Communications, to promote building digital infrastructures for hardware and software (a prerequisite for digital implementation), developing and securing human resources with digital skills, implementing initiatives to leave no one behind, and implementing digital services to solve social issues in rural areas.

With regard to building digital infrastructures such as optical fiber and 5G, the Ministry of Internal Affairs and Communications formulated the "Digital Garden City Nation Infrastructure Development Plan" in March 2022,[2] and is strongly promoting efforts in line with this plan.

Figure (related data) Council for the Realization of the Digital Garden City Nation Concept
URL: https://www.cas.go.jp/jp/seisaku/digital_denen/index.html

Figure (related data) Headquarters for the Promotion of the MIC Digital Garden City Nation Concept
URL: https://www.soumu.go.jp/main_sosiki/singi/denen_toshi/index.html

(2) Discussions on Information and Communications Policy with a View to 2030

In September 2021, the Ministry of Internal Affairs and Communications consulted with the Information and Communications Council on Information and Communications Policy with a View to 2030, with the goal of realizing Society 5.0 and securing economic security toward 2030 in light of future trends in the information and communications field, technology, and utilization. The first report was presented in June 2022.[3]

The Information and Communications Council resumed discussions in January 2023, taking into account the rapid progress in information and communications technology and the remarkable ongoing changes in social conditions. During the General Policy Committee meeting held under the council, discussions were held on the direction of ICT policy over the next 10 years by "backcasting" from the coming future of 2030. The final report[4] was presented in 2023.

[2] Revised April 2023
[3] First Report on "Information and Communications Policy with a View to 2030" (June 30, 2022) https://www.soumu.go.jp/menu_news/s-news/01ryutsu06_02000319.html
[4] Refer to [Policy Focus] Overview of the final report on "Information and Communications Policy with a View to 2030" for an overview of the final report.

Policy Focus Overview of the final report on "Information and Communications Policy with a View to 2030"

1. Background and history

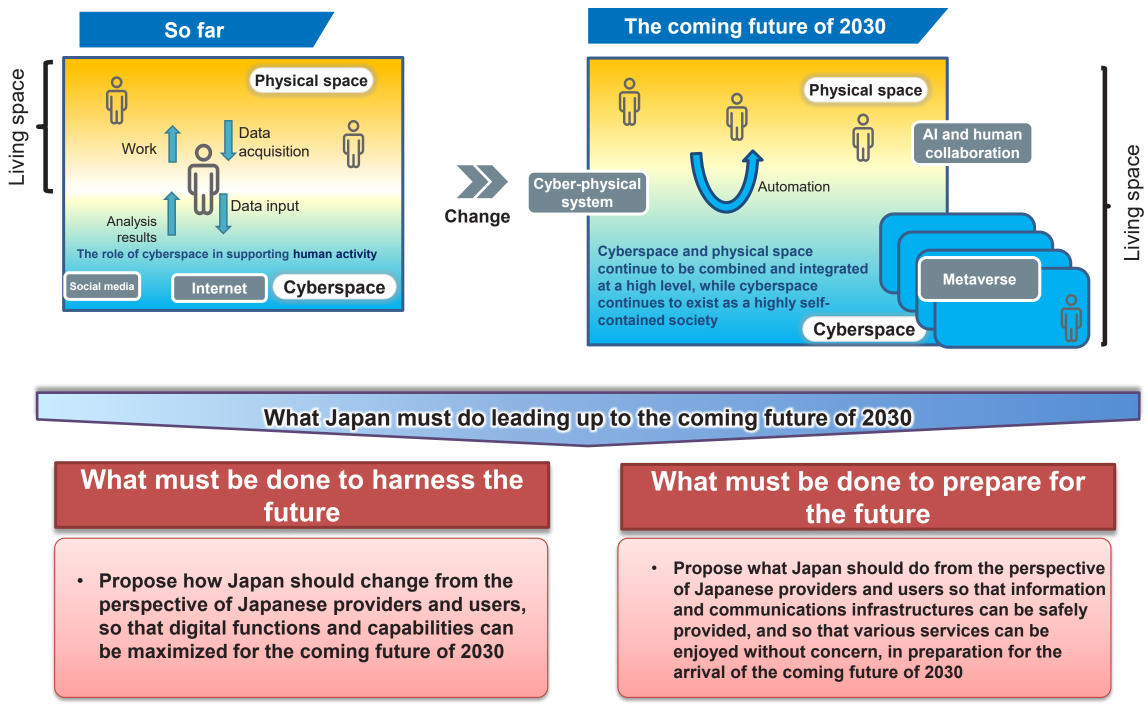
The role of information and communications in citizen's lives and economic activities, and securing the security associated with their use, have become more important due to the progress of digital technologies during the COVID-19 pandemic. Meanwhile, issues such as the growing presence of overseas platform operators and supply chain risks in the information and communications field have become apparent against the backdrop of recent changes in the international situation, such as tensions between the United States and China.

With this in mind, the Ministry of Internal Affairs and Communications consulted with the Information and Communications Council on Information and Communications Policy with a View to 2030 in September 2021, and held discussions on the direction of ICT policy to realize Society 5.0 and ensure economic security during a meeting of the General Policy Committee of the Information and Communications Policy Subcommittee, and its first report was presented in June 2022.

Japan is expected to face labor shortages and a shrinking domestic market, so the use of digital technology will become increasingly important. However, digital usage in Japan dropped to 29th place out of 63 countries and regions ranked in the 2022 IMD Digital Competitiveness Ranking, and dropped to 63rd place in the data utilization category. The situation where Japan cannot make full use of digital technology has been continued. Meanwhile, cyberspace environments have entered a new phase due to advances in AI, robotics, and other technologies, and hardware technology (which has been a strength of Japan) is becoming more important in realizing cyber-physical systems.

In order to ensure that Japan's ICT industry can continue to grow so that Japan can increase its international competitiveness to help realize a prosperous life for its citizens and achieve a sound Internet environment, the committee resumed deliberations in January 2023 in order to consider the direction of ICT policy in light of future socioeconomic and technological changes. The committee deliberated on the direction that Japan should take in order to forecast the coming future of 2030 and demonstrate its digital functions and capabilities, and to safely provide information and communications infrastructures in preparation for 2030 so that citizens can enjoy various services with peace of mind. In June 2023, the final report on Information and Communications Policy with a View to 2030 was presented.

Figure 1 Direction Japan must take toward the coming future of 2030



2. Overview of the final report on "Information and Communications Policy with a View to 2030"

(1) The coming future of 2030

In light of changes in the socioeconomic environment, such as the decrease in the working population due to the declining birthrate and aging population, and the advancement of information and communications technologies such as AI and robots, cyberspace and physical space are expected to have converged and become highly integrated in 2030. Cyberspace is also expected to become a new form of "society," and that existing living spaces will expand. Society 5.0 is expected to be realized in such a way that people will be able to concentrate on more essential activities and live rich lives that suit their lifestyles and needs, wherever they happen to be.

a AI and human collaboration (AI agents)

Mutual cooperation between AI and humans, AI and the environment, and AI and AI will support life and economic activities in physical space, enabling a richer life

b Advanced convergence of cyber-physical systems

[1] Improve safety and efficiency by using robots and other technologies to provide feedback from cyberspace to physical space

[2] Participate in remote physical space activities (life and economic activities) through cyberspace to compensate for mutual shortfalls, or participate in socioeconomic activities free from physical space constraints (increase remoteness of existence)

c Emergence of new life and economic activities (metaverse, etc.)

Through avatars, people can live or conduct socioeconomic activities in cyberspace, free from the various constraints unique to physical space.

Figure (related data): Coming future of 2030
Source: Final report on "Information and Communications Policy with a View to 2030"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00359
(Data collection)

(2) Challenges facing Japan toward 2030, and future direction

a Response to the rapid evolution of AI

Generative AI is now developed and provided mainly in the U.S., and so there is a bias in the learning data. There are therefore problems with this technology, such as reduced prediction accuracy and regional bias. It is also important for all citizens, not just young people, to be able to use AI to a certain extent, as mastery of AI will have an effect on convenience and productivity in social and economic activities.

Therefore, it is necessary to engage in efforts to contribute to the creation of environments that allow Japanese people to easily make use of generative AI (AI foundation models in Japanese that reflect Japanese culture and norms), and to help citizens acquire the ability to skillfully utilize digital tools such as AI.

b Response to the promotion of business transformation and carbon neutrality

As values change from ownership to use, and as businesses come under pressure to transform their businesses and achieve carbon neutrality, it is necessary to realize DX and GX by upgrading cyber-physical systems in a manner that assumes global expansion. In order to truly realize cyber-physical systems, "actuators" that serve as contacts from cyberspace to physical space will play a crucial role.

Although Japan has taken a leading position in developing technology, there are indications that it will fall behind in product and service development and lose out in business development. Outside of Japan, there are a number of efforts now in place to spread global standards in favor of certain countries as a national strategy. It is necessary to engage in efforts such as active cooperation between the public and private sectors to develop rules in Japan.

Due to the globalization of supply chains, international standardization (such as ensuring interoperability) is another important factor in realizing an ecosystem that transcends regional, business, and industry boundaries. In that case, it is also necessary to have a strategy for what is standardize for. In recent years, standardization at higher layers (including service standards and social issues such as the environment) have become important, in addition to standardization activities linked to products such as ensuring compatibility and quality.

It is important for innovative startups to continue to maintain growth speed in order to realize cyber-physical systems. For example, late-stage investments and partnerships between startups and agile operating companies boasting technology and human resources can be effective.

c Response to environmental changes in information and communications infrastructures

In order to strengthen and accelerate efforts toward realizing Beyond 5G (which will serve as a social infrastructure in 2030), it is necessary to strategically promote R&D aimed at social implementation and overseas expansion, focusing on technological fields where Japan has strengths.

As providers of information and communications infrastructures become more diverse and equipment becomes more complex, it is necessary to consider how future information and communications infrastructures based on the user's perspective should be built, so that users can enjoy the advantages of end-to-end high speed and low delay, and so that information and communications infrastructures are dependable.

In order to ensure economic security, the government must actively engage in both support and regulation, as a stakeholder. It is also important for us to reduce and eliminate cybersecurity and procurement risks. In order to improve autonomy by strengthening supply chains, it is necessary to develop methods to reliably procure devices and parts such as diversifying suppliers, while taking economic rationality into consideration.

d Response to the development of the new social space of cyberspace

The international community must commonly recognize that the metaverse is an online public space where freedom of expression and privacy are protected, and that its operation must be conducted democratically.

It is also necessary to promote the formation of international rules in cooperation between the public and private sectors and ministries and agencies, while determining and verifying the portability of rules and avatars applied within the metaverse.

Given the abundance of technology and intellectual property related to content such as avatars, Japan will need to actively engage in rulemaking in the global metaverse market.

e Response to ensuring sound cyberspace environments

Concerns are growing over state intervention, the concentration of data in big tech companies, the fragmentation of the Internet due to filter bubbles and echo chambers, and the distribution of false information and misinformation due to the “attention economy.”

In order to ensure freedom of expression, it is necessary to strengthen cooperation among stakeholders and the international community and promote constant efforts throughout society, including voluntary efforts among a wide range of stakeholders and national measures based on explanations including evidence from operators, such as platform operators ensuring appropriate responses as well as transparency and accountability, existing media engaging in collaborative fact-checking efforts, and improving the ICT literacy of citizens. False information and misinformation tend to spread easily among those with low literacy, so it is necessary to take measures to improve literacy for all generations.

Figure (related data) Overview of the final report on “Information and Communications Policy with a View to 2030”
Source: Final report on “Information and Communications Policy with a View to 2030”
URL: (Data collection)

Section 2 Trends in telecommunications business policies

1. Summary

(1) Initiatives so far

Over the more than 35 years since the liberalization of telecommunications business and the enforcement of the Telecommunications Business Act (Act No. 86 of 1984) in 1985, there have been a large number of new entries into the telecommunication market. Under the principle of competition, various communication technologies such as IP, using digital technology, and mobile broadband have been advanced and introduced, rates have dropped, and services have remarkably grown more diversified and advanced. The Ministry of Internal Affairs and Communications has continued to review various policies and systems in order to ensure that reliable telecommunications services are provided while maintaining the innovation and dynamism of such services.

For example, there have been many recent environmental changes in the Japanese telecommunications market, such as the spread of mobile phones and broadband, and the development of competition among groups mainly consisting of mobile telecom operators. In light of these environmental changes, MIC has developed systems to continue to ensure a fair competitive environment. MIC has taken measures to resolve issues such as higher rates for mobile phones (now a daily necessity) compared to other countries, and complicated and difficult pricing plans, in order to create a fair competitive environment in which citizens can use low-cost and diverse mobile phone services.

MIC has also developed rules to respond to the increasing number of problems related to the use of telecommunications services due to information gaps between consumers and business operators, inappropriate solicitation by business operators, the increasing complexity and sophistication of cyberattacks, and more serious global risks.

(2) Future challenges and directions

The telecommunications business provides telecommunications services that are essential for citizen's lives and socioeconomic activities. The importance of telecommunications services has continued to increase. As the social structure of Japan moves toward a rapid decline in population and a super-aging population, the creative role that ICT plays in rural areas, such as strengthening the regional industrial base and promoting rural migration, is expected to increase in the future. The role that ICT plays in the revitalization of economic activities such as creating new businesses and improving productivity, the realization of a safe and secure society, and the solving of social issues in various fields (such as healthcare, education, and administration) is also expected to increase.

It will therefore be extremely important for each individual and the social economy of Japan to secure the interests of users of telecommunications services and to develop digital infrastructures as a foundation to support the promotion of innovation, using digital technology, and DX throughout Japanese society.

In addition to the telecommunications market, the social structure of Japan is expected to undergo further drastic changes, ultimately rendering existing social and economic models useless. There is a growing need to attempt to use advanced information and communications technologies to solve social issues and create value.

Telecommunications services have become indispensable for citizen's lives and socioeconomic activities, and it is necessary to be able to continue to provide services even in emergency situations such as natural disasters and communications outages.

For this purpose, it is necessary to create an environment where all entities in Japan can use safe, secure and reliable information and communications services.

2. Creation of a fair competitive environment

(1) Analysis and verification of the telecommunications market

a Verification of the telecommunications market

Since fiscal 2016, the Ministry of Internal Affairs and Communications has been engaged in integrated market verification efforts to analyze and verify market trends and confirm whether telecom operators are operating appropriately, and holds the “Telecommunications Market Verification Conference” in order to obtain advice from an objective and professional perspective. The conference is attended by academic experts and others. In light of changes to the telecommunications market environment, the “Review Committee for Ensuring Fair Competition” (established under the “Telecommunications Market Verification Conference”) made recommendations in October 2021 on the need to strengthen market verification efforts. Based on these recommendations and others, market verification has been carried out continuously since fiscal 2021 based on the “Basic Policy on Market Verification in the Telecommunications Business Field,” which was formulated in December of the same year and describes a basic concept of market verification and the overall verification process.

b Creation of a fair competitive environment in the mobile market

The Ministry of Internal Affairs and Communications is working to create a fair competitive environment in the mobile market in order to realize a variety of low-cost services through promoting active competition among businesses. In 2019, the Telecommunications Business Act was revised to separate communication fees from device fees and to prohibit excessive lock-in. Since 2020, the "Working group on Verifying Rules of Competition" (established under the "Telecommunications Market Verification Conference") has continued to verify the effects of measures taken in response to this revision and their impact on the mobile market. The working group is currently conducting a review under Article 6 (Review Clauses) of the Supplementary Provisions of the Revised Telecommunications Business Act of 2019, and will take necessary measures based on the results of the review.

In October 2020, the Ministry of Internal Affairs and Communications announced its "Action Plan for the Creation of a Fair Competitive Environment in the Mobile Market," which outlines specific efforts to develop a fair competitive environment in the mobile market. Various measures have also been taken based on the discussion of the "Working group on Verifying Rules of Competition" and this action plan, such as placing a general ban on SIM locks (August 2021) and establishing a system to allow for the early termination of existing contracts (January 2022). Progress has also been made in creating a fair competitive environment in the mobile market even for mobile carriers, such as eliminating penalties, launching carrier email carry-over services, and introducing eSIMs.

The Ministry of Internal Affairs and Communications is now striving to publicize information through consumer groups to promote understanding among consumers. In December 2020, the "Mobile Phone Portal Site" was launched on the Ministry of Internal Affairs and Communications website with neutral information to help consumers choose a plan that suits them. In April 2022, the site underwent a redesign and greatly expanded its content to further promote consumer understanding.

Figure (related data) Mobile phone portal site
URL: https://www.soumu.go.jp/menu_seisaku/ictseisaku/keitai_portal/

(2) Creation of connection rules

a Review of method to calculate mobile connection fees

Since February 2021, mobile carriers have been offering low-cost pricing plans for mobile communications. Competition between MNOs and MVNOs in the mobile market is expected to further reduce prices and enhance and diversify services.

Based on the "Sixth Report" released by the "Study Group on Calculating Mobile Connection Fees" (September 2022), the Ministry of Internal Affairs and Communications has been engaged in efforts to ensure that mobile connection fees are appropriate, such as requiring companies to report equipment operation policies in their mobile connection fee notifications to MIC and confirming that companies are not arbitrarily operating equipment.

b Review of systems related to wholesale telecommunications service

Both the "Report 2021 on the Verification of Rules of Competition" and the "Fifth Report" of the "Study Group on Calculating Mobile Connection Fees" indicated that the reason why voice call rates (metered rate) of MNO had not fallen over many years is that negotiations between MNOs and MVNOs were not functioning effectively.

Based on the report of the study group (February 2022), the Act Partially Amending the Telecommunications Business Act was enacted in June of the same year. The new law stipulates that a wholesaler must provide wholesale telecommunications services and must provide information that contributes to the facilitation of negotiations at the request of the purchasing provider, with regard to wholesale telecommunications services provided using designated equipment. Based on the discussions of the study group, the Ministry of Internal Affairs and Communications revised the Ordinance for Enforcement of the Telecommunications Business Act, etc. in order to define the details of the system, such as the scope of services that must be provided and what information must be presented to purchasing providers. The Act came into effect in June 2023.

c Review of connection systems related to voice communication

The transition of the telephone network of Nippon Telegraph and Telephone East Corporation and Nippon Telegraph and Telephone West Corporation to an IP network is expected to be completed in 2024, and so MIC consulted with the Information and Communications Council in April 2020 on how connection systems should function at each stage of the transition to an IP network, and received a partial report in September of the same year and a final report in September 2021.

Based on the final report, the Act Partially Amending the Telecommunications Business Act was enacted in June 2022 and came into effect in June 2023, with the goal of revising the scope for calculating the occupancy rate of subscriber lines installed by each telecom operator under the Type I Designated Telecommunications Equipment System, from the prefectural level to the business area of each carrier.

The Ministry of Internal Affairs and Communications also revised the Ordinance on Type I Designated Telecommunications Equipment Connection Fees (Ministry of Posts and Telecommunications Order No. 64 of 2000) in order to establish provisions on voice connection fees for subscriber phones in the process of switching to an IP network, and Telecommunications Business Act Review Standards (Ministry of Internal Affairs and Communications Directive No. 75 of 2001) with regard to the right to set fees for calls from subscriber phones to mobile phones, and formulated a ruling policy on the right to set user fees.

The Ministry of Internal Affairs and Communications is now examining how voice fees should be handled after switching to an IP network, including the adoption of a "bill and keep" method where providers do not pay voice connection fees to each other.

3. Development and maintenance of digital infrastructures

(1) Promotion of optical fiber

While the use of digital technologies, including remote work, remote education, and remote medical care, holds great promise in solving regional problems, digital infrastructures using optical fiber have been slow to develop in geographically disadvantaged regions such as sparsely populated areas and remote islands, due to the heavy financial burden relative to the population.[1]

With this in mind, the Ministry of Internal Affairs and Communications has implemented the "Advanced Wireless Environment Improvement Promotion Project," which provides subsidies for a portion of the business expenses of local governments and telecom operators in disadvantaged areas who develop optical fiber, which is a prerequisite for high-speed, large-capacity wireless communications such as 5G. This project also covers expenses required for local governments to maintain and manage optical fiber and other equipment in remote island regions. Based on the "Digital Garden City Nation Infrastructure Development Plan" (formulated in March 2022 and revised in April 2023), the goal is to increase optical fiber coverage (household coverage) from 99.7% at the end of March 2022 to 99.9% by the end of March 2028.

In order to develop a communications environment that contributes to the "GIGA School Program," MIC is now focusing its efforts on schools that do not have sufficient communications environments. By taking into account the communications status of schools, MIC will promote the development of communications environments using 5G during fiscal 2023 for schools that plan to install optical fiber in fiscal 2024 or later, and will promote the early and smooth transition of public equipment to private equipment based on the requests of local governments.

(2) Local distribution of data centers, submarine cables, etc.

Demand for data centers and submarine cables has been increasing worldwide due to the rapid increase in Internet traffic during the COVID-19 pandemic and also due to expanded use of cloud and AI due to advances in digital transformation. These digital infrastructures will become even more important in the future as they support social and economic activities. Analyzing the locations of data centers in Japan reveals that, although investment in the Osaka area has increased in recent years, about 60% of data centers are concentrated in the Tokyo area. This situation is expected to continue. As for submarine cables, the landing stations that terminate international submarine cables are concentrated in and around the Boso Peninsula, while domestic undersea cables remain undeveloped in the Sea of Japan (missing links). If the Tokyo and Osaka areas are damaged during a massive earthquake, communications services could be affected on a nationwide scale. In order to strengthen Japan's digital infrastructure, it is necessary to better distribute data centers and develop undersea cables in the Sea of Japan. Because Japan is located at the transit point between North America, Europe, and the Asia-Pacific region, it is necessary to further promote the laying of international undersea cables to Japan and strengthen Japan's role as a hub for international data distribution. Furthermore, in view of recent changes in the international situation including the increasing complexity of the security environment surrounding Japan, it is necessary to enhance safety measures for international submarine cables and landing stations.

As a supplementary budget project for fiscal 2021, the Ministry of Internal Affairs and Communications established a subsidy to support private business operators to develop data centers and submarine cables, and has begun to support the development of data centers located outside the Tokyo area. The "Digital Garden City Nation Infrastructure Development Plan" (formulated in March 2022 and revised in April 2023) also includes goals for data centers and submarine cables. (1) It calls for the development of third and fourth core bases for data centers that complement and could serve as alternates for Tokyo and Osaka over the short term and, in coordination with relevant ministries and agencies (such as the Ministry of Economy, Trade and Industry), consideration for how to further decentralize data centers and the necessary support for the development of bases and other facilities. (2) It also calls for the development of domestic submarine cables within the Sea of Japan (missing links) and complete submarine cables around

[1] Refer to Chapter 4, Section 2, "Trends in the telecommunications field"

Japan (Digital Garden City Super Highway), and for the development of submarine cables to strengthen the role of Japan as a hub for international data distribution, in conjunction with efforts to decentralize data centers. In order to strengthen safety measures for international submarine cables and landing stations, MIC is also promoting efforts to implement multi-routing in case of disconnection of international submarine cables, protect international submarine cables and landing stations, and strengthen systems for laying and maintaining international submarine cables.

(3) Ensuring provision of broadband service

Broadband service is crucial to provide services such as remote work, remote education, and remote medical care. Having deemed these services necessary by Ministerial Ordinance, the Ministry of Internal Affairs and Communications has positioned broadband as a new type of universal telecommunications service under the Telecommunications Business Act ((ii) universal telecommunications services). In order to ensure the appropriate, fair, and reliable provision of such services, business operators are obligated to provide notification of the terms and conditions of contracts, provide services, and maintain compliance with technical standards. In order to ensure the provision of such (ii) universal telecommunications services nationwide, the system has also been revised by establishing a new grant system (Universal Service System for Broadband Services) based on contributions paid by broadband service providers nationwide (Act Partially Amending the Telecommunications Business Act [Act No. 70 of 2022]).

In order to examine the specific details of the system as specified by government and ministry orders in June 2022, MIC consulted the Information and Communications Council on the ideal universal telecommunications service system for broadband services, and received a report in February 2023. In this report, it was deemed appropriate to define the scope of these (ii) universal telecommunications services as FTTH, HFC CATV internet service, and wireless fixed broadband equivalent to these services (dedicated).[2] As for wireless fixed broadband (shared),[3] it was deemed appropriate to continue to consider how to position such services,[4] and a summary was provided on how business operators should respond and how the subsidy system should function. Based on the report, the Ministry of Internal Affairs and Communications has released government and ministry orders, and the new Act and these orders came into effect in June 2023.

4. Ensuring the safety and reliability of telecommunications infrastructures

(1) Establishment of systems related to technical standards for telecommunications equipment

In light of the increasing number of virtualization technologies and cloud services being introduced and used in communications networks, and due to the fact that communications service provision structures are becoming more diverse and complex, the IP Network Equipment Committee (Information and Communications Technology Subcommittee, Information and Communications Council) examined technical conditions for telecommunications equipment in response to the diversification and complexity of networks associated with the advancement of virtualization technologies from April 2022 to February 2023.

A partial report by the Information and Communications Council[5] based on the first report prepared in September 2022 deemed it appropriate to impose technical standards equivalent to those currently imposed on the mobile phone equipment of MNOs for MVNOs, etc. that will be designated as voice transmission mobile phone numbers. Following a report by the Information and Communications and Posts Administrative Council,[6] the Ministerial Ordinance to Partially Revise the Ordinance for Enforcement of the Telecommunications Business Act, etc. came into effect in February 2023 to relax conditions for designating voice transmission mobile phone numbers.

The committee also examined technical conditions for telecommunications equipment in response to the advancement of technologies such as virtualization technologies along with technical conditions for situations in which serious accidents could occur, and summarized them as its second report in February 2023. Based on the partial report of the Information and Communications Council (based on this report),[7] the Ordinance for

[2] Provided using a dedicated wireless connection (regional BWA, local 5G, etc.) for fixed communications services.
[3] Provided using a wireless connection (mobile phone network) shared by fixed communications services and mobile communications services.
[4] Several issues were indicated, such as the lack of stability in the quality of communications when a single base station is used to cover unspecified users of mobile phones and a large number of terminals are connected, and issues related to requirements for self-installed equipment set forth in Article 2, Paragraph 5 of the Act on Nippon Telegraph and Telephone Corporation, etc. in order for Nippon Telegraph and Telephone East Corporation and Nippon Telegraph and Telephone West Corporation to provide wireless fixed broadband using wireless equipment provided by others (mobile carriers).
[5] Partial report from the Information and Communications Council on technical conditions for telecommunications equipment in response to the diversification and complexity of networks associated with the advancement of virtualization technologies, etc. (September 16, 2022): https://www.soumu.go.jp/menu_news/s-news/01kiban05_02000253.html
[6] Results of request for comments on the partial revision of the Ordinance for Enforcement of the Telecommunications Business Act, etc., and report from the Information and Communications and Posts Administrative Council (January 20, 2023): https://www.soumu.go.jp/menu_news/s-news/01kiban06_02000100.html
[7] Partial report from the Information and Communications Council on technical conditions for telecommunications equipment in response to the diversification and complexity of networks associated with the advancement of virtualization technologies, etc. (February 24, 2023): https://www.soumu.go.jp/menu_news/s-news/01kiban05_02000283.html

Enforcement of the Telecommunications Business Act, etc. revised based on technical conditions for situations in which serious accidents could occur came into effect in June 2023. MIC will promptly proceed with the development of systems based on technical conditions for telecommunications equipment in response to the advancement of technologies such as virtualization technologies.

(2) Ensuring communications services in emergencies

a Initiatives for continuously sharing information

In recent years, natural disasters such as earthquakes, typhoons, heavy rain, heavy snow, floods, landslide disasters, and volcanic eruptions have frequently occurred in Japan, and communications services have also been affected by power outages, communication equipment failures, and cable disconnections.

In October 2018, the Ministry of Internal Affairs and Communications established the "Liaison Group for Securing Communications Services during Disasters" as a means for MIC and major telecom operators such as designated public agencies to reflect back on how successive disasters have been handled in the past, and to review systems and take more appropriate actions, so that communications services can be ensured during disasters. The group shares information and exchanges opinions on issues such as readiness coordination and cooperation, and rapid assessment and restoration of damage.

b Initiatives of the "Ministry of Internal Affairs Disaster Telecom Support Team (MIC-TEAM)"

In June 2020, the Ministry of Internal Affairs and Communications launched the "Ministry of Internal Affairs Disaster Telecom Support Team (MIC-TEAM)" to provide disaster response support in order to ensure means of information and communications during disasters. When a large-scale disaster has occurred or is likely to occur, MIC-TEAM is dispatched to local governments in disaster-stricken areas to assess the status of the disaster in relation to information and communications services, make contact and coordinate with relevant government organizations and business operators, provide technical advice to local governments, and provide other forms of support such as loaning out vehicle-mounted power supplies. In fiscal 2022, the team was dispatched to local governments in disaster-stricken areas during Typhoon No. 14 in September and in heavy snow areas since December 22.

In order to respond to issues related to collaboration and cooperation in providing power or fuel and cleaning up fallen trees following Typhoon Faxai in 2019, coordinated training was conducted in fiscal 2022 with Tagajo City, Miyagi Prefecture, Chiba Prefecture, Hamamatsu City, Shizuoka Prefecture, and Ehime Prefecture on how related organizations such as telecom operators and power/fuel-related utilities should provide an initial response.

c Investigation into the mutual use of networks among mobile carriers

Mobile phone service is an essential lifeline for citizen's lives and economic activities. One important challenge is to establish environments in which mobile phone users can continue to use communications services through "intercarrier roaming," which allows consumers to use the networks of other operators on a temporary basis, even during emergencies such as natural disasters and communications outages. In response, the Ministry of Internal Affairs and Communications began holding meetings of the "Study Group on Intercarrier Roaming in Emergency Situations" in September 2022. The study group prepared and published its first report on a basic policy for introducing intercarrier roaming that allows for full roaming as soon as possible for emergency calls, regular phone calls, data, and call-backs from agencies receiving emergency calls in December of the same year.

(3) Analysis and verification of telecommunications accidents

In order to prevent future telecommunications accidents from occurring, it is necessary to implement appropriate measures during and after accidents, in addition to measures taken in preparation for accidents. The Ministry of Internal Affairs and Communications began holding the "Telecommunications Accident Verification Conference" since 2015 to analyze and verify reports on serious accidents (mainly as defined in the Telecommunications Business Act) and quarterly reported accidents (as defined in Telecommunications Business Reporting Regulations), in order to effectively utilize various efforts to prevent recurrence by verifying accident reports. Members of the conference compiled the results of verifying telecommunications accidents that occurred in fiscal 2021, and published the "Verification Report on Telecommunications Accidents in Fiscal 2021" in November 2022.

Telecommunications services are becoming an increasingly essential foundation for citizen's lives and socioeconomic activities, and the impact of telecom operator communications outages on society as a whole is growing. Under these circumstances, communications outages caused by telecom operator are frequent. Many issues were noted with how telecom operators provide information when communications outages occur, such as taking too long to notify consumers or not even providing notification at all. In order to appropriately protect the interests of consumers, it is necessary to must seriously reconsider how consumers are provided with information in the telecommunications field. Toward that end, the Telecommunications Accident Verification Conference Notification and Contact Organization Working

Group was established in October 2022, and a summary of the group's report was released in January 2023.[8] Based on this information, "Notification Guidelines for Telecommunications Service Outages" were established in March 2023 to provide information on how to notify users in the event of telecommunications service accidents and outages occurring.

There are likely many common issues behind frequently occurring communications outages, such as insufficient risk assessment and risk identification, human errors and insufficient employee training, and insufficient governance of maintenance and operation systems. In response, the Telecommunications Accident Verification Conference began examining structural issues with organizations and attitudes behind individual accidents, reviewing technical standards and other management rules based on verifying these structural issues, and considering how to enhance governance of maintenance and operation attitudes related to safety measures in December 2022. The conference then summarized its findings in "Report on Verifying Structural Issues Involved in Telecommunications Accidents" in March 2023. MIC will continue to consider further revisions to such systems.

5. Development of a safe and secure usage environments for telecommunications services

(1) Ensuring governance in the telecommunications business field

The telecommunications business is essential for promoting innovation in various fields including the information and communications field. In order to provide innovative services and promote DX throughout society by introducing digital technologies, it is necessary to ensure that reliable telecommunications services that can be trusted by consumers are provided.

In order to ensure safe, secure, and reliable communications services and networks in the digital age, the Ministry of Internal Affairs and Communications began holding the "Telecommunications Business Governance Review Committee" in May 2021, in order to examine how telecom operators should ensure governance with regard to cybersecurity measures and data handling, and to consider future measures. Based on the recommendations of the review committee, the Act Partially Amending the Telecommunications Business Act was established in June 2022, which establishes new rules for information handling and requires operators to provide notification, in order to promote the proper handling of user information while ensuring consistency with rules in other countries. Aimed mainly at telecom operators that acquire and manage large amounts of information, the law also establishes rules to ensure that telecommunications services can be provided smoothly through the use of measures against cyberattack and accident reporting systems implemented through cooperation between operators. The Ministry of Internal Affairs and Communications then held meetings of the "Working Group on the Proper Handling of Specified User Information" from June to September of the same year to review details of regulations concerning the handling of specified user information, and revised the Ordinance for Enforcement of the Telecommunications Business Act to specify (1) information handling rules, (2) information handling policies, (3) items to evaluate the status of handling specified user information, (4) requirements for specified user information general administrators, and (5) the content of reports required when specified user information is leaked. This act and the Ordinance for Enforcement of the Telecommunications Business Act came into effect in June 2023.

(2) Establishment of consumer protection rules in the telecommunications business field

a Overview

As telecommunications services become more advanced and diverse, they bring added convenience and choice to many consumers. However, problems have also arisen due to issues such as information gaps between consumers and providers and inappropriate solicitation by providers. In order to prevent such problems from occurring and to allow consumers to enjoy the benefits of increasingly advanced and diverse telecommunications services, the Ministry of Internal Affairs and Communications has developed and is enforcing appropriate consumer protection rules for telecommunications services, and continues to review them as necessary.

b Ensuring the effectiveness of consumer protection rules

(a) Complaints and inquiries, cooperation with related parties, and administrative guidance

The Ministry of Internal Affairs and Communications has established the "MIC Telecommunications Consumer Consultation Center" to receive information provided by consumers.[9] The Telecommunications Consumer Support Liaison Group[10] also meets twice each year in regions all over Japan to share information on efforts and exchange opinions among related parties. Based on the information obtained through these efforts, MIC

---

[8] Summary of Telecommunications Accident Verification Conference Notification and Contact Organization Working Group https://www.soumu.go.jp/main_content/000858975.pdf

[9] 18,331 complaints have been received by phone and online (fiscal 2021).

[10] A liaison group organized by the Ministry of Internal Affairs and Communications to exchange opinions on how to support consumers in telecommunications services, with members of consumer centers and telecom operator organizations in various regions.

continues to work to ensure the effectiveness of consumer protection rules for telecommunications services by providing administrative guidance and by cooperating with the Consumer Affairs Agency as necessary.

MIC also continues to promote voluntary efforts by relevant organizations to comply with consumer protection rules.

(b) Monitoring

The Ministry of Internal Affairs and Communications has established its “Basic Policy on Supervising Rules for Protecting Consumers in the Telecommunications Business” to monitor the operation status of consumer protection rules, and holds the “Regular Meeting for Monitoring Consumer Protection Rules”[11] twice a year to share and evaluate information among experts and related business organizations.

Participants in this meeting share and evaluate the results of analyzing overall trends as well as trends in each service type (such as MNO, MVNO, and FTTH), with regard to complaints and inquiries in the telecommunications business field. The results of analyzing individual topics,[12] the results of field investigations (anonymous investigations), the results of ad hoc investigations of individual cases, the results of analyzing complaints and inquiries received by business organizations,[13] and follow-ups on efforts by operators to make improvements are also shared and evaluated.

Based on assessments during this meeting, the Ministry of Internal Affairs and Communications has instructed telecom operators who had undergone field investigations on areas for improvement, and has requested business organizations and others to take industry-wide measures and share information with their members. Analysis results and assessments from this meeting are also being used to consider revising consumer protection rules and to promote voluntary efforts by business operators.

c Review of consumer protection rules

The Ministry of Internal Affairs and Communications has continued to review and expand consumer protection rules in response to changes in the telecommunications market and problems encountered by consumers. Since June 2020, the “Consumer Protection Rule Review Committee” has met to thoroughly review relevant systems, and in September 2021 summarized its findings in “Report 2021 of the Consumer Protection Rule Review Committee.” Based on this report, the Ministry of Internal Affairs and Communications has taken the following steps to expand consumer protection rules.

[1] Revise Ordinance for Enforcement of the Telecommunications Business Act

In February 2022, the Ordinance for Enforcement of the Telecommunications Business Act was revised to institutionalize (1) an obligation to explain terms and conditions using explanatory documents during telemarketing calls, (2) an obligation to take measures to allow consumers to cancel services without delay, and (3) limits to the amount of money that can be requested for cancellation (effective July 1 of the same year).

[2] Revise guidelines

The “Guidelines on Telecommunications Business Act Consumer Protection Rules” clarified the fact that consignment contracts between mobile carriers and their distributors may be subject to business improvement orders if such contracts could encourage the violation of consumer protection rules (including specific cases). The guidelines also expanded the description of conduct that would be desirable from the perspective of consumer protection.

[3] Investigate how to improve complaint handling system

In October 2021, MIC established the “Complaint Handling System Review Task Force” to examine scope, functions, systems, and collaboration with other organizations, with regard to establishing systems that could effectively resolve issues with consumers that could not be resolved with individual business operators. MIC prepared a report in June 2022, and reached a decision to launch a new complaint handling system within the next year as a trial effort conducted by certain business organizations.[14] MIC also reached a decision to continue to examine the implementation status for any issues through such means as meetings of the “Consumer Protection Rule Review Committee.” MIC are currently considering launching the new complaint handling system by July this year.

Based on the “Recommendations on Initiatives Based on 'Report 2021 of Consumer Protection Rule Review Committee'” prepared in July 2022 by the “Consumer Protection Rule Review Committee,” MIC released “Requests for Implementation of Guidance to Ensure the Appropriateness of Distributor Business and Efforts to Strengthen the System for Handling Complaints” in August of the same year to related business operators and others. Based on the above recommendations, MIC revised the “Guidelines on Telecommunications Business Act Consumer Protection Rules” in September of the same year, and continue to engage in monitoring and other efforts to enhance consumer protection.

---

[11] Regular Meeting for Monitoring Consumer Protection Rules:
https://www.soumu.go.jp/main_sosiki/kenkyu/shouhisha_hogorule/index.html

[12] The 14th meeting, held in February 2023, dealt with (1) complaints about communication speeds, (2) complaints from the elderly, (3) complaints about FTTH telemarketing, and (4) complaints about in-person sales visits.

[13] Telecommunications Carriers Association and National Association of Mobile-phone Distributors

[14] Telecommunications Carriers Association and Japan Cable and Telecommunications Association

(3) Communication privacy and the protection of user information

a Overview

Various people, goods, and organizations are now connected to the Internet through smartphones, IoT, and other devices, and this has resulted in the creation and integration of large amounts of digital data. All signs point to the realization of Society 5.0, where the results of data analysis using AI are fed back into the real world in order to solve various social issues.

Platform providers that provide various services for free are increasing their presence, and they increasingly tend to obtain and accumulate user information. In addition, as the importance of platform providers in people's daily lives increases due to the provision of essential services by platform providers via smart phones, more sensitive information is being acquired and accumulated.

In order to ensure the proper balance between consumer convenience and secrecy of communications / the privacy protection, and to ensure that platforms function at full performance, platform providers must make their services more attractive and yet ensure that user information is handled appropriately, so that consumers can use their services with confidence.

b Establishment of rules and regulations on the external transmission of user information

The "Working Group on the Handling of User Information in Platform Service" was established by the "Platform Service Study Group" established by the Ministry of Internal Affairs and Communications. Its "Interim Summary" (September 2021), prepared based on the results of discussions by this group, deemed it appropriate to discuss the content and scope of regulations under the Telecommunications Business Act with reference to discussions of the EU ePrivacy Regulation (draft), and to proceed with examining the creation of a specific system with regard to the handling of user information, including cookies and location information. Based on this report, the Act Partially Amending the Telecommunications Business Act was passed in June 2022, which provides various stipulations including requiring telecom operators to notify consumers and provide them with the opportunity to confirm telecommunications in which a command is given to send information to an external party when providing telecommunications services ("external transmission regulation" below). The Ministry of Internal Affairs and Communications then held meetings of the same working group from June to September of the same year to review the details of the external transmission regulation and revised the Ordinance for Enforcement of the Telecommunications Business Act. The working group also defined who is subject to the regulation, what information must be provided in notifications, and how notifications must be provided. This act and the Ordinance for Enforcement of the Telecommunications Business Act came into effect in June 2023.

(4) Response to illegal and harmful information

a Overview

The distribution of illegal and harmful information on the Internet continues to be a serious problem. The Ministry of Internal Affairs and Communications, in cooperation with relevant parties, has continued to implement measures against various types of illegal and harmful information, such as slander, pirated content, and disinformation.

b Response to Internet slander

In light of the growing problem of slander on the Internet (and particularly on platform services such as social media), the Ministry of Internal Affairs and Communications, in cooperation with relevant organizations, is currently implementing the following initiatives based on the "Policy Package on Responding to Internet Slander" prepared and released in September 2020.

[1] Conduct awareness-raising activities to improve the information ethics and ICT literacy of individuals

[2] Provide Support for voluntary efforts by platform operators and improve transparency and accountability (implement continuous monitoring of platform operators)

[3] Conduct initiatives to disclose sender information (ensure the smooth operation of the revised Provider Liability Limitation Act[15])

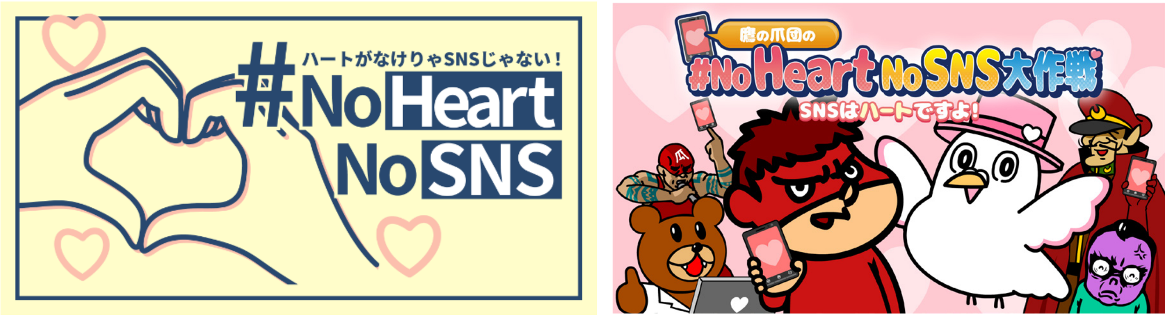
[4] Enhance consultation services (enhance the organization of the Illegal and Harmful Information Consultation Center, strengthen cooperation among multiple consultation agencies, and spread awareness of the guidance plans of multiple consultation services)

In particular, as part of the efforts described in [1], the Ministry of Internal Affairs and Communications has established a special website under the slogan "#NoHeartNoSNS (no social media without heart!)" in collaboration with the Ministry of Justice, the Social Media Association of Japan, and the Safer Internet Association. MIC has also created a special website tied with the popular "Eagle Talon" characters to provide consultation services and other helpful information to those who are concerned with communication on social media, and have been conducting awareness-raising activities through various media including government PR (**Figure 5-2-5-1**).

---

[15] Act on the Limitation of Liability for Damages of Specified Telecommunications Service Providers and the Right to Demand Disclosure of Identification Information of the Senders (Act No. 27 of 2021)

Figure 5-2-5-1 "#NoHeartNoSNS (no social media without heart!)" related content



*Left: "#NoHeartNoSNS (no social media without heart!)" logo
*Right: "Eagle Talon #NoHeartNoSNS Operation" main visual

Based on this policy package, the "Platform Service Study Group" held interviews with platform operators and published its "Second Summary" in August 2022, which summarizes future directions for dealing with illegal and harmful information. In order to ensure transparency and accountability regarding measures such as the deletion of posts by platform operators, the report argues that it is necessary to promptly formulate a code of conduct regarding measures to ensure transparency and accountability, and that the government must undertake certain actions, such as requiring compliance and introducing a legal framework. The distribution of slander and other illegal and harmful information continues to be a serious issue. The "Working Group on Measures against Slander and Other Illegal and Harmful Information" began meeting in December 2022 as a panel of experts to focus on this specific issue, with the goal of effectively deterring such information. The group has been discussing how to ensure transparency regarding the deletion of posts by platform operators, and what role platform operators should play in order to effectively deter the distribution of illegal and harmful information.

c Countermeasures to Internet piracy

In December 2020, the Ministry of Internal Affairs and Communications prepared "MIC Polices Related to Internet Piracy." Based on these policies, MIC continue to promote awareness-raising activities to improve the information ethics and ICT literacy of individuals, access deterrence functions using security measure software, legal amendments concerning the sender information disclosure system, and international cooperation through discussions at international forums such as ICANN.

MIC has also been holding meetings of the "Review Committee on Suppressing Access to Internet Piracy Sites" since November 2021, in which interviews are held with related businesses and other organizations. In September 2022, the committee confirmed the policies of the Ministry of Internal Affairs and Communications along with the progress of efforts by related businesses and other organizations. The committee also published its "Current Summary," which examines measures focusing on the entire ecosystem supporting pirate sites in order to implement more effective measures.

d Measures against disinformation

Disinformation has become a major issue in recent years. In response, the Ministry of Internal Affairs and Communications continues to discuss disinformation on the Internet during meetings of the "Platform Service Study Group." Through this study group, MIC has been monitoring the efforts of platform operators as well as their transparency. Based on the results of monitoring and the results of a survey conducted on overseas trends, MIC published a second summary in August 2022 that suggests future measures to ensure appropriate responses and transparency by platform operators, as well as efforts to promote improving ICT literacy.

In March 2023, the study group published "Initiatives Concerning Measures against Disinformation Ver. 1.0," which summarizes voluntary responses by stakeholders. The Ministerial Declaration of the G7 Digital and Tech Ministers' Meeting in Takasaki, Gunma held on April 29 and 30 of the same year stated that a collection of practices on combating disinformation, called Existing Practices against Disinformation (EPaD), would be prepared by concerned parties, including private companies and civic groups.

In addition, in order to promote the improvement of users' literacy, in June 2022, MIC developed and published an educational material on false and misleading information, "How to Face Up to the Internet - To Avoid Being Deceived by False and Misleading Information." In addition, in November of the same year, MIC established the "Study Group on Literacy Improvement for ICT Use" to examine the ideal form of literacy required in the future digital society and measures to promote literacy.

(5) Development of environments for young people to use the Internet

a Overview

The Internet is becoming indispensable in the daily lives of citizens. In order for young people to use the Internet in a safe and secure manner, the Ministry of Internal Affairs and Communications is promoting the use of filtering in mobile phone devices and promoting awareness-raising activities. In addition, the "Working Group on Improving Juvenile ICT Literacy"[16] was held to discuss measures to improve juvenile ICT literacy and filtering services as a means to protect young people, based on the roles of mobile carriers, OS operators, parents/guardians, and other relevant parties.[17]

b Promotion of the use of filtering

In response to the widespread use of the Internet through smartphones, apps, and public wireless LANs, and due to the drastic decline in the usage of filters, the Act Partially Amending the Act on Establishment of Enhanced Environment for Youth's Safe and Secure Internet Use (Act No. 75 of 2017) was enacted in February 2018. This act obligates mobile carriers and their distributors to set (enable) filters when selling mobile phone devices. In response, the Ministry of Internal Affairs and Communications is now promoting measures so that mobile carriers and their distributors will enable filters.

c Promotion of awareness-raising activities

(a) Compilation and publication of Internet trouble case studies

Young people must have sufficient media information literacy in order for them to be able to use the Internet safely and securely. However, this is also true of their parents/guardians and teachers. The Ministry of Internal Affairs and Communications began publishing "Internet Trouble Case Studies" in fiscal 2009. Updated and released annually, this document summarizes methods for avoiding trouble on the Internet as an aid for parents/guardians and teachers.

The 2023 edition includes trouble case studies on copyright and Internet slander, and also includes information on smartphone filtering, time management, and age-appropriate Internet usage environments.

(b) Creation and publication of awareness-raising videos

In order to effectively reach young people and their parents/guardians, the Ministry of Internal Affairs and Communications has created videos using popular characters for use in conducting awareness-raising activities, in cooperation with related business operators. For example, educational videos on filtering using the popular cartoon "My Hero Academia" are now being posted on the websites of relevant ministries and agencies, showing up in mobile phone shops and mass merchandisers nationwide, and being used in educational sites for young people (**Figure 5-2-5-2**).

---

[16] Reorganized from the "Task Force on Creating a Safe and Secure Internet Environment for Young People" in December 2022.
[17] Refer to Chapter 5, Section 6, "Promotion of ICT utilization" for information on measures to improve juvenile ICT literacy

Figure 5-2-5-2 Filtering and anti-piracy videos for young people

(c) Implementation of on-site lectures at schools

Since fiscal 2006, The Ministry of Internal Affairs and Communications, in cooperation with the Ministry of Education, Culture, Sports, Science and Technology, the Multimedia Promotion Center, and telecom operators, has been running "e-Net Caravan," a series of free on-site lectures for students, parents/guardians, and teachers at schools, in order to raise awareness about the safe use of the Internet by young people.

Remote classes have been offered in addition to the traditional group format since the fall of 2020, in light of the spread of COVID-19.

(d) Establishment of a period for implementation of concentrated efforts

Since 2014, the Ministry of Internal Affairs and Communications has been conducting the "Spring Safety Net and Back-to-School Campaign" in cooperation with relevant ministries and agencies, business operators, and organizations, with efforts focused on graduation and new enrollment periods when many young people get their first smartphones. The campaign focuses on efforts such as awareness-raising activities for young people, parents/guardians, and school personnel to ensure safe and secure use of smartphones and social media.

In 2023, efforts focused on promoting parental control and conducting awareness-raising activities to help young people use the Internet more appropriately.

d Efforts assuming the use of the Internet

Society as a whole is going digital technology at an increasingly rapid rate. This is the result of younger children using the Internet, the COVID-19 pandemic, and the installation of devices in schools under the GIGA School Program. In light of these environmental changes, in July 2021, the "Task Force on Creating a Safe and Secure Internet Environment for Young People" prepared "New Issues and Measures for the Development of Safe and Secure Internet Usage Environments for Young People"[18] as a policy for future efforts.

Based on this, the Ministry of Internal Affairs and Communications, in cooperation with the public and private sectors, has been promoting initiatives that assume that young people will use the Internet, such as efforts to prevent problems caused by the dissemination of information by young people, in addition to previous initiatives focusing on preventing young people from accessing illegal and harmful information.

[18] Task Force on Creating a Safe and Secure Internet Environment for Young People, "New Issues and Measures for the Development of Safe and Secure Internet Usage Environments for Young People": https://www.soumu.go.jp/menu_news/s-news/01kiban08_03000356.html

6. Mediation and arbitration by the Telecommunications Dispute Settlement Commission

(1) Functions of the Telecommunications Dispute Settlement Commission

The Telecommunications Dispute Settlement Commission is a specialized organization established to promptly and fairly handle increasingly diverse disputes in the telecommunications field, where technological innovation and the competitive environment are rapidly advancing. Disputes are currently handled by five members and eight special members appointed by the Minister for Internal Affairs and Communications.

The commission has three functions: (1) mediation and arbitration, (2) deliberation and reporting on inquiries from the Minister for Internal Affairs and Communications, and (3) recommendations to the Minister for Internal Affairs and Communications.

The commission secretariat has established a consultation service for communications and broadcasting business operators and others, which can be accessed by dedicated phone or email. The secretariat responds to inquiries and regarding disputes between telecom operators, and has established a website dedicated to the committee. In order help resolve disputes smoothly, the committee has published the "Telecommunications Dispute Settlement Manual" and various pamphlets that provide a collection of dispute cases and explanations of procedures [1], [2], and [3] above.

Figure (related data): Overview of the functions of the Telecommunications Dispute Settlement Commission
URL:https://www.soumu.go.jp/main_sosiki/hunso/outline/about.html

a Mediation and arbitration

Mediation is a procedure whereby, in the event of a dispute between telecom operators or broadcasters, the commission appoints a "mediator" from among its members and special members, and the mediator encourages the parties to come to terms with each other in order to achieve a prompt and fair resolution of the dispute. If necessary, the mediator also presents a mediation proposal. The procedure is not compulsory and requires the approval of both parties to proceed. However, if agreement is reached between both parties following the mediation procedure, a settlement will have been reached under the Civil Code.

Arbitration is generally conducted after the commission designates three members from among the members and special members as "arbitrators" and then an agreement is reached following the decision of the arbitrators (arbitral tribunal). In this case, the arbitral decision would have the same effect as a final and binding judgment between the parties, as applied mutatis mutandis by the Arbitration Act.

b Deliberation and reporting on inquiries from the Minister for Internal Affairs and Communications

Based on the provisions of the Telecommunications Business Act or Broadcast Act, a party may file a petition for a negotiation order or an application for a ruling with the Minister for Internal Affairs and Communications in the event that negotiations between telecom operators or broadcasters fails.

The Minister for Internal Affairs and Communications is required to consult with the commission when issuing these negotiation orders and rulings. The commission is consulted by the Minister for Internal Affairs and Communications, and deliberates and reports on these matters.

c Recommendations to the Minister for Internal Affairs and Communications

The commission may make recommendations to the Minister for Internal Affairs and Communications regarding improvements in rules of competition that have been identified through mediation, arbitration, and deliberation/reporting on inquiries. The Minister for Internal Affairs and Communications publicizes the content of recommendations received from the commission.

(2) Commission activities

In fiscal 2022, three mediation cases over disputes concerning the provision of wholesale telecommunications services were handled. There were also 11 inquiries handled using the consultation service.

From when the commission was established in November 2001 to the end of March 2023, 72 mediation cases and three arbitration cases were handled, while 11 inquiries to the Minister for Internal Affairs and Communications and three recommendations to the Minister for Internal Affairs and Communications were submitted.

Figure (related data): Mediation handling
URL:https://www.soumu.go.jp/main_sosiki/hunso/case/number.html

Section 3 Radio policy trends

1. Summary

(1) Initiatives so far

Radio waves are a finite and scarce resource widely used to provide services essential to the lives of citizens, such as mobile phones and police and fire services. For this reason, it is necessary to ensure fair and efficient use of radio waves. Specifically, because use of the same frequency in the same area causes interference, radio waves should not be used randomly and require a system to ensure proper use. In addition, because how radio waves propagate and the transmittable quantity of information vary depending on the spectrum, it is necessary to use them for the purposes appropriate for each spectrum. Furthermore, due to their nature to propagate across borders, use of radio waves requires international rules and coordination including treaties. The old Radiotelegraphy Act that stated "radiotelegraphy and wireless telephones shall be administered by the Government" was replaced by the Radio Act, the purpose of which is "to promote the public welfare by ensuring the fair and efficient utilization of radio waves"

(Article 1) in 1950. Since its enactment, Japan has promoted the private sector use of radio waves that are common property of the public. Today, radio waves have become indispensable for people's daily lives. MIC has allocated frequencies under international cooperation and licensed radio stations, and has been making efforts that include: radio wave supervision for good radio use in an environment that is free of interference/jamming; R&D to expand radio resources; and technical examination work for effective radio use.

(2) Future challenges and directions

Radio waves are an essential infrastructure in the era of digital transformation, in which Japan aims to solve issues and enjoy further economic growth by incorporating advanced technologies (such as IoT, big data, AI, and digital technologies necessary for a "new normal") into all industries and sectors of life.

Industries that use radio waves are expected to continue to develop in this era of digital transformation, and demand for radio use will expand exponentially. However, because radio waves are scarce resources shared by all, it is necessary to promote more equitable and efficient use of radio waves in the future.

In addition, the traffic of land mobile stations such as mobile phones continues to increase. In order to comfortably maintain the radio wave usage environment for mobile phones and the like, in addition to the more effective use of the frequency currently used, securing the circumferential wave number such as the sharing of the frequency used for other applications and the development of unused frequencies such as terahertz waves has become a major issue. It is also important to maintain a favorable radio wave usage environment while responding to changes in the circumstances surrounding radio wave usage. Therefore, it is necessary to promote radio surveillance and radio equipment purchase tests in response to new radio wave usage and changes in the distribution of radio equipment.

2. Promotion of effective use of radio waves in the era of digital transformation

(1) Investigation into promoting the effective use of radio waves in the era of digital transformation

Since November 2020, the Ministry of Internal Affairs and Communications has been holding meetings of the "Radio Policy Roundtable in the Age of Digital Transformation: ("roundtable" in this Section)" to discuss the future of radio wave use, issues related to radio wave policy in the era of digital transformation, new target setting for effective radio wave use, and measures to realize them. A report was then prepared in August 2021. The report sets bandwidth targets for four radio systems that will require more bandwidth in the future (mobile phone network systems such as 5G and Beyond 5G, satellite communications and HAPS systems, IoT and wireless LAN systems, and next-generation mobility systems), beginning at the end of fiscal 2020. The goal is to add approximately 16 GHz by the end of fiscal 2025 and then approximately another 102 GHz by the 2030s. The report also recommends several policies for making effective use of radio waves in the era of digital transformation: (1) introduce and popularize wireless systems required for the era of digital transformation, (2) verify and allocate the effective use of frequencies, (3) make effective use of public frequencies, (4) monitor and supervise radio waves in the era of digital transformation, and (5) review the radio wave usage fee system. In 2022, two follow-up roundtable were held to report on the progress of each initiative based on the recommendations made in the report.

(2) Measures to promote the effective use of radio waves

a Partial revision of the Radio Act

Based on the recommendations in the report released by the roundtable, the Act to Partially Amend the Radio Act and the Broadcasting Act was passed in June 2022 in order to promote the fair and efficient use of radio waves. The act includes strengthening the functions of the Radio Regulatory Council, establishing a system to reallocate frequencies for mobile phones and other devices, and reviewing the radio wave usage fee system, and was enacted in October of the same year (with some provisions excluded). The major amendments to the Radio Act are as follows.

- Strengthening the functions of the Radio Regulatory Council

  Until now, the Minister for Internal Affairs and Communications has evaluated the effective use of radio waves ("effective use evaluations") based on the results of the radio wave usage surveys. Now, the Radio Regulatory Council, which consists of members with extensive experience and knowledge, will conduct these evaluations in order to ensure that evaluations are conducted more appropriately in response to advanced technology.

- Establishing a system to reallocate frequencies for mobile phones and other devices

  Frequencies used by base stations for telecommunications business (for devices such as mobile phones) can now be reallocated when the results of an effective use evaluation conducted by the Radio Regulatory Council do not meet certain criteria, or when the Minister for Internal Affairs and Communications deems it necessary to conduct a reallocation examination based on a request for competition. A decision was also made to assign responsibility to authorized developers when installing special base stations in locations other than locations noted in authorized plans, and for information related to ensuring the fair use of radio waves to be added to development guidelines.

- Reviewing the radio wave usage fee system

  Radio wave usage fees will be revised for the next three years (fiscal 2022 to fiscal 2024) by taking into account the total cost of radio wave work benefiting the public good along with the expected state of radio stations. It will also be possible to provide subsidies for research and development leading up to implementing Beyond 5G with regard to how radio wave usage fees are utilized.

b Investigation into method for transitioning smoothly for reallocation

Based on the recommendations in the report released by the roundtable, the "Task Force on Smooth Transitioning of Mobile Phone Frequencies for Reallocation" began meeting in February 2022 with the aim of further examining issues involved in reallocating frequencies, and prepared a report in December of the same year. There have already been reallocation requests for the so-called platinum band, and the report takes this into consideration in proposing a concept for the transition period as well as how much the transition should cost and who should pay for it, in the event that a competitive application is filed and development guidelines are determined. In order to improve systems related to matters indicated in this report, the Ordinance for Enforcement of the Radio Act was partially revised in March 2023 with regard to matters to be taken into consideration in determining whether guidelines must be established and measures to be taken when the standard transition period is exceeded.

c Initiatives to make effective use of public frequencies

Considering the fact that the recommendations of the report released by the roundtable confirmed the direction of efforts to take toward making effective use of frequencies (either to discard, transition, share frequencies, or using digital technologies) with regard to radio stations used for the public good and operated by the state (relevant ministries and agencies) and that progress would need to be monitoring on a yearly basis, the Public Frequencies Working Group followed up with relevant ministries and agencies (including conducting interviews) from March to June 2022 and confirmed that efforts by relevant ministries and agencies had overall made appropriate progress.

Following the revision of the Radio Act in June of the same year, the Radio Regulatory Council reached a decision to continue to conduct surveys to confirm the progress of systems of relevant ministries and agencies, and to conduct effective use evaluations.

(3) Investigation into 5G business design and new allocation methods

In order to investigate Japan's new allocation method for mobile phone frequencies, the "Review Committee for New Mobile Phone Frequency Allocation Method" began meeting in October 2021, and released the "Summary of the Review Committee for New Mobile Phone Frequency Allocation Method" in November 2022. In this summary, it was deemed appropriate to continue to consider allowing "conditional auctions" for high-frequency bands such as millimeter wave, in order to lead to innovation and the creation of new services.

Based on this summary, the "5G Business Design Working Group" working under the roundtable has been meeting since January 2023 to investigate measures to expand 5G business utilizing high-frequency bands such as millimeter wave (which will play a central role in future allocation to 5G), as well as the design of a "conditional auction" system as a new allocation method contributing to this goal. In February of the same year, the working group organized its "Allocation Method Investigation Task Force" with the aim of investigating selection conditions (comprehensive evaluation method and conditional auctions) for the 5G frequency allocation method as well as specific system design for conditional auctions. It is now engaged in discussions to release a summary in the summer of the same year.

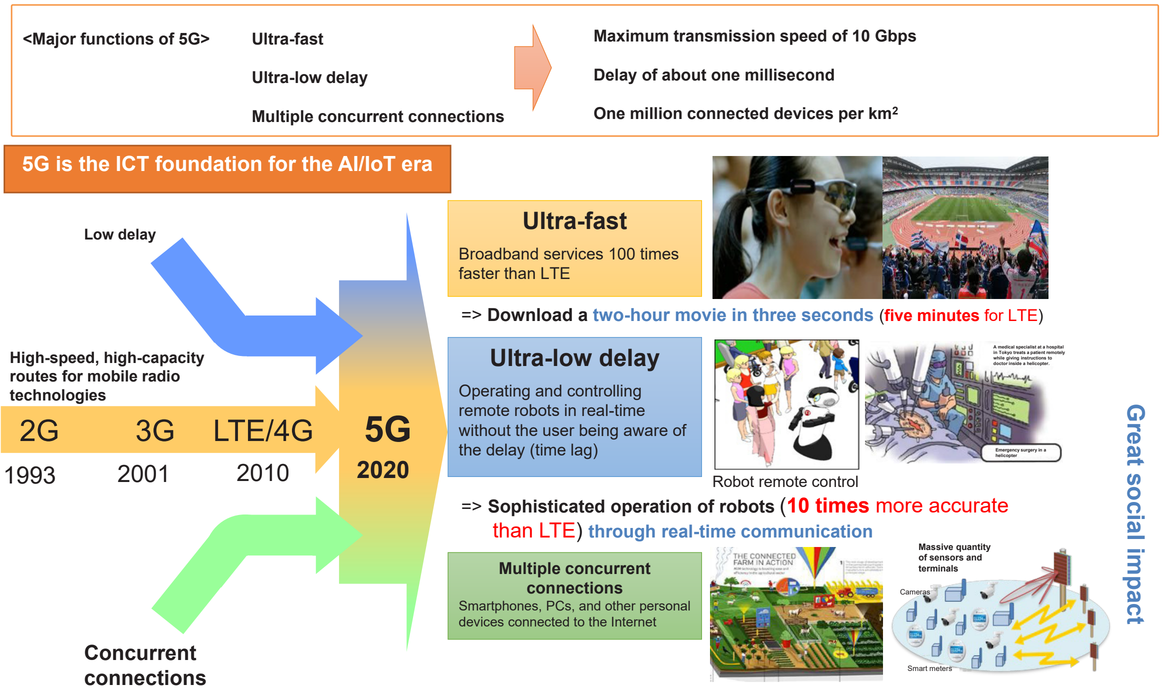
3. Spread and development of 5G and B5G

(1) Spread and development of 5G based on the Digital Garden City Nation Infrastructure Development Plan

a Formulation of the "Master Plan for Regional Development of ICT Infrastructures"

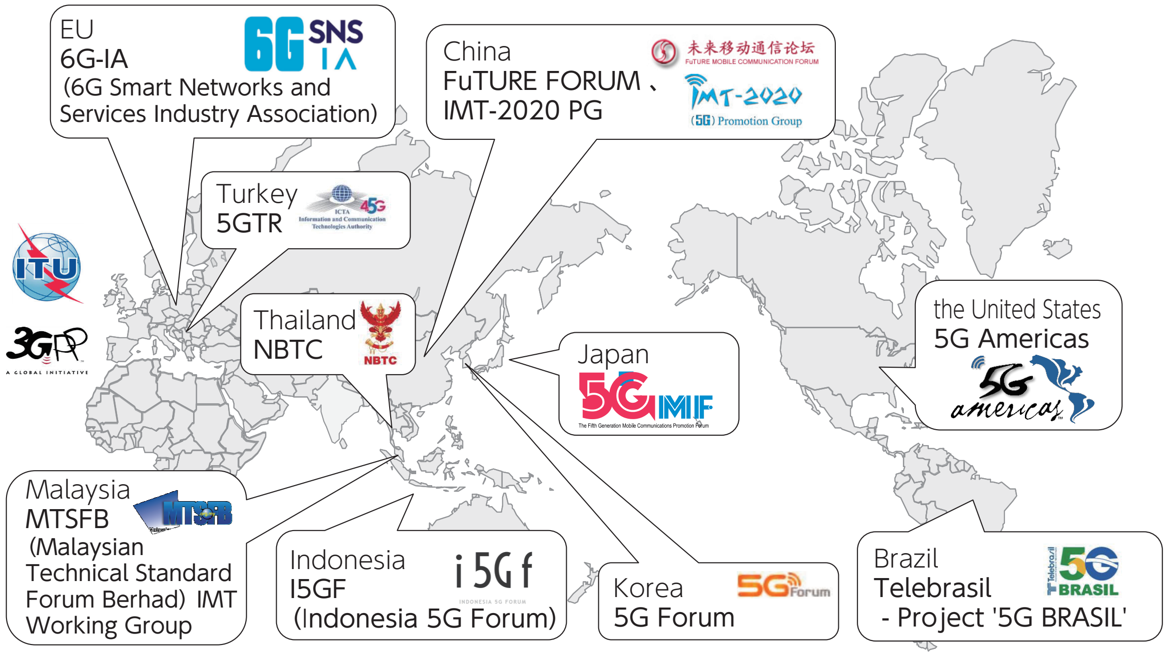
In addition to even higher speeds than 4G, 5G offers a range of features including ultra-low latency to allow robots to operate smoothly even in remote areas, and multiple simultaneous connections to connect multiple devices to a network simultaneously (**Figure 5-3-3-1**). For this reason, 5G holds great promise as an essential infrastructure for realizing an IoT society in which all things are connected to the Internet. In fact, specific initiatives utilizing 5G are already being promoted in various regions and fields, such as autonomous driving of tractors, inspecting products using AI-based image analysis, and controlling construction machinery remotely.

Figure 5-3-3-1 5G features



Recognizing that 5G will serve as a global infrastructure for economy and society, the Ministry of Internal Affairs and Communications is actively contributing to the efforts of the International Telecommunication Union (ITU) to standardize 5G, and is striving to strengthen international cooperation with Western and Asian countries (**Figure 5-3-3-2**). In order to make integrated and effective use of measures to support the development of ICT infrastructures (including 5G) and measures to promote the use of 5G, and to deploy other ICT infrastructures throughout Japan as soon as possible, in June 2019 MIC formulated a master plan for regional development of ICT infrastructures leading up to fiscal 2023, then revised it in July and then again in December 2020.

Figure 5-3-3-2 Organizations promoting 5G in each country/region



b Formulation of "Digital Garden City Nation Infrastructure Development Plan"

In light of Prime Minister Kishida's announcement in December 2021 that 5G coverage would be increased to 90% by fiscal 2023 in order to realize the Digital Garden City Nation Concept, the Ministry of Internal Affairs and Communications requested mobile carriers at the end of the same month to continue to develop 5G base stations and to prepare and submit plans on the number of 5G base stations and 5G coverage by fiscal 2025. Based on these plans, MIC formulated and announced the "Digital Garden City Nation Infrastructure Development Plan" on March 29, 2022, as a follow-up to the "Master Plan for Regional Development of ICT Infrastructures" (the development plan was revised on April 25, 2023 in consideration of changes in the social situation since then).

Serving as a policy for the development of 5G, this infrastructure development plan describes a two-phase strategy aimed at achieving the world's most advanced 5G environment. The first phase calls for the nationwide development of 5G infrastructures (4G and 5G master stations), while the second phase calls for the regional development of slave stations and the expansion of area coverage nationwide (**Figure 5-3-3-3**). During the first phase, the aim is to bring 4G to all residential areas and deploy master stations nationwide to serve as the basis for deploying 5G in nearly all areas of demand. During the second phase, the aim is to have 95% of the population covered by 5G nationwide by the end of fiscal 2023 (up from 30% as of the end of fiscal 2020), and 5G base stations in all municipalities. By the end of fiscal 2025, the aim is to have 97% of the population covered nationwide and 90% or more in each prefecture. The aim is to reach 4G and 5G road (highways and national roads) coverage of 99% (100% for highways) by the end of fiscal 2030, in order to improve non-residential areas. Some concrete measures to achieve this goal include allocating new frequencies for 5G such as the 2.3 GHz band, revising the Radio Act to establish responsibility for installing base stations, supporting the installation of 5G base stations in disadvantaged areas through subsidies under the "Mobile Phone Area Development Project," providing support through tax measures, and promoting infrastructure sharing **(Figure 5-3-3-4)**.

In order to allow wireless and IoT solutions that meet local needs to be implemented throughout society in a manner that brings residents convenience, MIC is promoting the development of regional digital infrastructures that flexibly combine various wireless systems including local 5G, and the practical application of advanced solutions that utilize these digital infrastructures. For example, MIC will promote the development of digital infrastructures in cooperation with relevant ministries, agencies, and local governments, in conjunction with projects involving autonomous driving and drones that are soon expected to be implemented throughout society.

Figure 5-3-3-3 5G development

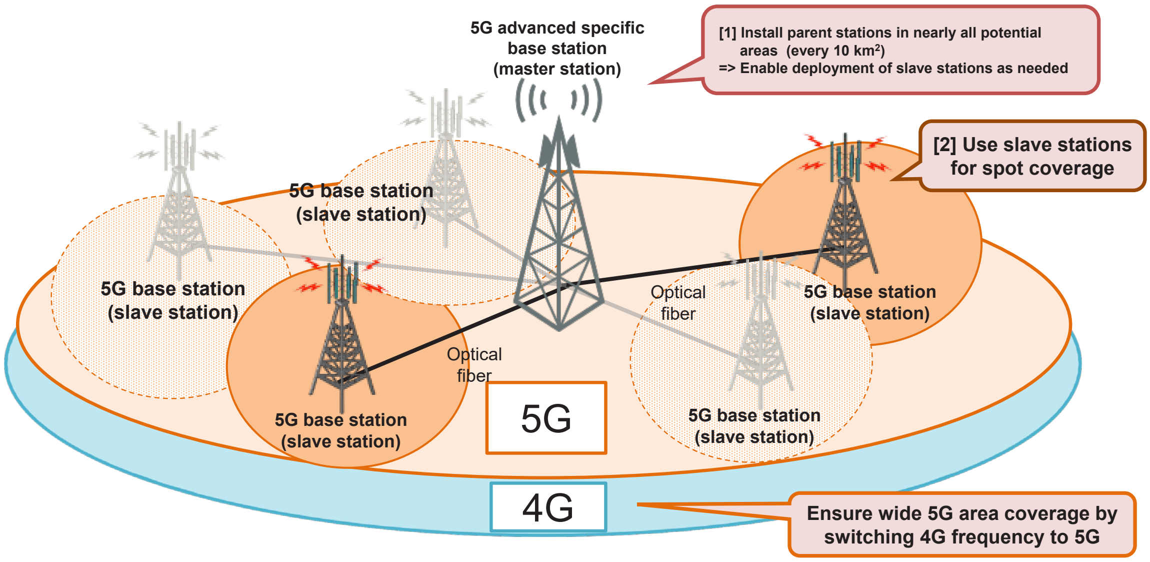
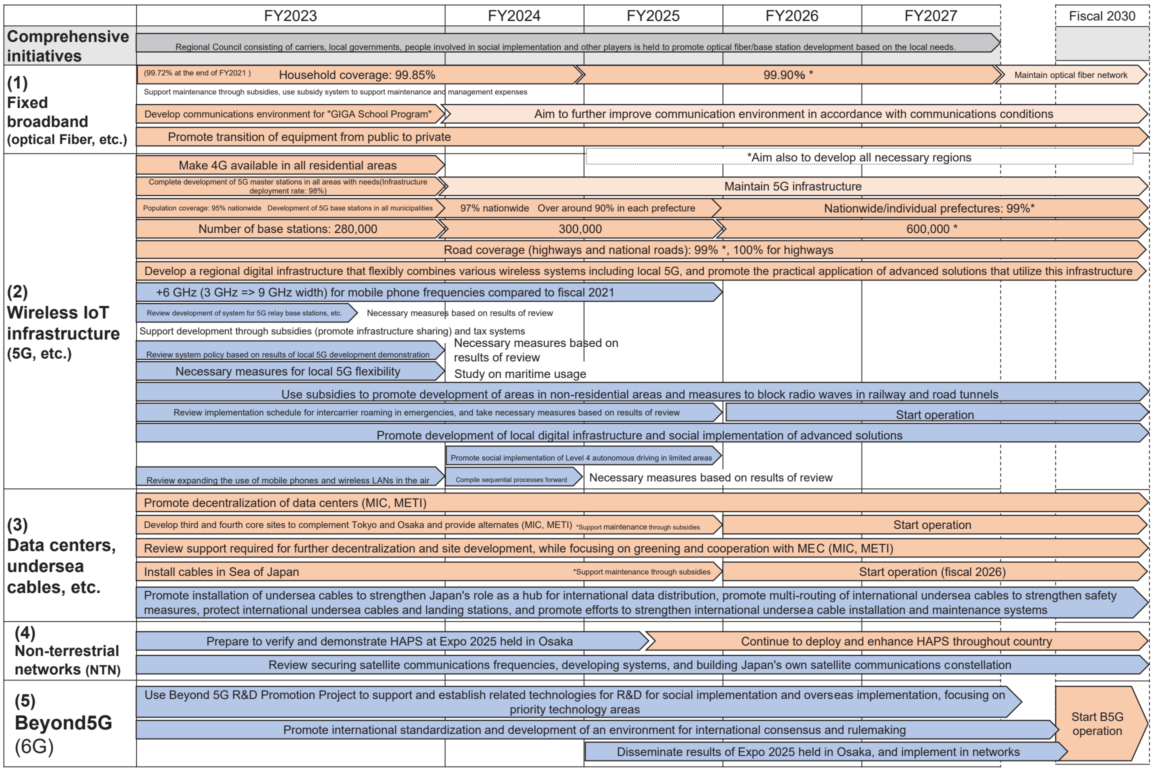


Figure 5-3-3-4 Development of Digital Garden City Nation infrastructure (roadmap)



(2) Beyond 5G

The next generation 5G information and communications infrastructure, "Beyond 5G (6 G)," is expected to serve as the foundation for all industrial and social activities in the 2030s. In June 2020, the Ministry of Internal Affairs and Communications compiled the "Beyond 5G Promotion Strategy - Roadmap to 6G" report, and is currently promoting this strategy in cooperation with relevant ministries and agencies.[1]

[1] Refer to Chapter 5, Section 7, "ICT Technology Policy Trends" for more information on efforts related to Beyond 5G.

4. Promotion of advanced radio use systems

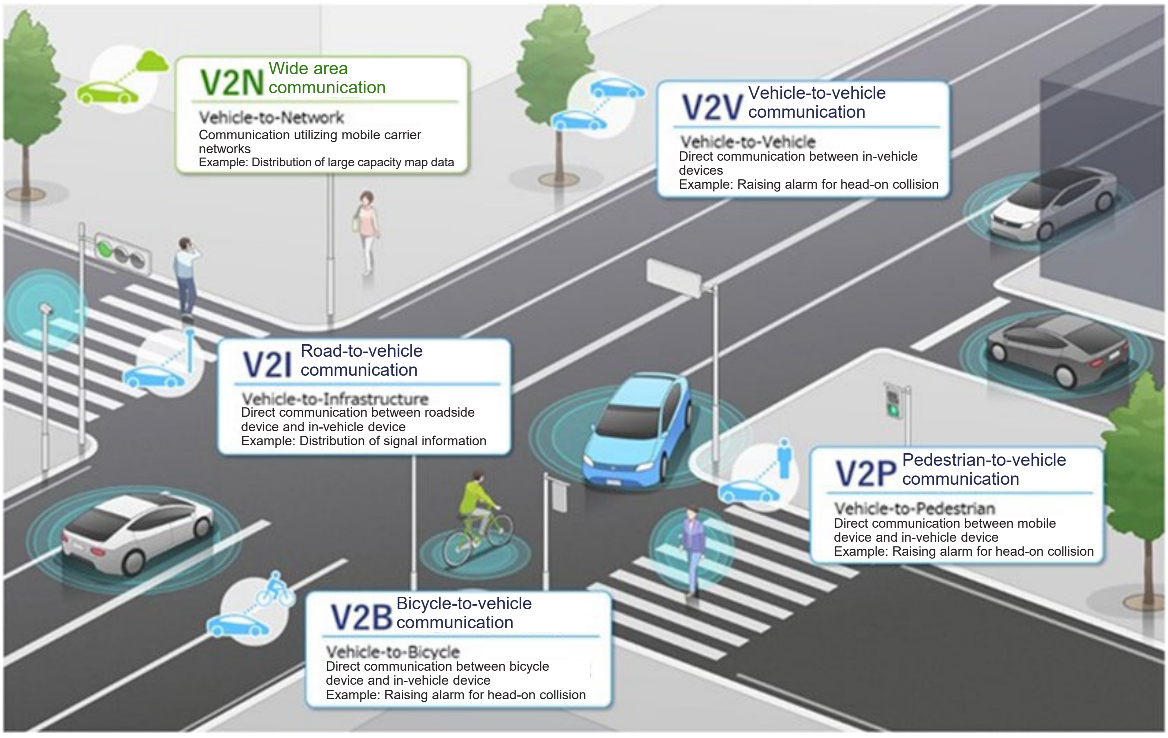
(1) Intelligent transportation systems

Intelligent transport systems (ITS) use information and communications technologies to connect people, roads, and cars, and contribute to the safe and comfortable transportation of people and goods by reducing traffic accidents and congestion.

The Ministry of Internal Affairs and Communications is currently allocating frequencies and establishing technical standards for use in vehicle information and communications systems (VICS), electronic toll collection systems (ETC), in-vehicle radar systems, and 700 MHz intelligent transportation systems, and is also promoting the use of these systems.

Verification and implementation of autonomous driving is currently underway worldwide, though mainly in Europe and the U.S. In addition to in-vehicle sensors such as cameras and radar, vehicle to everything (V2X) communication (which exchanges information with surrounding vehicles and roadside infrastructures), is expected to play an important role in achieving advanced autonomous driving, such as merging/diverging support (**Figure 5-3-4-1**).

Figure 5-3-4-1 V2X communication



Although Japan was the first in the world to develop a practical 700 MHz intelligent transportation system in the form of a V2X communication system in 2015, efforts to verify and implement a V2X communication system utilizing the 5.9 GHz band are now being promoted worldwide. In response, the "Frequency Restructuring Action Plan" (released in November 2022) called for efforts to proceed with investigating the allocation of an additional 5.9 GHz band.

In light of these developments, the Ministry of Internal Affairs and Communications began holding meetings of the "Study Group on Next-Generation ITS Communications for Autonomous Driving" in February 2023, and has been working with relevant ministries and agencies, business operators, and academic experts to investigate how next-generation ITS communications must work for autonomous driving, as well as the types of communications needed to support it. The study group is now preparing to release an interim summary in the summer of 2023.

In order to contribute to the international standardization and overseas development of Japanese ITS technology, MIC is working to submit contributions to the draft reports and recommendations of the ITU Radiocommunication Sector (ITU-R), disseminate information at international conferences such as the ITS World Congress, and spread the development of Japanese technology throughout Asia and the Middle East, with a particular focus on India.

(2) Public Safety LTE

Major public agencies in Japan have individually developed and operated wireless systems specific to their respective operations, so it is not easy for these systems to communicate with each other beyond the framework of the individual agency. These systems are also mainly based on voice due to restrictions on the frequencies that can be allocated and the maintenance costs.

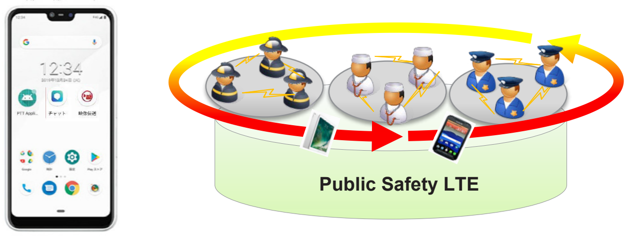
In countries such as the U.S. and the United Kingdom, public safety organizations such as fire and police departments are now utilizing a communications technology used for mobile phones called Long Term Evolution (LTE) to introduce jointly-used mobile communications networks that enable high-speed data communications for applications such as audio and image transmission. "Public Safety LTE (PS-LTE)" is a type of public safety network that utilizes LTE. These networks are expected to contribute to smoother rescue operations by ensuring communication between public safety organizations in the event of a terrorist attack or major disaster. The technology is also said to reduce device costs due to using globally standardized technology.

For this reason, the Ministry of Internal Affairs and Communications has been working toward implementing PS-LTE in Japan (**Figure 5-3-4-2**) since fiscal 2019. In cooperation with relevant organizations, MIC will continue to examine the functions required for implementing PS-LTE in Japan and consider how to implement the technology in society, in order to implement PS-LTE as soon as possible.

Figure 5-3-4-2 Implementation of Public Safety LTE

PS-LTE

- Can use mobile phone (LTE) technology to send and receive audio, images, and videos.
- Can use commercial mobile phone networks and general-purpose smartphone devices, and technical hurdles for interconnection between different institutions are low.



(3) Non-terrestrial networks

Non-terrestrial networks (NTN) such as HAPS and satellite communications are mobile communications networks that are not limited to the earth, but connect everything from sea, air, and space in multiple layers. They are useful for ensuring efficient coverage over remote islands, seas, and mountainous areas, and for building redundancy into terrestrial networks including submarine cables to prepare for emergencies such as natural disasters. The Ministry of Internal Affairs and Communications is currently engaged in efforts to promote the introduction of services in Japan beginning in fiscal 2025, based on the "Digital Garden City Nation Infrastructure Development Plan" (which was formulated in March 2022 and then revised in April 2023).

For HAPS, MIC will promoteto the formulation of international rules (such as expanding the number of available frequencies) and develop domestic systems, and also plan to expand overseas operations through verification and demonstration efforts at Expo 2025 held in Osaka. As for satellite communications, systems required to install Ku-band non-geostationary satellite communications systems have already been developed, MIC will continue to ensure sufficient frequencies and promote the installation of required systems.

(4) Spatial transmission wireless power transmission systems

Spatial transmission wireless power transmission systems transmit power over a distance of several meters by transmitting and receiving radio waves, without any wires required. They are expected to be used to power supply to sensor devices in factories. These systems supply low power without any need to connect charging cables or replace batteries. In addition to being more convenient, this brings more flexibility when installing sensor devices, and is expected to help realize Society 5.0 through the use of IoT.

The Ministry of Internal Affairs and Communications has been conducting studies on the sharing of frequencies with other wireless systems, radio wave safety, technical conditions, and the establishment of systems to make operation and coordination easier, with the goal of bringing these systems into practical use. Based on these studies, a system was developed in May 2022 for indoor use as an on-premises radio station using three frequency bands (920 MHz, 2.4 GHz, and 5.7 GHz), that meets certain requirements.

5. Promotion of overseas development of radio systems

Technologies and systems such as radio wave monitoring systems are playing an increasingly important role in ensuring the safe and secure use of radio waves. The importance of these technologies and systems is now recognized in Southeast Asia and other regions where the use of radio waves is rapidly expanding. Japan will need to contribute to the international community by developing radio systems with superior technology for use overseas, and will need to develop Japanese wireless infrastructures and services into a promising business that is competitive globally, leading to further growth of the domestic economy.

With this in mind, MIC is promoting strategic efforts in cooperation with the public and private sectors in order to expand the use of advanced Japanese radio systems globally and particularly throughout Asia. More specifically, in order to ensure that technologies with high-frequency utilization efficiency that match frequencies used in Japan are established as international standards due to their international superiority, MIC has implemented the “International Coordinated Use of Frequencies Promotion Project” to promote the international use of such technologies. MIC is also conducting surveys on technology trends in Japan and overseas, conducting verification experiments overseas, dispatching public-private missions, and making use of personnel exchanges at the technology user level. In light of the growing global demand for safe, secure, and reliable ICT infrastructures, the Ministry of Internal Affairs and Communications plans to intensively expand Japanese 5G network solutions overseas through Open RAN and vRAN over the next three years. MIC continues to promote open 5G standards though such means as proposing 5G models that take actual needs into consideration, based on the results of using 5G domestically (including local 5G)

In order to promote open base station specifications through Open RAN in Japan and overseas, the Ministry of Internal Affairs and Communications continued to conduct technology tests until fiscal 2022 to investigate interconnectivity and technical standards of base stations composed of base station equipment (RU, DU, and CU) from different vendors. Finally, “Japan OTIC,” a base for testing and certification in accordance with O-RAN Alliance standards, was established at Yokosuka Telecom Research Park in December 2022 by several domestic telecom operators, in order to promote the Open RAN ecosystem in Japan with a view to overseas deployment.

6. Development of radio wave usage environments

(1) Promotion of bioelectromagnetic environment measures

The Ministry of Internal Affairs and Communications is promoting the development of environments in which radio waves can be used safely and securely.

In order to prevent radio waves from causing undesirable effects on the human body, the "Radio Protection Guidelines[2]"was established. Part of these have been established as safety standards concerning the strength of radio waves under the Radio Act. These are guaranteed to be equivalent to international guidelines, and reflect the results of long-standing investigations[3] into radio safety. Previous studies have not confirmed the causal relationship between radio waves at levels below these safety standards and their effects on health. The Ministry of Internal Affairs and Communications continues to educate the public about the safety of radio waves through phone inquiries, information sessions, and leaflets.[4]

In order to prevent radio waves emitted from devices from affecting medical devices, MIC conducted a research study on the effects of radio waves on medical devices[5] each year. In fiscal 2022, MIC measured the effect of radio waves (3.7 GHz, 4.5 GHz, and 28 GHz) from 5G mobile phone devices on medical devices used in the home environment, nursing homes, and medical institutions. The results of the study so far have been published as "Guidelines for Preventing Radio Waves from Affecting Implantable Medical Devices[6].“ The use of radio waves in medical institutions continues to expand, so MIC also hold information sessions on precautions for various technologies (including medical telemeters, mobile phones, and wireless LANs), and on how to deal with radio waves. These are distributed on demand to inform medical workers and others about the safe and secure use of radio waves. As a related initiative, MIC began implementing a project to block radio waves in medical facilities in fiscal 2017 through the ”Subsidy for Wireless System Usage and Support Project,“ and have been developing environments where mobile phones can be used safely and securely in medical facilities (**Figure 5-3-6-1**).

---

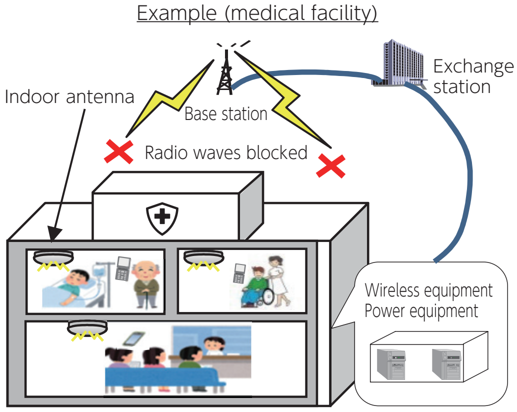
[2] Radio wave protection guidelines: https://www.tele.soumu.go.jp/j/sys/ele/medical/protect/
[3] Radio wave safety research at the Ministry of Internal Affairs and Communications: https://www.tele.soumu.go.jp/j/sys/ele/seitai/index.htm
[4] Radio wave safety efforts: https://www.tele.soumu.go.jp/j/sys/ele/index.htm
[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

Figure 5-3-6-1 Project to block radio waves in medical facilities

[Burden breakdown]

Government	Medical institution	General incorporated association, etc.
1/3	1/6	1/2

*Does not apply to the portion of the burden other than that of the government, depending on the management status of the medical institution or organization.



(2) Promotion of measures against electromagnetic interference

With the spread of various electrical and electronic devices, it is necessary to take measures to protect wireless usage from unwanted radio waves emitted from various devices and facilities. For this reason, the "Radio Use Environment Committee[7]" established by the Information and Communications Technology Subcommittee of the Information and Communications Council investigates and reviews measures against electromagnetic interference, and contributes to deliberations on international standards by the Comité International Spécial des Perturbations Radioélectriques (CISPR). In response to a report by the Information and Communications Council, the Ministry of Internal Affairs and Communications has been working to eliminate wireless equipment interference caused by unnecessary radio waves and to prevent interference with electrical and electronic devices, by promoting standardization in Japan.

As an example of an international activity related to CISPR, Japan is now actively investigating technologies to prevent radio waves leaking from wireless power transmission systems for electric vehicles from jamming existing radio stations, as investigations into international standards for wireless power transmission systems used in electric vehicles (EVs), multimedia devices, and home appliances are now in full swing.

As an example of a domestic activity related to CISPR, MIC is investigating national standardization with regard to revising various CISPR standards, and have received several partial reports from the Information and Communications Council in February 2022 ("Wireless Frequency Interference Wave and Immunity Measurement System Technical Conditions: Auxiliary Equipment - Conducted Emission Measurement," "Wireless Frequency Interference Wave and Immunity Measurement System Technical Conditions: Conducted Emission Measurement," and "Wireless Frequency Interference Wave and Immunity Measurement System Technical Conditions: Radiated Emission Measurement").

(3) Prevention of radio jamming and interruption

In order to eliminate jamming and interference and maintain a favorable radio wave usage environment as new radio wave usage including fifth generation mobile phones (5G) expands, the Ministry of Internal Affairs and Communications continues to monitor radio waves to eliminate jamming and interference, and is strengthening measures against the distribution of wireless and equipment that could cause these issues.[8]

More specifically, public awareness-raising activities are being conducted to prevent general consumers from violating the Radio Act by purchasing or using wireless equipment that is not compliant with technical standards (in other words, establishing an illegal radio station), and to prevent jamming and interference of other radio stations. Since fiscal 2013,MIC has been purchasing wireless equipment that is widely available on the market (such as through the Internet), measuring the strength of their radio waves to determine whether they conform to the standards set forth in the Radio Act, conducting annual "wireless equipment purchase tests," and publicizing the results[9] for the benefit of general consumers.

Manufacturers, distributors, or importers of wireless equipment determined to be noncompliant as a result of testing are required to ensure that they deal only with wireless equipment that complies with technical standards and to refrain from selling noncompliant equip-

[7] Radio Use Environment Committee: https://www.soumu.go.jp/main_sosiki/joho_tsusin/policyreports/joho_tsusin/denpa_kankyou/index.html
[8] Overview of MIC The Radio Use Web Site: https://www.tele.soumu.go.jp/j/adm/monitoring/index.htm
[9] Results of wireless equipment purchase tests: https://www.tele.soumu.go.jp/j/adm/monitoring/illegal/result/

ment. In fiscal 2020, MIC formulated the “Guidelines to Prevent the Distribution of Wireless Devices Noncompliant with Technical Standards,” and are now promoting efforts to prevent the distribution of noncompliant equipment by clarifying efforts required of wireless equipment manufacturers and other companies, as well as voluntary efforts made by e-commerce companies.

Section 4 Trends in Broadcasting Policy

1. Summary

(1) Initiatives so far

Broadcasting is a basis of democracy. It has fulfilled the role of social capital to share disaster information, community information, and other basic social information.

Television broadcasting switched completely from analog to digital at the end of March 2012. Since then, broadcasting services have been upgraded with HD quality and data broadcasting. In order to promote 4K/8K broadcast services with higher definition and picture quality even compared with HD, MIC, in cooperation with broadcasters, home appliance manufacturers, and others, implemented necessary projects following a roadmap revised in July 2015, so that many people across the country could enjoy the 2021 Tokyo Olympic and Paralympic games through lively and powerful 4K/8K pictures.

The overseas expansion of content is expected to have a large ripple effect, such as an increase in the number of foreign visitors to Japan and an increase in exports of agricultural, forestry, fishery, and regional products, as Japan's appeal spreads overseas through content. MIC has promoted efforts to expand broadcast content overseas in cooperation with relevant ministries, agencies, and organizations.

Furthermore, with focus on radio broadcasting, the usefulness of which was recognized when earthquakes occurred, MIC has promoted initiatives that contribute to the resilience of broadcasting networks, which includes countermeasures against poor reception of radio broadcasting and protection of transmitting equipment from disasters so that broadcasting can continue to appropriately provide people with disaster information and other information. In order to equalize information access opportunities through broadcasting, MIC has promoted the spread of broadcasting for the visually challenged and those with hearing impairments by formulating “Guidelines for Information Accessibility in Broadcasting” and other measures.

Both a “receiver” and “sender” are important for broadcasting programs, so MIC has been working to improve literacy in broadcast media, especially for elementary, junior high, and high school students, and has been developing, disseminating, and lending educational materials.

(2) Future challenges and directions

With the spread of broadband, the growth of Internet video streaming services, and the diversification of viewing devices, the environment surrounding broadcasting has changed drastically, with how viewers view content changing and increasingly shifting away from television. As viewers increasingly obtain information not only from broadcasting but also from the Internet, advertising costs for terrestrial television broadcasts may continue to decline in the long term, requiring structural changes to be made. Meanwhile, issues such as fake news are also emerging in Internet spaces. It is important to ensure information health, and broadcasting plays an important role in disseminating reliable information, guaranteeing freedom of knowledge, sharing basic social information, and promoting a mutual understanding of diverse values. In fact, expectations for its role are increasing in this digital age.

In response to these changes, it is necessary to tackle issues including strengthening the foundation of broadcasting businesses, promoting the distribution of broadcast content, and strengthening the resilience of broadcasting networks and their disaster resistance, while at the same time considering how broadcasting and broadcasting systems should function from a medium-to-long term perspective.

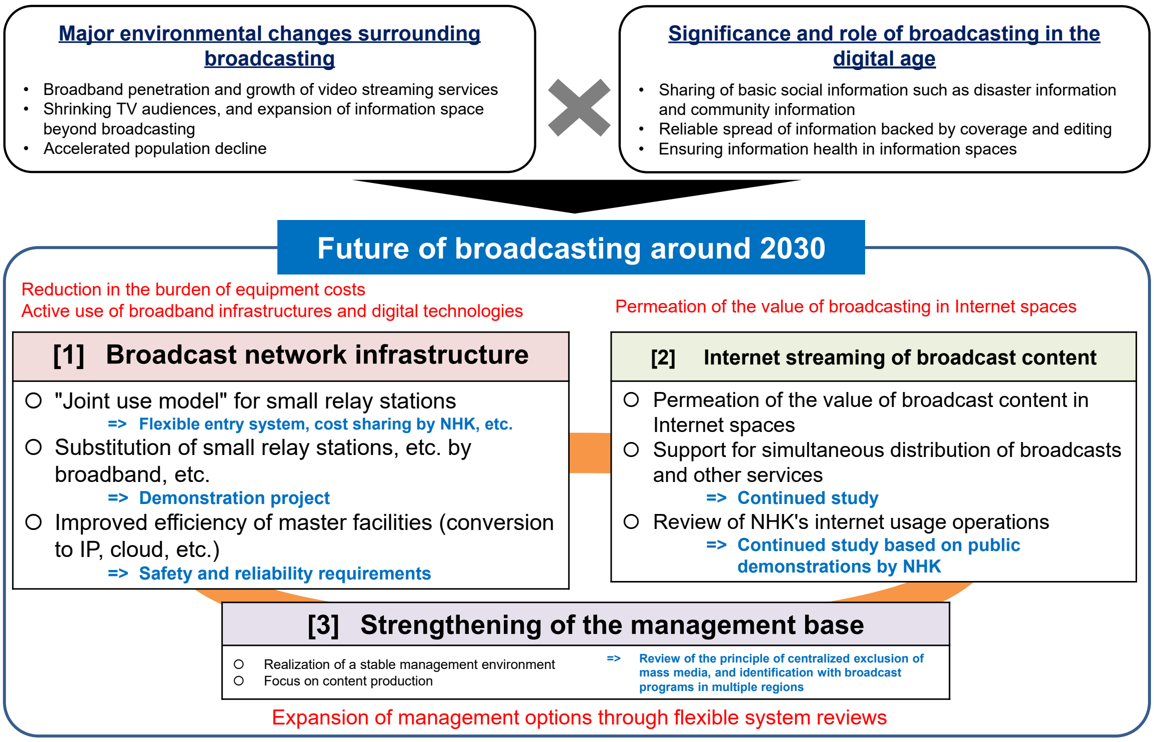
2. Consideration of how the broadcasting system should function in the digital age

In order to examine the future of broadcasting and how the broadcasting system should function as times change over the medium-to-long term in order to increase management options instead of being trapped in the existing framework, MIC held the “Study Group on the Ideal Broadcasting System in the Digital Age” (“Broadcast System Study Group”) in November 2021, and published its “Summary of the Future of Broadcasting and the Ideal Broadcasting System in the Digital Age” in August 2022 [1](**Figure 5-4-2-1**). This report proposes three main issues: (1) the future of the broadcast network infrastructure, (2) how to distribute broadcast content on the Internet, and (3) strengthening the management foundation of broadcasters. Based on the recommendations of this report, the Act Partially Amending the Broadcast Act and Radio Act was enacted in May 2023 (Act No. 40 of 2023) to establish a system for domestic basic broadcasters in multiple broadcasting re-

[1] “Summary of the Future of Broadcasting and the Ideal Broadcasting System in the Digital Age” (August 5, 2022): https://www.soumu.go.jp/menu_news/s-news/01ryutsu07_02000236.html

gions to simultaneously broadcast the same program under certain conditions and to take measures such as enabling multiple specified terrestrial basic broadcasters to jointly use relay station equipment in a single broadcasting region. MIC will make preparations for its smooth implementation, and will continue to study ways to replace small-scale relay stations with broadband and other services and to promote broadcast content policies and distribution.

Figure 5-4-2-1 Overview of report by the "Study Group on the Ideal Broadcasting System in the Digital Age" (published on August 5, 2022)



3. Future vision of public broadcasting

Based on the report of the Broadcast System Study Group, the "Public Broadcasting Working Group" has met since September 2022 to discuss how NHK should distribute content on the Internet. Specific discussions are now underway on several topics, including (1) the role of public broadcasting in the Internet era, (2) how public broadcasting should utilize the Internet, (3) how to cooperate with private broadcasters on using the Internet, and (4) how to finance Internet utilization and the subscription fee system. Based on discussions at the working group, MIC will consider how to implement public broadcasting in response to the demands of the times.

4. Strengthening of the foundation of broadcasting businesses

(1) Initiatives regarding AM radio broadcasting

Much of the AM transmission equipment used by private AM radio broadcasters is more than 50 years old, and deterioration has become a serious issue. Meanwhile, private AM radio broadcasters have been burdened with costs related to both AM and FM equipment due to the launch of FM complementary broadcasting, which was introduced for the purpose of eliminating poor reception of AM radio broadcasting. Due to decreasing business revenue, paying to update this AM radio broadcast equipment has become an issue for management.

In light of these severe business conditions, when private AM radio broadcasters consider changing from AM to FM broadcasting (FM conversion) or abolishing AM broadcasting relay stations without going through FM conversion, MIC will establish a special measure to allow AM stations to be suspended for a period of six months or longer during the simultaneous relicensing of broadcasters in November 2023. In March 2023, MIC published its "Basic Policy on Special Measures Pertaining to Suspension of Operation of AM Stations," which describes information such as the details, requirements, and procedures related to these special measures, and now plans to examine the impact of the suspension of AM stations on residents and local governments based on the application of special measures.

(2) Strengthening of efforts to spread new 4K8K satellite broadcasting

The "Report by the Working Group on the Future Image of Satellite Broadcasting" (**Figure 5-4-4-1**) released in October 2021 covers several issues to tackle in the future, including (1) improving the reception environment to spread new 4K8K satellite broadcasting and enhance 4K content, (2) utilizing vacant spectrums of BS dextrorotation and unused spectrums of BS levorotation, and (3) reducing the infrastructure usage fee and flexible platform operation in response to changes in the business environment.

Based on this recommendation, MIC published its "Basic Concept of Allocating Vacant Bandwidth of BS Dextrorotation to 4K Broadcasting Based on the Report of the Working Group on the Future Image of Satellite Broadcasting" in August 2022. It summarizes concepts such as the following:

- If a certain amount of vacant bandwidth can be ensured for BS dextrorotation, it would be appropriate to allocate the bandwidth to 4K broadcasting in order to popularize 4K broadcasting
- It is appropriate to position 4K and other ultra-high definition television broadcasting as transmission lines, similar to dextrorotation and levorotation
- Bearing in mind the possibility of operators voluntarily advancing the sophistication of the video coding system for 2K broadcasting, an environment that allows 2K and 4K broadcasting to coexist in the same transponder could be developed following necessary verification

Based on this basic concept, MIC revised its basic broadcasting dissemination plan in November 2022, and then in March of the same year launched an open call for satellite broadcasters to broadcast in 4K through BS dextrorotation (by the end of May), with the aim of being certified by around the summer of 2023. In cooperation with groups such as broadcasters, manufacturers, and relevant organizations, MIC will continue to work toward further enhancing and expanding 4K broadcasting.

Figure 5-4-4-1 Summary of the report by the Working Group on the Future Image of Satellite Broadcasting

Current state and challenges

- ○ After the start of the "new 4K8K satellite broadcasting" in December 2018, the number of receivers that can receive the broadcasting reached 10.3million in total. (*) However, there is a need for further promotion of improvement in reception environments, enhancement of 4K content and public relations targeting viewers. *As of the end of August 2021.
- ○ Some vacant spectrums are expected in BS dextrorotation in the future. In addition, there are still significant unused spectrums in BS and CS levorotation
- ○ Due to the spread of online video streaming and the impact of the COVID-19 pandemic, the business environment of broadcasters is increasingly severe. In this contest, there is a new task to reduce their burden of usage fee of infrastructure including satellite relay units.

Tasks to be tackled in the future

1. Popularization of the new 4K8Ksatellite broadcasting

(1) Improvement of the reception environment
Promote the following initiatives in industry-government collaboration
[1] Strengthen public relations regarding reception methods
○ Publicity considering the difference in reception environment between dextrorotation and levorotation
○ Publicity for utilization of services using cable television and optical communication link
[2] Support for facility modification
○ Project to improve the environment for reception of satellite broadcasting
○ Project to promote conversion of cable television networks to fiber optics
[3] Development of simple modification methods using new technologies
○ Use of plastic optical fiber (POF) and local 5G
(2) Enhancement of 4K contents
[1] It is essential to enhance both quality and quantity of pure 4K content
[2] Promote public relations with strong customer appeal

2. Promotion of effective use of frequencies

(1) Utilization of vacant spectrums of BS dextrorotation
[1] When certain vacant spectrums are secured in the future, the spectrum will be allocated to 4Kbroadcasting to spread the broadcasting
[2] Establish necessary systems for allocation
○ Revision of the basic broadcasting dissemination plans
○ Putting together an approach to cost allocation
(2) Utilization of unused levorotation spectrums
[1] Improve the reception environment steadily.
[2] Consider possibilities of use for new services other than 4K8K broadcasting
○ Verification of technical feasibility of using the HEVC method for 2K broadcasting

3. Response to changes in the business environment

(1) Reduction in burden of infrastructure usage fee
[1] Infrastructure operators (B-SAT and SKY Perfect JSAT) make efforts to lower the usage fee by reviewing their cost structure.
○ Streamlining of systems, minute examination of the operation costs
○ Joint operation /use of earth station equipment, etc.
○ Consideration of hybrid satellite procurement
[2] Setting up a place for opinion exchange of infrastructure operators, broadcasters, etc.
(2) Flexible platform operation
○ It is necessary for pay broadcast management business (SKY Perfect JSAT) to promptly and flexibly respond to changes in the market environment, which includes revision of th ePlatform Guideline.

5. Promotion of the production and distribution of broadcast content

(1) Promotion of the production and distribution of broadcast content

a Initiatives to effectively distribute broadcast content and other programs on the Internet

The report of the Broadcast System Study Group mentioned that it is important to reduce the equipment burden on local stations and other broadcasters and to create an environment in which they can focus on content production.

In order to create such an environment, it is necessary to continue to promote the distribution of broadcast content on television and the Internet so that it can be viewed more widely, in addition to promoting the production of content by broadcasters. In particular, local broadcasters are expected to play a major role in the dissemination of community information.

As the environment surrounding broadcasting changes, such as the expansion of Internet video streaming services and the diversification of how content is viewed, Japan's broadcast content must be widely distributed in Japan and overseas by promoting the use of various platforms on the Internet including broadcasting, in order for broadcasting to continue to play its role as a social infrastructure.

With this in mind, the “Working Group on Promoting the Production and Distribution of Broadcast Content” has been meeting since December 2022 under the Broadcast System Study Group. The working group has been studying measures to promote the production and distribution of broadcast content in the Internet era with the cooperation of related business operators and others.

b Utilization of viewing data in the broadcasting field and how privacy should be protected

By collecting and analyzing the viewing history and other information about broadcast programs from television receivers connected to the Internet, for example, programs can be produced that closely match the detailed viewing needs of viewers in each region and disaster information can be provided. However, there is a problem in that it is technically possible to derive sensitive personal information including political beliefs and medical history of individual viewers.

Considering the public nature of broadcasting, MIC has established rules specific to the broadcasting field, which should be observed by every person handling personal information of broadcast recipients and others in the “Guidelines on Personal Information Protection of Broadcast Recipients etc.” in addition to the minimum rules under the Act on the Protection of Personal Information. The “Study Group on the Utilization of Viewing Data in the Broadcasting Field and the Ideal State of Privacy Protection” has also been meeting since April 2021. The study group revised these guidelines in 2022 and 2023 based on the revised Act on the Protection of Personal Information, and has been discussing appropriate rules for handling the distribution history of broadcast content on the Internet, in addition to appropriate rules on handling viewing data collected in the process of broadcasting, in order to develop rules that balance data utilization and privacy protection.

c Facilitating the processing of rights pertaining to simultaneous distribution of live broadcast programs

In response to changes in the viewer environment due to the spread of smart devices, broadcasters are advancing online simultaneous distribution of broadcast programs on the Internet (refers to simultaneous distribution, repeat broadcasts and time-limited repeat broadcasts; the same applies hereinafter) and similar initiatives. These initiatives expand opportunities to view high quality content and are important for improving viewers' convenience, promoting the content industry, and securing international competitiveness. On the other hand, a large amount of various copyrighted works are used in broadcast programs, and there are problems in processing rights, such as the possibility of “masking” due to the inability to process copyrights during simultaneous distribution. In promoting simultaneous distribution, it was necessary to create an environment where copyrighted works could be used more quickly and easily.

In order to facilitate the handling of rights related to simultaneous distribution, MIC worked together with ACA (responsible for the Copyright Act [Act No. 48 of 1970]) to hear the opinions of concerned parties and studied the direction of the system amendment. As a result, the Act Partially Amending the Copyright Act (Act No. 52 of 2021) was enacted at the 2021 ordinary session of the diet and measures were taken toward this end. Following the revision, simultaneous distribution of all five commercial broadcasters was realized in April 2022. With simultaneous distribution now in full swing, the government is closely monitoring trends with regard to how rights are handled, and is considering further facilitation.

d Promotion of regulation on production and trade of broadcast content

In order to improve the production environment and enhance motivation of producers in the broadcast content field, MIC held the “Study Group on Verification and Review on Promotion of Production and Trade of Broadcast Content” consisting of experts and other members. Based on the discussions of the group, MIC formulated the “Guidelines for Regulation on Production and Trade of Broadcast Content Developed” (seventh edition) and is urging broadcasters and program production companies to regulate production and trade of broadcast content.

Specific measures include conducting regular follow-up surveys regarding the guidelines to assess the state of production and trade of broadcast content, assessing the actual situation of compliance with the guidelines through interviewing of broadcasters and program production companies, providing guidance on problems based on Article 4 of the Act on the Promotion of Subcontracting Small and Medium-sized Enterprises (Act No. 145 of 1970), holding courses for dissemination of the guidelines, and setting up a legal consultation hotline for produced broadcast content to provide free consultation by lawyers on specific individual issues.

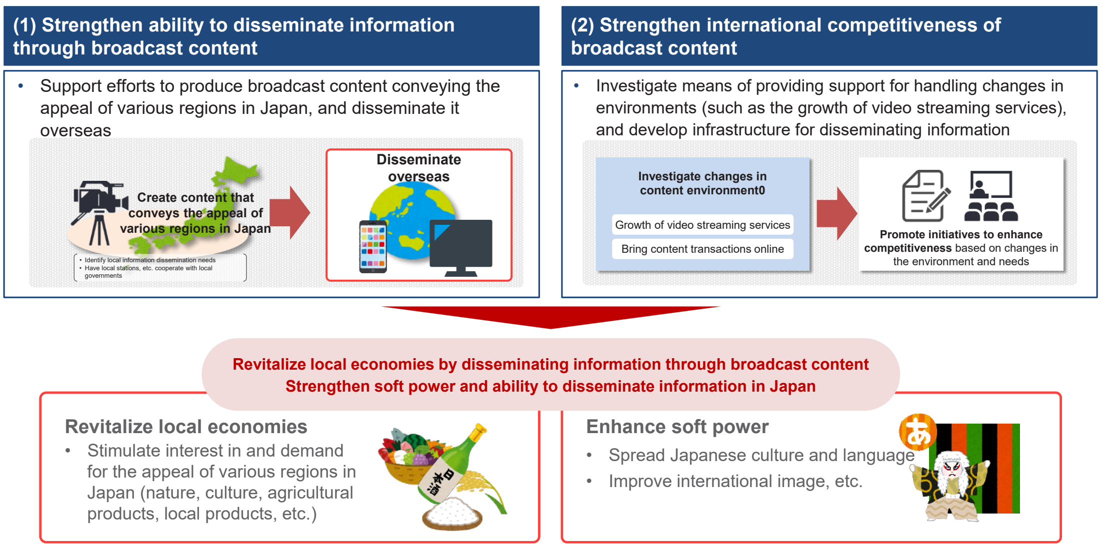
(2) Overseas expansion of broadcast content

Cross-border distribution of content is advancing due to the expansion of video streaming services. There is also more overseas content being distributed in Japan. In order for Japan's content industry to develop, it is necessary to capture the growth of expanding markets by producing high-quality content from a global perspective and actively expanding overseas.

The overseas development of content is also extremely important from a diplomatic perspective, as it will convey the appeal of Japan to foreign countries and heighten interest in Japan's nature and culture. This is expected to have economic effects such as increasing the number of foreign visitors to Japan and expanding sales channels for agricultural, forestry, fishery, and regional products. It will also contribute to improving impression of Japan and strengthen its soft power.

In cooperation with the "Broadcast Program Export Association of Japan" (BEAJ), which promotes the overseas expansion of broadcast content, and relevant ministries, agencies, and organizations, MIC continues to support efforts by Japanese broadcasters in cooperation with local governments to produce broadcast content that demonstrates the appeal of Japan's regions and disseminate it through overseas broadcasters. The public and private sectors also cooperated at international content trade fairs such as MIPCOM (Cannes, France) and TIFFCOM (Tokyo) in October 2022 and at ATF (Singapore) in December of the same year, in order to conduct PR activities and hold seminars to promote Japanese content overseas. In fiscal 2023, MIC began to develop an online platform to disseminate information on Japanese broadcast content overseas in cooperation with broadcasters and production companies that are actively engaged in overseas expansion. Including these initiatives, MIC will continue to promote the overseas expansion of content toward the goal of reaching a 1.5-fold increase in overseas sales (compared with fiscal 2020) by fiscal 2025 (**Figure 5-4-5-1**).

Figure 5-4-5-1 Promotion of the overseas expansion of broadcast content



6. Promotion of broadcasts for the visually challenged and those with hearing impairments

In February 2018, MIC formulated the “Guidelines on Information Accessibility in the Broadcasting Sector,” which set targets for the spread of closed-caption broadcasting, explanation broadcasting, and sign language broadcasting, in order to enable visual and hearing impairments and others to obtain information smoothly through TV broadcasting, and has encouraged broadcasters to make voluntary efforts. The “Study Group on the Enhancement of Broadcasting for Those with Visual and Hearing Impairments” has also been meeting since November 2022. Consisting of experts, organizations for persons with disabilities, and broadcasters, the study group has been reviewing these guidelines and discussing measures to enhance broadcasting for the visually challenged and those with hearing impairments, based on recent results with subtitled broadcasts, technological trends, and other factors.

MIC also subsidizes production costs for subtitled broadcasts, explanatory broadcasts, and sign language broadcasts, based on the Act on Advancement of Facilitation Program for Disabled Persons' Use of Telecommunications and Broadcasting Services, with a View to Enhance Convenience of Disabled Persons (Act No. 54 of 1993). Due to the fact that subtitling live programs requires a large amount of manpower and costs, as well as human resources with special skills, MIC began to subsidize the maintenance costs of devices for subtitling live programs in fiscal 2020, including systems that utilize cutting-edge ICT.

7. Improvement to the resilience of broadcast networks and enhancement of disaster resistance

(1) Conversion of cable networks to fiber optic

Cable networks are the information and communications infrastructure of communities. In order to enhance disaster resistance through their conversion to fiber optic, MIC is implementing the “Project to enhance the disaster resistance through conversion of cable televisions to fiber optics toward establishment of 'New Normal',” which provides a partial subsidy for the costs necessary to convert cable networks to fiber optic in communities by using the second fiscal 2022 supplementary budget and the fiscal 2023 initial budget (**Figure 5-4-7-1**). Newly introduced from the second supplementary budget in fiscal 2022, the purpose of this program is to provide integrated support for cable TV operators to convert existing service areas to optical, while also converting non-optical communal reception facilities to cable TV areas.

Figure 5-4-7-1 “Project to enhance the disaster resistance through conversion of cable televisions to fiber optics toward establishment of 'New Normal'”

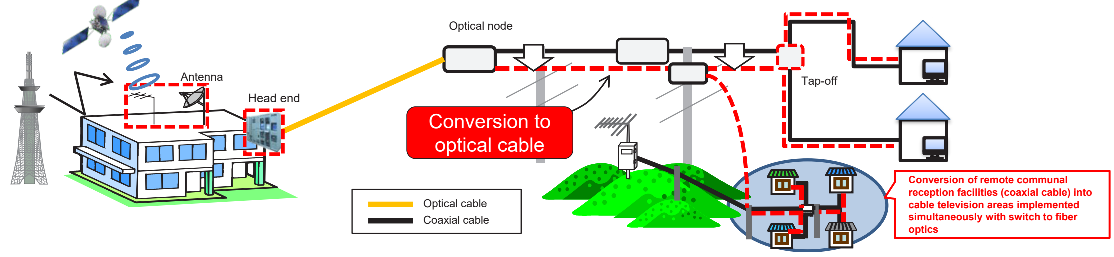
Project illustration

○ **Project operator**
Municipalities, municipality collaboration entities or a third sector (including entities that continue to fulfill the role pertaining to the provision of cable television services through transfer of the relevant facilities from these entities(Succeeding business operators))

○**Target regions**
Regions satisfying all of (1) to (3) below:
(1) Municipalities where cable television is positioned in their regional disaster prevention plan
(2) Regions with unfavorable conditions
(3) Municipalities with financial index 0.5 or lower and other regions where the subsidy is found particularly necessary

○**Subsidy rate**
(1) Municipalities or municipality collaboration entities (Succeeding business operators): 1/2
(2) Third sector (Succeeding business operators): 1/3

○**Subsidized costs (shown in red in the figure below)**
Optical fiber cable, transmitting/receiving facilities, antennas, etc.
*Includes transmission line equipment necessary for converting remote communal reception facilities (coaxial cable) into cable television areas implemented simultaneously with the switch to fiber optics (expanded from the R4 supplementary budget).



(2) Support for initiatives by broadcasters and others

In order to support initiatives by broadcasters, local governments, and others to improve the resilience of broadcast networks, MIC is now running "projects to support broadcast network development (the project to develop basic terrestrial broadcasting networks and the project to develop regional cable television networks)" (**Figure 5-4-7-2**), the "project to support resolution of poor reception of commercial radio broadcasting," and the "project to support improvement of disaster resistance of basic terrestrial broadcasting, etc." using the fiscal 2023 initial budget.

Figure 5-4-7-2 Projects to support broadcast network development

- In order to reliably provide disaster information, evacuation information, and other information essential for protecting the lives and property of citizens, the projects to support broadcast network development provide partial subsidies for the following maintenance costs, in order to <u>bring resilience to the broadcast networks that serve as important means of transmitting information locally in the event of a disaster</u>.
  [1] Emergency earthquake early warning equipment, such as spare transmitting station equipment and supplementary disaster response transmitting stations involved in new radio and television development
  [2] Redundant routes for cable television trunk lines

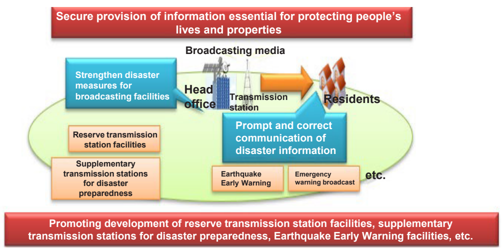
Subsidy rate

- Local governments (*) : 1/2
- Third sector(*), commercial broadcasters, (item [1] only): 1/3

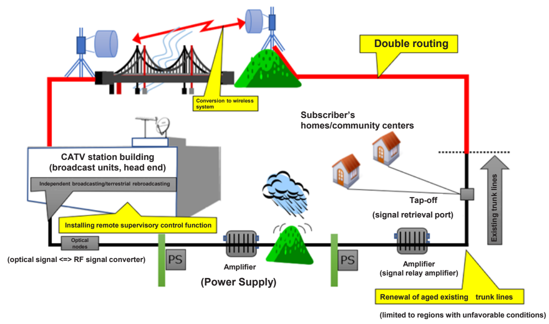
*Item [2] also includes entities that continue to fulfill the role pertaining to the provision of cable television services through transfer of the relevant facilities from these entities (succeeding business operators).

Project name/image

[1] Project to develop basic terrestrial broadcasting networks



[2] Project to develop regional cable television networks



Section 5 Trends in Cybersecurity Policy

1. Summary

(1) Initiatives so far

Under intensifying threats to cybersecurity on a worldwide scale, the Basic Act on Cybersecurity (Act No. 104 of 2014) stipulating basic principles of Japanese cybersecurity policy was enacted in 2014. Based on the act, the Cybersecurity Strategic Headquarters was established under the Cabinet in 2015 to lead the cybersecurity measures of the government. Since then, a "Cybersecurity Strategy" has been formulated every three years to set goals and policies of measures considering changes in economic society and the increase in threats against cybersecurity. In September 2021, a new "Cybersecurity Strategy[1]" was decided by the Cabinet. The government has continued to promote cybersecurity policies based on this.

The "Action Plan on Information Security of Critical Infrastructure[2]" (decided by the Cybersecurity Strategic Headquarters in June 2022) established a basic framework for the protection of critical infrastructure and designates the information and communications field (telecommunications, broadcasting, and cable television) as one of the 14 critical infrastructure fields, suspension or unavailability of which would heavily affect people's lives and socioeconomic activities. As a government agency responsible for critical infrastructure, MIC must continue to promote efforts to ensure the safety and reliability of information and communications networks.

MIC has held meetings of the "Cyber Security Task Force" consisting of security experts since 2017. The task force has successively compiled a list of challenges and measures to be tackled by MIC with consideration to various changes in the situation, including the Tokyo Olympic and Paralympic games and the COVID-19 pandemic. In August 2022, it formulated "Comprehensive ICT Cybersecurity Measures 2022[3]," which includes measures to ensure the safety and reliability of information and communications networks and improve the ability to handle cyberattacks autonomously. In order to respond to situations where many cyberattacks target IoT devices, the "Subcommittee on Cybersecurity Measures in Information and Communications Networks" has been held under the task force since January 2023 to consider comprehensive measures required from both the terminal side (IoT devices) and the network side, based on the current status of efforts and issues. Based on this, various measures are now being taken to promote cybersecurity measures in the ICT field.

(2) Future challenges and directions

As the movement of people has been restricted to prevent the spread of COVID-19 and the use of remote work has progressed, the switching of all socioeconomic activities to digital (the promotion of digital transformation [DX] of society as a whole) is now recognized as an even more important policy issue.

In recent years, cyberspace has become a battleground between countries, reflecting the harsh security environment and geopolitical tensions. There have been many cyberattacks targeting government agencies and critical infrastructures. Amid widespread and rapid progress in the conversion of the economy and society to digital, an increase in cyberattacks including the disruption of information and communications networks and the leakage of information could cause serious damage to people's lives and to Japan's economic and social activities. In December 2022, Japan's National Security Strategy was revised to include the introduction of "active cyber defenses" to improve response capabilities in the cybersecurity field, marking a turning point in Japan's cybersecurity policy.

As cyberspace increasingly becomes a public space, information and communications technology (ICT) infrastructure and services including IoT and 5G provide the basis for digital transformation. In order to promote digital reform and transformation across society, it is a critical prerequisite to ensure cybersecurity so that each citizen can use ICT safely.

Therefore, it is necessary to ensure the safety and reliability of information and communications networks, improve the ability to handle cyberattacks autonomously, promote international cooperation, and promote public awareness, as described below.

[1] Cybersecurity Strategy: https://www.nisc.go.jp/active/kihon/pdf/cs-senryaku2021.pdf
[2] Action Plan on Information Security of Critical Infrastructure: https://www.nisc.go.jp/pdf/policy/infra/cip_policy_2022.pdf
[3] Comprehensive ICT Cybersecurity Measures 2022: https://www.soumu.go.jp/main_content/000829941.pdf

2. Efforts to ensure safety and reliability of information and communications networks

(1) Initiatives related to IoT security

As IoT advances and various things supporting social and economic activities are connected to the Internet, IoT devices are often exposed to the threat of cyberattacks because they are difficult to manage, the performance of the devices is limited, and appropriate security measures cannot be taken. This calls for stronger countermeasures. In addition to cyberattacks that actually exploit IoT devices, communications related to cyberattacks observed by the NICTER cyberattack observation network operated by NICT in 2022 showed that IoT devices (especially DVR/NVR) were still the most frequently targeted.

Under these circumstances and in order to strengthen cybersecurity measures for IoT devices, the Act on the National Institute of Information and Communications Technology[4] was partially amended in 2018. Based on the amendment, MIC and NICT in collaboration with Internet service providers (ISPs) have been implementing the “National Operation Towards IoT Clean Environment (NOTICE)” initiative since February 2019. Under the current initiative, (1) NICT identifies IoT devices on the internet, which can be abused for cyberattacks by entering a password that can be easily derived such as “password” or “123456,” (2) NICT sends information about the identified devices to the relevant ISP, and (3) the notified ISP identifies the users of the devices and alerts them.

Concurrently with NOTICE, MIC, NICT, ICT-ISAC and ISPs have been cooperating since June 2019 to implement a project where ISPs alert the users of IoT devices already infected with malware. In this project, devices performing communications caused by malware infection are detected by NICT based on the information obtained through NICTER above, and the ISPs identify the users of the devices.

In light of the fact that NOTICE efforts will end in March 2024, the Subcommittee on Cybersecurity Measures in Information and Communications Networks is now organizing the current status and issues with NOTICE and is examining the direction of NOTICE in the future. This includes enhancing observation capabilities and promoting effective countermeasures against the threat of cyberattacks that exploit IoT devices.

Figure (related data) Overview of NOTICE and NICTER alerts
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00360
(Data collection)

(2) Initiatives related to active security measures by telecom carriers

With the progress of 5G, it is expected that the use of IoT devices will further expand in various industries. In order to improve the effectiveness of security measures for IoT devices, it is necessary to improve the environment to allow for more flexible responses on the network side where traffic is passing in addition to existing measures on the terminal side.[5]

Cyberattacks and other threats are becoming increasingly large, detailed, and complicated. In response, MIC has been taking measures so that telecom carriers can efficiently and actively deal with these threats, since fiscal 2022. In fiscal 2023, MIC will continue such efforts as (1) demonstrating C&C cyber detection technology, (2) demonstrating detection technologies and sharing methods for phishing sites and other malicious websites, and (3) demonstrating ways of introducing network security measures. MIC will also promote the sharing and use of detection information to improve the accuracy of C&C servers working with telecom carriers based on the discussions of the Subcommittee on Cybersecurity Measures in Information and Communications Networks, including visualizing IoT botnets.

The "Certified Association against Cyber Attacks on Telecommunications Facilities[6]" is a third party organization that shares information between ISPs and conducts research studies of sender information during DDoS and other cyberattacks, among other duties. In the past, information sharing and analysis at the association was limited to cases where the senders are identified after attacks. In order to allow information sharing and analysis for signs of activity prior to attacks (port scanning), the Act Partially Amending the Telecommunications Business Act was enacted in June 2022 as an effort to promote collaboration among telecom operators handling DDoS and other cyberattacks.[7]

---

[4] Act on the National Institute of Information and Communications Technology (Act No. 162 of 1999)
[5] “Comprehensive ICT Cybersecurity Measures 2021” (formulated in 2021) states that “it is necessary to consider measures to realize advanced and flexible responses in information and communications networks managed by ISPs on the internet” through “implementing active measures by telecom operators against cyberattacks.” (https://www.soumu.go.jp/menu_news/s-news/02cyber01_04000001_00192.html)
[6] Based on Article 116-2 (1) of the Telecommunications Business Act, ICT-ISAC was certified as a Certified Association against Cyber Attacks on Telecommunications Facilities in January 2019.
[7] The Act Partially Amending the Telecommunications Business Act (Act No. 70 of 2022) came into effect on June 16, 2023.

(3) Initiatives related to supply chain risk policies

From fiscal 2019 to fiscal 2021, MIC conducted research and examination on ensuring the security of 5G networks. MIC organized a list of security issues and their countermeasures that operators should keep in mind by conducting technical verifications that take the entire 5G network into account (including virtualization infrastructures and management systems), and released some of the results in "5G Security Guidelines (First Edition)[8]" in April 2022. These guidelines were adopted as a new work item in ITU-T SG17 in September 2022, and MIC is currently promoting efforts toward international standardization in cooperation with specialized agencies.

In the communications field, the configuration of systems is becoming more complex as the functions required for systems become more sophisticated and diverse, and various commercial software products and open source software (OSS)[9] solutions are now being used as software components. These changes in software supply chains have resulted in cyberattacks that insert malicious code in software components or target vulnerabilities in software components. However, if the configuration of software components in a system is not understood, it becomes difficult to respond quickly to attacks.

In response, MIC has been conducting demonstration projects to introduce SBOM[10] in the communications field since fiscal 2023, in order to contribute to the enhancement of cybersecurity by gaining a clear understanding of software supply chains using SBOM.

Although smartphones are now widely used, there are only limited methods for checking the actual conditions of smartphone applications when there is a concern that they may be transmitting user information against the user's wishes. Since fiscal 2023, MIC has been conducting a demonstration project to gain a clear understanding of the actual conditions of application behavior through having third parties conduct technical analysis of applications.

(4) Initiatives related to trust services

Real space and cyberspace are highly integrated in Society 5.0, so exchanges conducted in physical spaces must also be able to be smoothly conducted in cyber space. In order to accomplish this, it is necessary to build infrastructures to safely and reliably distribute data. Trust services (**Figure 5-5-2-1**) are becoming increasingly important as systems to prevent data falsification and sender impersonation.

At the whole government level, the “Sub-working Group for Trust-Assured Digital Transformation” was established in November 2021 under the “Data Strategy Promotion Working Group” based on the Digital Society Promotion Council Order (Cabinet Order No. 193 of 2021), in order to study needs and the necessary assurance level of various procedures and transactions in the public and private sectors. The sub-working group published the “Report of the Sub-working Group for Trust-Assured Digital Transformation[11]” in July 2022.

Based on the final report[12] of the “Working Group on Trust Services” released in February 2020, MIC has been studying the development of necessary systems and guidelines for time-stamps and e-seals.

a Development of a national time-stamp authorization system

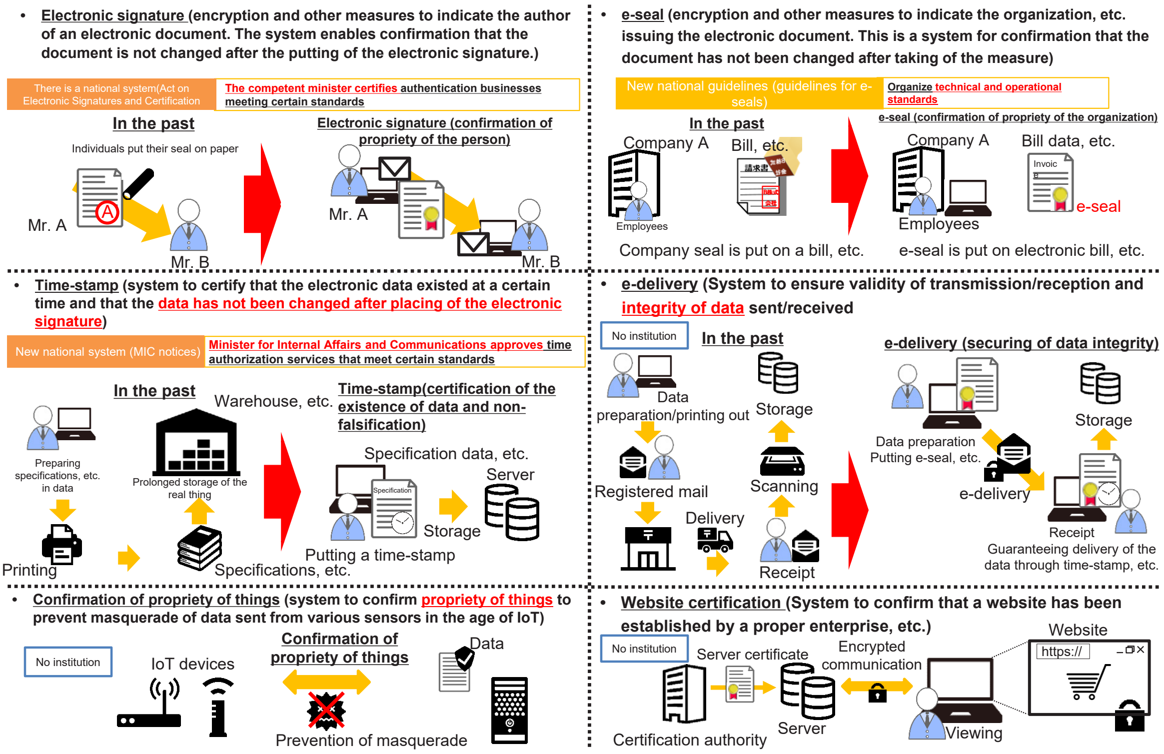
The “Study Group on the Time-Stamp Authorization System” established in March 2020 further reviewed time-stamps, and in April 2021 MIC established Rules Concerning Authorization of Time-Stamp Operations (MIC Notice No. 146 of 2021). The Japanese government (Minister for Internal Affairs and Communications) then established an authorization system. Due to the revision of the tax system in fiscal 2022, time-stamps based on the national authorization system will be adopted instead of time-stamps based on a private authorization system (Japan Data Communications Association), with regard to the digital data retention system for tax-related documents.[13] In February 2023, the Japanese government certified the time authorization service for the first time. MIC will continue to operate the state authorization system appropriately and reliably, while taking necessary measures to further expand the use of time-stamps.

b Formulation of “guidelines on e-seals”

The “Study Meeting on a System for Ensuring the Reliability of Data Issued by Organizations” established in April 2020 studied how ideal e-seals should be implemented in Japan. In June 2021, MIC released a report of the review committee and formulated “Guidelines on e-seals[14]” compiling technical/ operational standards required from reliable e-seal services and business operators in Japan.

[8] 5G Security Guidelines (First Edition): https://www.soumu.go.jp/main_content/000812253.pdf
[9] Software whose source code is freely available for anyone to use, improve, or redistribute.
[10] Software Bill of Materials.
[11] Report of the Sub-working Group for Trust-Assured Digital Transformation (https://www.digital.go.jp/councils/trust-dx-sub-wg/)
[12] Final Report of the Working Group on Trust Services https://www.soumu.go.jp/main_content/000668595.pdf
[13] A transitional measure was taken from April 1, 2022 to July 29, 2023 to allow the use of time-stamps pertaining to operations authorized by Japan Data Communications Association as before.
[14] Guidelines on e-seals (https://www.soumu.go.jp/main_content/000756907.pdf)

Figure 5-5-2-1 Trust services



(5) Initiatives related to ensuring the safety of cloud services

a Assessment of cloud service safety for government information systems

Under "Principle of the Cloud-by-Default," the government had the "Study Group on Safety Evaluation of Cloud Services" meeting to study the issue of safety assessment of cloud services. As a result, (1) the basic framework for a system, (2) the approach to cloud usage in government agencies, and (3) the jurisdiction and operation of the system have been determined as per the "Basic Framework for the Security Evaluation System of Cloud Services in the Government Information System" (established by the Cybersecurity Strategic Headquarters, January 30, 2020).

In response to the basic framework, the Information System Security Management and Assessment Program (ISMAP) was launched in June 2020 based on various rules and regulations decided by the ISMAP Management Committee, which consists of experts and government agencies with jurisdiction over the system (National Center of Incident Readiness and Strategy for Cybersecurity, Digital Agency, MIC, and METI). Cloud services that have been confirmed to have implemented security measures based on the standards set by this system began being registered in March 2021. As of May 11, 2023, a total of 44 services have been published on the ISMAP Cloud Service List.[15]

In November 2022, ISMAP for Low-Impact Use (ISMAP-LIU) was launched as a mechanism for SaaS solutions that deal mainly with confidentiality class 2 information and that are used for processing operations and information that pose a small security risk. ISMAP-LIU is designed to be looser than the current ISMAP for overall auditing of SaaS services that have very limited use or functionality, or that deal only with relatively unimportant information. It will work together with ISMAP to further expand cloud-by-default.

b Formulation of guidelines on cloud security

In order to promote the safe and secure use of cloud services, MIC formulates "Guidelines on Information Security Measures in Cloud Service Provision" summarizing information on security measures to be taken by cloud service providers. In September 2021, MIC released a revised edition (the 3rd edition) based on the actual state of cloud service provision and use. There have been recent cases where cloud service users failing to use services appropriately have resulted in the risk of information leaks. To address this issue, a broad range of entities including providers and users studied means for promoting the appropriate use of cloud services, and then formulated and released "Guidelines for Appropriate Settings for Cloud Service Usage and Provision" in October 2022.

[15] ISMAP Cloud Service List: https://www.ismap.go.jp/csm?id=cloud_service_list

3. Improvement of ability to handle cyberattacks autonomously

(1) Initiatives for the development of security personnel

While cyberattacks are becoming increasingly sophisticated and complicated, Japan is short of cybersecurity personnel both in quality and quantity. The development of human resources is an urgent issue. To address this issue, MIC is working with the NICT "National Cyber Training Center" on several initiatives (CYDER, CIDLE, and SecHack365) to actively promote the development of cybersecurity personnel.

a Practical cyber defense exercises for persons in charge of information systems (CYDER)

CYDER is a set of practical cyber defense exercises for persons in charge of information systems at various organizations including state organs, local governments, independent administrative agencies, and critical infrastructure operators. Teams of trainees participate in the exercises and experience actual machine operation for a series of actions from detection of incidents caused by cyberattacks, response, reporting, and restoration in a large-scale virtual LAN environment simulating the network environment of their organization (**Figure 5-5-3-1**).

In fiscal 2022, in addition to the conventional group exercise courses and online standard courses for beginners, intermediates, and semi-advanced students, a new online introductory course where students can learn the basics of incident response. In addition, the "Onsite CYDER" program was implemented, in which NICT travels to local governments to resolve issues with insufficient training due to geographical and temporal factors, and the "CYDER Satellite" program was implemented to improve the efficiency of instructors and staff by holding simultaneous meetings at multiple venues (**Figure 5-5-3-2**).

In total, more than 17,000 people have participated in CYDER group exercises since fiscal 2017.

Figure 5-5-3-1 Practical cyber defense exercises (CYDER: CYber Defense Exercise with Recurrence)

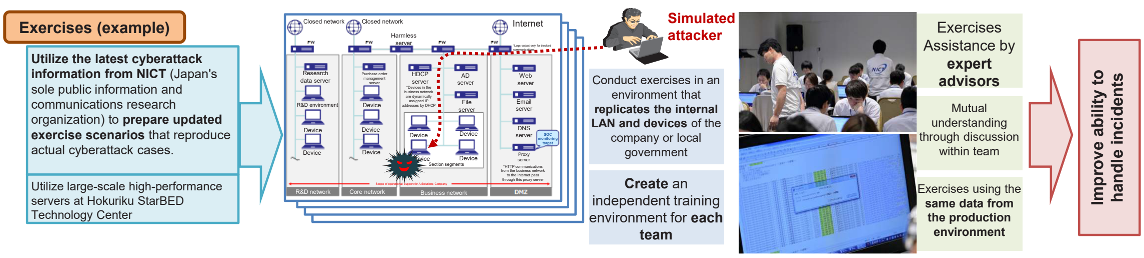


Figure 5-5-3-2 CYDER in fiscal 2022

Course	Type of exercise	Level	Intended audience (topics covered)	Intended organizations	Location	Frequency	Period
A	Group exercises	Beginner	Individuals just beginning to work with systems (Procedure for responding to incidents)	All organizations	All prefectures, etc. *On-site and satellite lessons are also being tried	72 times	From July, to Feb. of the following year
B-1		Intermediat	System administrators and operators (Autonomous incident response and security management)	Local governments	11 regions nationwide	20 times	From Oct., to Jan. of the following year
B-2				Organizations other than local governments	Tokyo, Osaka, Nagoya, Tsukuba	13 times	Jan. to Feb. of the following year
C		Semi-advanced	Security specialists (Advanced security technology)	All organizations	Tokyo	3 times	From Oct., to Feb. of the following year
Online Standard	Online exercises	Equivalent to beginner	Individuals just beginning to work with systems (Procedure for responding to incidents)	All organizations	(Participant workplaces, etc.)	As needed	5/24 to 7/19
Online Introduction		Introduction					1/17 to 2/24 of the following year

b Expo cyber defense training course (CIDLE)

CIDLE is a cyber defense training course for persons in charge of information systems of the Japan Association for the 2025 World Exposition, with the goal of ensuring a perfect security system for the 2025 World Exposition in Osaka. Leveraging what was learned during the Tokyo 2020 Olympic and Paralympic Games, a lecture and exercise program is scheduled to be offered during fiscal 2023.

c Training program for young security personnel (SecHack365)

A program for cultivating young security innovators, SecHack365 is for ICT personnel age 25 or younger and living in Japan to become cutting-edge security personnel (security innovators) who can create new security technologies. Front-line researchers and engineers teach research and development of security technologies by using NICT's actual cyberattack-related data continuously and at full scale for one year. 40 enrollees completed the course in fiscal 2022, for a total of 252 since fiscal 2017.

(2) Establishment of an integrated cybersecurity knowledge/human resource development platform (CYNEX)

Domestic security business models are mostly based on the introduction and operation of overseas security products, and so cybersecurity measures in Japan heavily depend on overseas products and information, which leads to insufficient collection and analysis of cyberattack information and other data in Japan. In addition, through use of overseas security products, domestic data flows to overseas businesses, security-related information of Japan is analyzed overseas, and domestic businesses purchase threat information based on the analytical results from foreign businesses.

As a result, domestic security businesses cannot accumulate core knowhow and knowledge, and it is difficult for them to contribute to global information sharing or to train engineers who can work internationally. User companies also have a shortage of personnel who can appropriately handle security products and information. In order to enhance Japan's independent skills to cope with cyberattacks, which include training of cybersecurity personnel, it is necessary to build an ecosystem that accelerates domestic generation of cybersecurity information and human resource development in Japan.

In collaboration with NICT, which conducts top-level research and development on cybersecurity in Japan, MIC began trial operation of the “integrated cybersecurity knowledge/human resource development platform” (commonly known as CYNEX) in fiscal 2022. CYNEX is an advanced platform that serves as a huge nexus for industry, academia, and government on cybersecurity, with the technology and knowledge cultivated by NICT at its core. In fiscal 2023, full-scale operation of information analysis, product verification, and human resource development projects is scheduled to start, while cooperation with universities and private companies is expanded.

Figure (related data) Integrated cybersecurity knowledge/human resource development platform (CYNEX)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00379
(Data collection)

Beginning in fiscal 2023, the introduction of domestic security software is planned for some ministries as one part of CYXROSS, a demonstration project for the collection and analysis of cybersecurity information using government device information. The strengthening of security measures in Japan is also planned by aggregating and analyzing obtained malware information in NICT's CYNEX.

Figure (related data): Demonstration project for the collection and analysis of cybersecurity information using government device information (CYXROSS)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00380
(Data collection)

This cutting-edge platform enables collection and analysis of a broad range of cybersecurity information in Japan, and further promotes development of domestic security products taking advantage of such information, while at the same time training highly skilled security personnel and supporting human resource development in private and educational institutions. Through this project, MIC aims to further reinforce cybersecurity measures in Japan.

4. Promotion of international cooperation

Cyberspace spreads globally, and so collaboration with other countries is essential for establishing cybersecurity. MIC actively engages in discussions, disseminating and collecting information at various international conferences, and cyber consultations with the aim of contributing to building international consensus on cybersecurity.

Efforts to assist developing countries in building capacity in the field of cybersecurity are also important in order to reduce cybersecurity risks worldwide. MIC has been promoting human resource development projects in the ASEAN region through the ASEAN-Japan Cybersecurity Capacity Building Centre (AJCCBC), and has been engaged in efforts to contribute to the improvement of cybersecurity capabilities, particularly in the ASEAN region.[16]

In order to promote information sharing on international cybersecurity among private entities including telecom operators, MIC holds workshops with the participation of ISPs of ASEAN countries as well as Japan-US and Japan-EU opinion exchange sessions at the Information Sharing and Analysis Center (ISAC).

5. Promotion of awareness raising

(1) Initiatives related to remote work security

Security was noted as the biggest challenge in a questionnaire survey[17] of enterprises introducing remote work. In order to dispel anxiety about security so that enterprises can implement remote work with security, MIC has been formulating and sharing “Telework Security Guidelines” since 2004.

The COVID-19 pandemic triggered drastic changes in the environment surrounding remote work and there are also changes in security trends, which include progress in use of the cloud and sophistication of cyberattacks. In response, MIC made a total guidelines revision of the security measures to be implemented, specific trouble cases, and other matters in May 2021.

At the same time, it is assumed that there may not be a dedicated person in charge of security or that the person in charge does not understand the specialized systems at small-to-medium-sized enterprises and other organizations. With this in mind, MIC formulated the “Telework Security Guide for SMEs (Checklists)” focusing on ensuring a minimum level of security. In May 2022, MIC revised the design and wording with universal design in mind to improve readability, and also prepared a new “Employee Handbook” as an appendix full of information that employees can actually use.

(2) Promotion of formulation of security communities rooted in the area (regional SECUNITY)

In order to ensure the safety and reliability of information and communications services and networks in Japan, it is necessary to ensure cybersecurity not only at business operators providing national or metropolitan-area services but also at business operators providing information communication services in local areas. However, local enterprises and local governments are facing various challenges, including information gaps on cybersecurity compared with enterprises running business in the Tokyo metropolitan area or nationwide, difficulties taking sufficient security measures independently due to lack of management resources, and failures to recognize the need for security measures.

MIC established “regional SECUNITY” communities that have built mutual help relationships regarding security among involved parties in 11 regions (mostly districts of regional bureaus of telecommunications) by fiscal 2022. In fiscal 2023, MIC will continue to support large-scale cross-regional events and the expansion of efforts to promote awareness among a wide range of people.[18]

Figure (related data) Regional security communities
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00381
(Data collection)

[16] Refer to Chapter 5, Section 8 “Promotion of International Strategies for ICT” for more information on the efforts of the ASEAN-Japan Cybersecurity Capacity Building Centre.
[17] Survey on actual conditions of remote work security: https://www.soumu.go.jp/main_sosiki/cybersecurity/telework/
[18] Details on the latest events can be found at the following URL
https://www.soumu.go.jp/main_sosiki/cybersecurity/localsecunity/index.html

(3) Appropriate promotion of sharing and disclosure of information related to cyberattacks

As the threat of cyber attacks increases, it is beneficial for both the affected organization and society as a whole to share and disclose information related to cyberattacks with cybersecurity related organizations, in order to clarify the full extent of attacks and strengthen countermeasures. However, there are many cases where the affected organization is cautious about sharing and disclosing information due to concerns about its reputation.

In April 2022, the “Study Group on Sharing and Disclosing Information on Cyberattacks” was formed under the management committee of the “Cybersecurity Council,” a consultative body consisting of a wide variety of public and private organizations. The study group discussed guidance on sharing and disclosing information on cyberattacks that would serve as a practical reference for organizations affected by cyberattacks. Following public comments, a document was compiled and published by the study group in March 2023.[19]

Relevant ministries and agencies will continue to work together to disseminate and raise awareness of this information, and will continue to consider whether to revise this information based on feedback from organizations affected by cyberattacks.

(4) Initiatives related to wireless LAN security

In addition to in homes and at workplaces, wireless LAN is now widely used while on the go through public wireless LAN services. However, without appropriate security measures, there is a danger of cyberattacks and information theft through wireless LAN devices. To address this issue, MIC has formulated separate guidelines on wireless LAN security measures for users and providers, and released revised versions of these documents adapted to new technologies and the latest security trends in May 2020.

The “Simplified Manual for Wi-Fi Users” is aimed at wireless LAN users, and presents three security measures to keep in mind: (1) carefully check access point to connect, (2) check whether the right URL is being used for HTTPS communication, and (3) check the settings of devices installed in the home. An explanation is provided for each of these points.

The “Guide on Security Measures for Wi-Fi Providers” is aimed at wireless LAN providers, and was compiled to help a broad range of people including restaurants and retail stores providing wireless LAN service to check what security risks are involved and what security measures to take.

In order to raise awareness about security measures for wireless LAN, a free online course is held every fiscal year in conjunction with Cyber Security Month (Feb. 1 to March 18) to provide information on the latest security measures for wireless LAN.[20] During fiscal 2022, an online course called “Learn About Wi-Fi Security Measures” was held from March 1, 2023 to March 26 of the same year.

---

[19] Guidance on sharing and disclosing information on cyberattacks that would serve as a practical reference for organizations affected by cyberattacks (formulated on March 8, 2023):
https://www.soumu.go.jp/menu_news/s-news/01cyber01_02000001_00160.html

[20] Online course on security measures for wireless LAN (Wi-Fi): https://www.soumu.go.jp/main_sosiki/cybersecurity/wi-fi/index.html

Section 6 Promotion of ICT Usage

1. Summary

(1) Initiatives so far

Since the establishment of the Information Technology Strategic Headquarters and the enactment of the Basic Act on the Formation of an Advanced Information and Telecommunications Network Society (Act No. 144 of 2000)[1] in 2000, Japan has promoted the use of ICT under various national strategies including the e-Japan Strategy. Based on these strategies, MIC has promoted the use of ICT in various fields such as medical care and regional revitalization in order to deal with Japan's social/economic challenges including the declining birthrate and aging society and associated labor shortages, increases in medical and nursing care expenses, and intensified natural disasters.

(2) Future challenges and directions

As various social/economic issues such as the decline of the working-age population and the contraction of local economies become more serious, there is an increasing need to use ICT to solve these issues. For example, the use of remote work is expected to realize work styles that are independent of location and time, and the use of new communication technologies such as local 5G is expected to improve productivity. In particular, following the outbreak of COVID-19 in 2020, the use of ICT in enabling non-contact and non-face-to-face lifestyles has once again become important, and it is necessary to take this opportunity to further promote the use of ICT throughout society.

Although the use of AI and the metaverse by companies and others is expected to help improve the convenience of daily life and revitalize Japan's economy, it is necessary to gain a clear understanding of the impact of these on society and the problems that may arise, and realize the implementation of a safe and secure society.

The use of ICT throughout society has progressed. However, as discussed in Chapter 4, Section 11, there is some variation in the usage rate of the Internet due to factors such as age. In order to realize a shift to digital that leaves no one behind, it is necessary to narrow the digital divide by eliminating anxiety and resistance to digital technologies among the public including the elderly, and by advancing initiatives to improve people's ability to use digital technologies.

The use of various Internet services such as social media and video streaming services is increasing among users of a wide age range, and it will be important for all generations to acquire literacy to properly utilize ICT, such as critically viewing information and disseminating information with consideration for others, as information distributed on the Internet also includes illegal harmful information, disinformation, and misinformation.

2. Promotion of ICT usage to contribute toward solving social/economic issues

(1) Promotion of local 5G

a Overview of local 5G

Unlike nationwide 5G services provided by mobile carriers, local 5G is a 5G system that can be flexibly constructed by various entities including local enterprises and local governments in their building or premise based on the unique needs of the community or industry. The use of local 5G in various fields, forms, and environments is expected to play an important role in handling various challenges and creating new value.

b Development demonstrations for realizing local 5G services to solve issues

As an effort to spread local 5G, MIC began to tackle “development demonstrations for realizing local 5G services to solve issues” in fiscal 2020, in order to implement technical studies on radio wave propagation under a variety of use environments assuming actual use situations, and to create solutions using local 5G. In fiscal 2020, 19 demonstrations were conducted, followed by 26 demonstrations in fiscal 2021 and 20 demonstrations in fiscal 2022.[2]

In order to promote the introduction of local 5G in various situations such as factories, farmland, transportation, medical treatment, construction sites, and disaster sites, the “Public-Private Liaison Conference to Spread Local 5G” was established in January 2021. Consisting of relevant organizations and others, the purpose of the conference is to disseminate information for the spread of local 5G.

c Promotion of development through the tax system

In order to promote the introduction of safe and reliable 5G and solve various social issues in local communities by using 5G, while at the same time strengthening the international competitiveness of Japan's economy, a

[1] This act was abolished by the Basic Act on the Formation of a Digital Society (Act No. 35 of 2021).
[2] Go! 5G https://go5g.go.jp/

tax system to promote the introduction of 5G was established in fiscal 2020. The fiscal 2022 tax reform extended special measures to allow tax credits or special write-offs for corporate and income taxes until the end of fiscal 2024 along with special measures for property taxes until the end of fiscal 2023, after reviewing the plan to promote the development of base stations in rural areas in order to realize the "Digital Garden City Nation Concept."

(2) Promotion of remote work

a Overview of remote work

Remote work is a flexible way of working that uses ICT to make effective use of time and place. It is effective for realizing a variety of working styles that suit each person's life stage and lifestyle, including those raising children, the elderly, and persons with disabilities, and for ensuring business continuity in the event of disasters or infectious diseases. People can work where they wish to live while maintaining income, so this work style can bring about various benefits throughout society such as creating a flow of people from urban areas to rural areas. Since 2020 and the spread of COVID-19, remote work has been widely used as a means of reducing the number of workers at worksites, especially in urban areas. However, as notions on preventing the spread of COVID-19 have spread, the implementation rate of remote work has dropped along with the number of infections. According to a survey of companies conducted by Tokyo Shoko Research, Ltd., the rate rose from 25.3% to 55.9% during the first emergency declaration, and then fell to 31.0%. The rate rose again to 38.4% during the second declaration, but has remained around 30%[3] since 2022.

With this in mind, MIC established the "Task Force for the Investigation of Remote Work Post-COVID-19" in April 2021 to receive opinions from experts on further expanding and establishing remote work, and investigating how remote work should function in Japan in the future. A proposal issued in August of the same year argued that "Japanese-style remote work," such as enhancing communication through the use of ICT tools while maintaining good Japanese employment practices and business styles, should be the future of Japan.

In order to build momentum for remote work, the Remote Work Month Executive Committee (Cabinet Secretariat Bureau of Personnel Affairs, Cabinet Office for Promoting Regional Revitalization, Digital Agency, MIC, MHLW, METI, MLIT, Japan Tourism Agency, Japan Telework Association, and Japan Telework Society) advocates that November of each year be designated as "Remote Work Month" (an intensive period for remote work), conducts surveys of efforts to measure the effects of implementing remote work (such as contribution to work style reform and operational efficiency), and holds events and seminars runs by relevant ministries and agencies. In order to increase incentives for companies and others to introduce remote work through the selection and publication of advanced cases, and to accumulate reference cases for companies considering introducing remote work, MIC has been conducting the "Top Hundred Telework Pioneers" program since 2015 to award companies that have been recognized for their satisfactory use of remote work. The "MIC Minister Award" is also given to companies that have made particularly excellent efforts from the viewpoint of management results, ICT utilization, and contribution to local revitalization.

b Support for the spread of remote work

With the aim of supporting the introduction of remote work in SMEs and rural areas where the remote work implementation rate remains low, MIC in collaboration with local chambers of commerce and industry and social security labor attorney associations has established remote work support networks across Japan, and is now conducting public relations activities in collaboration with regional bureaus of telecommunications and others. MIC is also working to spread better remote work practices by providing free individual consultation by experts (remote work managers) for enterprises and other organizations considering introducing or improving remote work practices. Since fiscal 2022, support has been provided integrated with labor-related remote work consultation provided by MHLW as "one-stop telework support projects."

In order to address information security concerns often cited as challenges for introducing remote work, MIC formulated "Telework Security Guidelines" and "Telework Security Guide for SMEs (Checklists)" for reference by enterprises and other organizations when implementing remote work. The revised version released in fiscal 2022 features updated checklists and the addition of the "Employee Handbook."

In order to promote the spread and establishment of remote work in local areas, MIC began conducting demonstrations in fiscal 2022 to build a model that uses remote work to solve cross-field policy issues facing local areas.

Figure (related data) Ensuring remote work security
URL:https://www.soumu.go.jp/main_sosiki/cybersecurity/telework/index.html

[3] The 22nd "Survey on COVID-19 (Tokyo Shoko Research, Ltd.)": https://lp.tsr-net.co.jp/rs/483-BVX-552/images/20220622_TSRsurvey_CoronaVirus.pdf

(3) Promotion of smart city vision

Since fiscal 2017, MIC has been promoting the concept of smart cities in order to solve various problems faced by cities through the use of digital technology and data, leading to regional revitalization. The "Smart City Promotion Project for Solving Local Issues" is being implemented in cooperation with relevant ministries and agencies to support local governments and others working to implement smart cities using "Urban OS," a data linkage platform which serves as the foundation for smart city services. In fiscal 2022, the project provided support to 12 organizations.

Efforts were also made to promote the spread of smart cities by creating and releasing videos and interview articles that introduce examples of smart city initiatives in the region, as well as case studies of smart city services.[4]

(4) Promotion of ICT use in the education field

In order to further promote the use of ICT in education, MIC in cooperation with MEXT implemented the "Smart School Platform Demonstration Project" using data from the "school affairs system" used by teachers and the "lesson/learning system" used also by students to examine safe, effective, and efficient methods of linking data between systems from fiscal 2017 to 2019. In fiscal 2020, MIC released "Smart School Platform Technical Specifications" on its website and engaged in efforts to popularize and promote this information. During fiscal 2021 to 2022, MIC has been studying technical specifications (reference models) required to realize a "digital education platform" to serve as the basis of information sharing between digital learning systems owned by business operators outside of schools.

(5) Promotion of ICT use in the medical field

Japan is becoming a super-aging society and is facing challenges such as increasing medical and nursing care costs and uneven distribution of medical resources. For this reason, MIC has been promoting the spread of remote medical care and the use of PHR[5] data in order to improve and streamline medical and health services by building and upgrading infrastructures for utilizing medical, nursing, and health data.

The Japan Agency for Medical Research and Development (AMED) launched a research project in fiscal 2022 to develop and demonstrate an 8K endoscope system and continues to prepare communications environments and network conditions necessary for realizing remote surgery, with the goal of developing remote medical care, which is expected to serve as a powerful means of resolving the uneven distribution of doctors throughout the country. Since fiscal 2023, it has also been conducting research and development to establish a data distribution platform necessary for obtaining PHR data requested by physicians from various PHR services, in order to enhance medical care and improve the accuracy of medical examinations.

The "Safety Management Guidelines for Information Systems and Service Providers Handling Medical Information" (MIC and METI) and related documents will be revised in fiscal 2023 in light of the increasing complexity and diversity of information systems and services handling medical information, the damage caused by new threats such as ransomware attacks, and experiences during actual use.

(6) Development of disaster prevention information systems

Japan is one of the world's top nations in terms of natural disasters and has sustained severe social/economic damage each time it was hit by a large-scale natural disaster. As large-scale natural disasters including Nankai Trough earthquakes are anticipated in the future, it is necessary to reduce human and physical damage from disasters by efficiently using ICT.

a Development of disaster resistant communications networks for firefighting and disaster prevention

Collecting and sharing information pertaining to damage situations requires a communications network that can guarantee communication in times of disaster. Communications networks connecting the state, the Fire and Disaster Management Agency (FDMA), local governments, residents, and others have been constructed for this purpose. The networks consist of (1) the Cabinet Office's Anti-Disaster Radio Communication System collecting and conveying information within the government, (2) fire defense disaster prevention radio networks connecting FDMA and prefectures, (3) prefectural disaster management radio communications systems connecting prefecture and municipalities, (4) municipal disaster management radio communications systems connecting the municipality and residents, and (5) satellite communications networks connecting the state and local governments as well as local governments to local governments. Regarding satellite communications networks, MIC is promoting measures to introduce high-performance and inexpensive next-generation systems.

[4] Case study videos and interview articles https://www.mlit.go.jp/scpf/efforts/index.html
Smart city service case studies https://www.soumu.go.jp/main_content/000808085.pdf

[5] Abbreviation for Personal Health Record and generally refers to lifelong personal health/medical information (e.g., health examination results, vaccination/medication history, inspection results, vital signs checked by the person). It is expected that individuals will use it as a digital record to promote their own health.

b Deployment of mobile communications devices for disaster management

In order to guarantee communications in afflicted areas when communication by mobile phone or other means is unavailable, MIC lends mobile communications devices for disaster management to local governments and others. As of February 2023, 417 satellite mobile phones, 179 MCA radios, and 1065 convenience radios have been deployed in regional bureaus of telecommunications and other entities across the country. Use of these devices is expected to complement communications of information essential for a range of activities from collecting and circulating disaster information during the initial response, to conducted prompt and smooth emergency restoration activities.

c Securing means of emergency communication during disasters

In preparation for situations where it is difficult to use telecommunications services through a public telecommunications network during a disaster, attaché case type ICT units developed by MIC have been deployed in regional bureaus of telecommunications nationwide since fiscal 2016. A system has been established to help secure necessary means of communication by lending the units at the request of local governments and other disaster prevention organizations. A total of 25 units have been lent out to regional bureaus of telecommunications as of April 2023.

d Stable operation of Nationwide Instantaneous Alert System (J-Alert)

FDMA has established the "Nationwide Instantaneous Alert System (J-Alert)" to instantaneously transmit information on situations requiring immediate response (including ballistic missile information, early earthquake warnings, and tsunami warnings) from the government to residents through such means as emergency alert emails to mobile phones and municipal disaster management radio communications systems. In order to quickly and reliably transmit emergency information by J-Alert, municipalities are urged to thoroughly check the operation of J-Alert devices so that they do not cause problems, and the multiplexing of the J-Alert information transmission means being promoted.

e Promotion of the use of L-Alert

MIC is promoting the use of L-Alert, which is a common platform for unified transmission of disaster information including evacuation orders issued by local governments to diverse media including a large number of broadcast stations and Internet business operators. It has spread across the country throughout all 47 prefectures and now plays an important part in the disaster information infrastructure.

To further promote the spread and use of L-Alert, MIC engaged in demonstrations to map disaster information provided through L-Alert to help visitors and other people who are not familiar with the region to understand information such as evacuation areas easily. MIC has also provided training on L-Alert for local government officers and other users.

3. Promotion of data distribution/use and new businesses

(1) Social implementation of personal data trust banks

In order to promote the appropriate use of personal data including personal information, MIC and METI launched a study group to investigate a scheme for certifying information trust functions, and compiled the "Guidelines on Accreditation of Information Trust Function Version 1.0" on the voluntary certification of personal data trust banks by private organizations and others in June 2018. The guidelines focus on the use of data originating from individual users and consist of (1) accreditation criteria, (2) what to include in model agreements, and (3) the accreditation scheme. Based on the guidelines, an accreditation organization called the Information Technology Federation of Japan administered the first "personal data trust bank" accreditation in June 2018. Four companies have been accredited as "personal data trust banks" as of February 2023.

The guidelines have been continuously reviewed since then. Most recently, the handling of personal information requiring special attention in the health and medical fields by personal data trust banks has been under review by the "Personal Information Requiring Special Attention Working Group" established under the study group since November 2022, and the "Guidelines on Accreditation of Information Trust Function Version 3.0" are scheduled to be published around the summer of 2023. Since fiscal 2023, MIC has been studying how personal data trust banks should function in smart cities to promote cooperation and utilization of various regional data including personal data retained by local governments, in order to promote regional DX including the creation of new local services and the realization of administrative efficiency.

(2) Promotion of cashless payment

The "Follow-up on Growth Strategy" (Cabinet Decision in June 2019) was formulated to promote cashless payment toward the goal of doubling the percentage of cashless payment to about 40% by June 2025.

A type of cashless payment called code payment can be difficult to use for shops introducing multiple services. To address this issue, "Payments Japan" was established with MIC and METI as observers as an organization to promote cashless payment by concerned bodies and business operators, and formulated "Guideline for Unified Technical Specification of Code Payment" in March 2019. Codes based on this guideline are referred to as "JPQR." Since then, JPQR has been promoted with a focus on restaurants, retail stores, barber shops, beauty salons, taxis, and other industries highly compatible with JPQR, as well as local government service desks that handle fees for issuing various documents including resident cards. By the end of fiscal 2022, about 14,000 shops in total have introduced JPQR. In fiscal 2023, the payment of local taxes using a unified local tax QR code will start, with the standard for this QR code also being a unified standard of JPQR.

(3) Acceleration of adoption of secure and reliable cloud services

With the spread of cloud services including ASP, SaaS, PaaS, and IaaS and users have more service options, it has become necessary to create an environment for users to obtain sufficient information for comparison, assessment, and selection of cloud services. With this in mind, MIC began formulating and publishing a total of eight guidelines referred to as "Information Disclosure Guidelines for Safety and Reliability of Cloud Services" in 2011 (partially revised in 2022), and has continued to add to and revise these guidelines as cloud services become increasingly diverse, such as adding "Information Disclosure Guidelines for Safety and Reliability of Cloud Services Using AI (ASP/SaaS Edition)" in 2022. Based on this, the ASP-SaaS-AI-IoT Cloud Industry Association (ASPIC) has established and now operates a system whereby a third party certifies whether cloud operators are taking measures in line with the above guidelines, with more than 300 services having been certified so far.

In order to further popularize cloud services, efforts are being made to disseminate and publicize good practices for cloud services in cooperation with industry associations.

(4) Discovery and development of ICT startups

Japan set 2022 as the "first year for the creation of startups," and the government formulated a "Five-Year Plan for the Development of Startups" on November 24, 2022 with the goal of increasing investment in startups by 10 times in five years and is now working to create an ecosystem that produces and nurtures startups.

In order to nurture the next generation of industries through the creation and utilization of cutting-edge ICT, MIC plans to begin implementing the "Start-up Creation and Emerging R&D Support Program" in fiscal 2023, which will provide comprehensive support from research and development to commercialization under the shared roles of the public and private sectors.

MIC and NICT also hold "Entrepreneurs' Koshien" and "Entrepreneurs' EXPO" to award and support excellent business plans by students and start-up companies aiming to start their own businesses, with the aim of solving local issues and revitalizing the economy by creating ICT start-ups originating in the region.

(5) Promotion of the spread of AI

AI is expected to be linked and networked with other AI, information systems, and other resources over the Internet (AI networking), thereby dramatically increasing both benefits and risks as it spreads widely across space.

"The Conference toward AI Network Society" launched by MIC in October 2016 studied social, economic, ethical, and legal issues for the promotion of AI networking. The conference compiled and released "Draft AI R&D Guidelines for International Discussion[6]" summarizing the matters to be noted in AI development in July 2017 and "AI Utilization Guidelines[7]" summarizing the matters to be noted in AI utilization in August 2019. Since then, a report has been published every year since 2020[8] summarizing ambitious initiatives in AI by companies and other organizations. Under the "Social Principles of Human-Centric AI" (determined by the Integrated Innovation Strategy Promotion Council on March 29, 2019), MIC will continue to work to promote the social implementation of safe, secure, and reliable AI.

MIC has also actively participated in international discussions on AI at G7, OECD, and other international conferences. In particular, the Global Partnership on AI (GPAI), an international initiative established in June 2020 to promote the development and use of responsible AI based on human-centered ideas, held its third annual meeting (GPAI Summit 2022) from November 21 to November 22 in 2022 at Hotel Chinzanso Tokyo. During GPAI Summit 2022, it was also decided that Japan will serve as the Chair for one year beginning in November 2022. Japan will continue to disseminate information through initiatives related to GPAI and actively contribute to international discussions.

(6) Identification of issues related to the utilization of the metaverse and other resources

Recent increases in the speed of communication and improvements in the rendering performance of computers have seen the spread of the "metaverse," a virtual digital space that can be accessed by users through net-

[6] Draft AI R&D Guidelines for International Discussion https://www.soumu.go.jp/main_content/000499625.pdf
[7] AI Utilization Guidelines https://www.soumu.go.jp/main_content/000809595.pdf
[8] "Report 2020" https://www.soumu.go.jp/menu_news/s-news/01iicp01_02000091.html

works such as the Internet in order to communicate. Various regions around the country have been reproduced on the metaverse, and even economic activities have been carried out, attracting much attention. Since the metaverse is free from various constraints such as distance, time, and range of activities in cyberspace, it has great potential for social transformation for the future development of Japan, and the market is expected to expand in the future.

With the understanding that it is necessary to promote innovation related to the metaverse and to take measures to ensure that cyberspace is safe and secure while taking care not to become an excessive constraint on its spread, MIC has been holding meetings of the "Study Group on the Utilization of Metaverse in the Web3 Era[9]" since August 2022, in order to identify and understand what issues related to cyberspace might exist, rather than examining them only after they become problems, with an eye toward the future spread of the metaverse.

With regard to the utilization of virtual spaces such as the metaverse, the study group has been working to resolve issues related to information and communications administration with various use cases in mind in order to gain a clear understanding of users and digital infrastructure environments, with the goal of improving user convenience, providing appropriate and easy access, and creating innovation. In February 2023, the study group released an interim report[10] that summarizes discussions to date. The study group has continued to study the issue since then and the report will be compiled around the summer of the same year.

4. Creation of environments where everyone can enjoy the convenience of ICT

In order to make use of digital technologies in a way that leaves no one behind by bridging the digital divide caused by disabilities or age, MIC is actively promoting various measures for information accessibility, while at the same time supporting the use of digital technologies by the elderly.

(1) Support for R&D on information accessibility

In order to bridge the digital divide caused by disabilities or age, MIC provides partial subsidies to promote information accessibility in the communication and broadcasting fields. Specifically, the “R&D on Technologies to Bridge the Digital Divide” program provides necessary funds to enterprises conducting R&D on technologies regarding communications and broadcasting services for people with disabilities and the elderly. The subsidy was granted to three entities in fiscal 2022.

Furthermore, based on the Act on Advancement of Facilitation Program for Disabled Persons' Use of Telecommunications and Broadcasting Services, with a View to Enhance Convenience of Disabled Persons (Act No. 54 of 1993), MIC through NICT provides partial subsidies to promote the provision and development of information accessibility communications and broadcasting to enterprises providing or developing communications or broadcasting services for disabled persons. The subsidy was provided to three entities in fiscal 2022.

(2) Provision of phone relay service as a public infrastructure

Phone relay services are services where sign language interpreters mediate in communications between persons with hearing impairment (persons having difficulty communicating due to a disability of hearing, language functions, phonetic functions) and persons without hearing impairment by.

In order to ensure the proper provision of phone relay services, the Act on Facilitation of the Use of Telephones for the Persons with Hearing Impairments, etc. (Act No. 53 of 2020) came into effect in December 2020. The service began operating as a public infrastructure in July 2021 by the Nippon Foundation Telecommunication Relay Service, which is designated as a phone relay service organization. In order to further promote the spread of phone relay services, MIC is working with relevant ministries and agencies to publicize these services, and is cooperating in efforts to conduct phone relay service seminars and registration meetings held nationwide by phone relay service providers. As of the end of fiscal 2022, 12,307 users have been registered.

(3) Improvement to accessibility of public agency websites

In order to facilitate the use of public agency websites by everyone including the elderly and persons with disabilities, MIC formulated “Guidelines for Operation of Public Websites for Everyone (2016 Edition)” in April 2016 to support improving the accessibility of websites of national and local governments and other public organizations. In fiscal 2022, MIC conducted a questionnaire survey on the current status of website accessibility at public organizations, conducted a survey on JIS compliance of public organization websites, and held seminars for public organizations at three locations nationwide.

(4) Support for the use of digital technologies by the elderly and others

In order to bridge the digital divide and create an environment in which everyone can benefit from digital

[9] Establishment of the “Study Group on the Utilization of Metaverse Towards Web3 Era” (press release) https://www.soumu.go.jp/menu_news/s-news/01iicp01_02000109.html
[10] https://www.soumu.go.jp/main_content/000858216.pdf

technologies as society as a whole goes increasingly digital, MIC has been engaged in the "Project on Digital Utilization Support for Users" since fiscal 2021. This project provides assistance in the form of training sessions for the elderly and others who are concerned about using digital technologies, including advice and consultation on online administrative procedures using smartphones. In fiscal 2022, seminars were held mainly at mobile phone shops in 4,804 locations nationwide.

5. Promotion of improving literacy for ICT utilization

(1) Implementation of tests to evaluate the Internet literacy of young people

In fiscal 2011, MIC developed the "Internet Literacy Assessment indicator for Students (ILAS)[11]" to evaluate the online literacy of young people. It is designed specifically to measure the ability to respond to dangers and threats on the Internet, and tests seven risks including risks related to illegal information, inappropriate use, and privacy. A test to measure the Internet literacy of young people has been conducted each year since fiscal 2012, targeting first-year high schools students and other young people of equivalent age. In fiscal 2022, a total of 15,333 students from 100 schools were tested, and the overall correct answer rate was 71.1%. The correct answer rate for improper use risks (such as walking while using smartphones and violations of manners) was higher than that for other risks at 79.7%, while the correct answer rate for improper transaction risks (such as problems due to phishing or online transactions) was lower than that for other risks at 60.3%.

(2) Promotion of the spread of community ICT clubs

MIC has been conducting a demonstration project using "community ICT clubs" to provide local children with opportunities to learn applied ICT skills such as programming, and also to contribute to the development of local human resources by setting local issues as topics of study and discussion. Information on activities implemented in various parts of the country throughout fiscal 2018 and 2019 can be found on the project website.

In FY 2022, MIC conducted surveys on how local learning should be conducted in online environments and held online and community exchange meetings for the purpose of sharing information and exchanging opinions among community ICT clubs, with the aim of promoting the spread of these clubs by creating model examples of local online learning.

(3) Awareness raising to improve literacy for ICT use

In order to raise awareness about the safe use of the Internet by children, MIC runs the "e-Net Caravan," a series of free onsite lectures held at schools for individuals such as students, parents/guardians, and teachers. MIC also prepares and publishes "Internet Trouble Case Studies," a document that provides information on preventing trouble on the Internet.

The "Let's Go Online! Staying Safe and Secure on the Internet[12]" website was launched in 2021 to raise awareness about safe and secure Internet use. This website is tailored to each generation and contains content for preschoolers and their parents/guardians, young people, parents/guardians and teachers, and the elderly. It also features seasonal topics such as "social media slander," "measures against Internet piracy," and "false information and misinformation" to improve literacy.[13]

(4) Promotion of improving literacy based on the concept of "digital citizenship"

In order to respond to changes in the environment surrounding ICT, such as increasing opportunities to use ICT for a wide range of generations and the emergence of the distribution of false information and misinformation on the Internet, MIC began holding meetings of the "Review Committee on Improving ICT Literacy[14]" in November 2022 and the "Working Group on Improving Juvenile ICT Literacy" in December 2022. The groups have since been studying ways to promote literacy and measures to improve the level of literacy required of the digital society of the future, based on the concept of "digital citizenship" (engaging autonomously with digital society on one's own initiative). Based on the discussions of the review committee and working group, a roadmap for identifying the pillars supporting measures that must be taken will be formulated, indicators for measuring proficiency of literacy will be established, and efforts toward developing content to improve literacy will be promoted around the summer of 2023.

[11] https://www.soumu.go.jp/use_the_internet_wisely/special/ilas/
[12] Let's Go Online! Staying Safe and Secure on the Internet https://www.soumu.go.jp/use_the_internet_wisely/
[13] Refer to Chapter 5, Section 2
[14] Establishment of the "Review Committee on Improving ICT Literacy" (press release) https://www.soumu.go.jp/menu_news/s-news/01ryutsu02_02000348.html

Section 7 ICT Technology Policy Trends

1. Summary

(1) Initiatives so far

MIC is promoting technology policy in the information and communications field, focusing on initiatives aimed at Beyond 5G (6G), which is expected to serve as the foundation for all industries and social activities as the next generation of basic information and communications infrastructure to be utilized across national borders.

Specifically, MIC formulated the "Beyond 5G Promotion Strategy" in June 2020, and has been conducting research and development to establish the elemental technologies necessary for the realization of Beyond 5G (6 G). Recognizing the importance of strengthening international competitiveness and ensuring economic security for Beyond 5G (6G), the Information and Communications Council has since then been deliberating while sharing the efforts and knowledge of relevant organizations and key stakeholders in Japan, and has been making progress in such initiatives as compiling an interim report on the "Information and Communications Technology Strategy for Beyond 5G" in June 2022.

In the "Sixth Science, Technology and Innovation Basic Plan" approved by the Cabinet in March 2021, relevant ministries and agencies are cooperating to promote research and development in advanced fields such as quantum, AI, and space, with the aim of realizing a sustainable and resilient society that ensures the safety and security of citizens.

The National Institute of Information and Communications Technology (NICT) is also promoting basic and fundamental research and development in five priority fields (advanced electromagnetic technology, innovative networks, cybersecurity, universal communication, and frontier science) during the period covering the fifth medium-to-long term plan period (April 2021 to March 2026).

(2) Future challenges and directions

With regard to Beyond 5G (6G), Japan's ICT industry has not always been able to achieve significant business and business results even though it has established internationally excellent technologies. In addition, from the perspective of ensuring Japan's economic security, demonstrating competitiveness in global markets is an issue that must be addressed. Therefore, efforts must be made to ensure R&D results are utilized globally from a global perspective (so-called "global first").

As for R&D in cutting-edge fields such as quantum, AI, and space, early social implementation in society is facing various issues such as establishing ultra-reliable quantum communication technology, realizing simultaneous interpretation in anticipation of the Expo 2025 held in Osaka, and developing advanced space network technology.

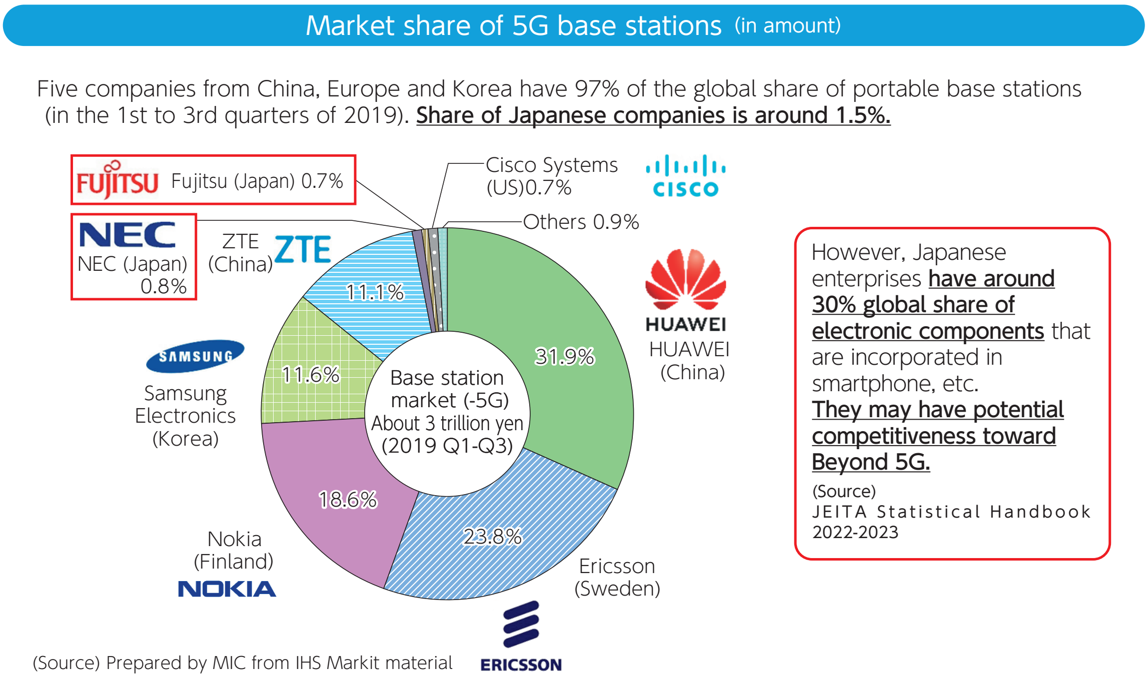
2. Beyond 5G(6G)

(1) Domestic and international trends surrounding Beyond 5G (6G)

Major overseas companies now account for a high proportion of the international market share of 5G base stations, and the international competitiveness of Japanese companies is relatively low.

On the other hand, Japanese companies account for about 30% of the global market share and have competitive potential in the market for electronic components that are also integrated into base stations and smartphones (**Figure 5-7-2-1**).

Figure 5-7-2-1 International competitiveness in the communications infrastructure market



(Source) Prepared by MIC from IHS Markit material

Large-scale government research and development investments and research and development plans have been announced in countries outside of Japan, and global development competition is intensifying in order to secure technological superiority in Beyond 5G (6G).

For example, in the U.S., the "CHIPS and Science Act of 2022," enacted in August 2022, stipulates that a budget of 20 billion dollars (approximately three trillion yen) will be allocated over the next five years for the development of advanced technologies including Beyond 5G (6G), AI, and quantum computers. In Europe, the EU plans to spend 900 million euros (approximately 120 billion yen) over seven years from 2021 to 2027 for research and development projects related to Beyond 5G (6G). Countries are making progress in various initiatives, and are expected to actively promote research and development of Beyond 5G (6G) in the future (**Figure 5-7-2-2**).

Figure 5-7-2-2 Beyond 5G (6G) R&D by the governments of other countries

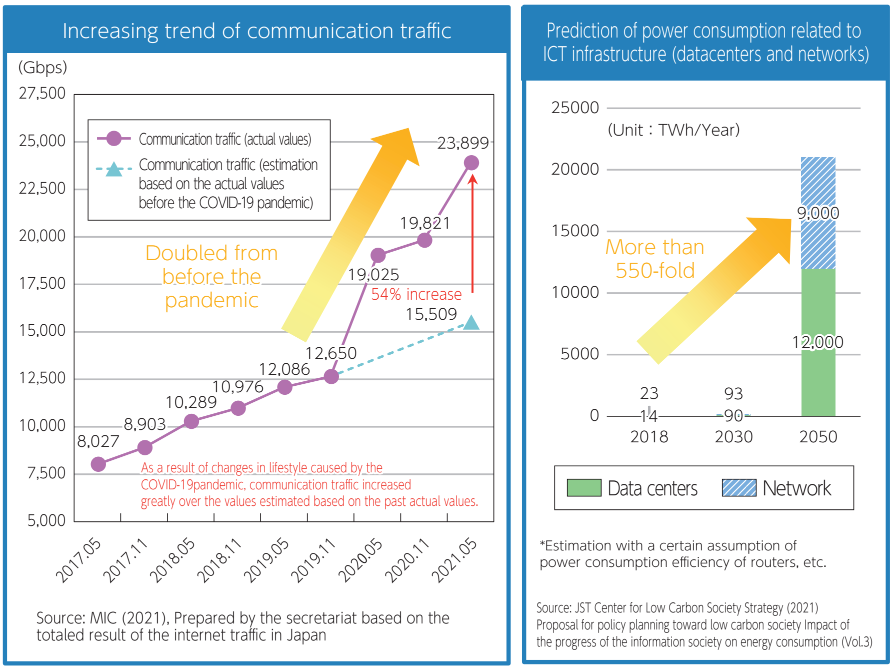
The United States		●The "CHIPS and Science Act of 2022," which provides $52.7 billion (about 7 trillion yen) in support for the production and research and development of semiconductors and **$20 billion (about 3 trillion yen) in support for the development of AI, quantum computers, and advanced technologies such as next-generation communication standards (6G)**, was enacted (August 2022)
Europe		**EU, Germany and Finland governments invest 1.85 billion Euro (about 240 billion yen) in total in 6G R&D** (as of March 2022)
	EU	●EU decided 900 million Euro investment in 6G R&D in the next R&D program Horizon Europe (2021-2027) (March 2021) ●SNS JU secured 2 billion euros (about 260 billion yen) in total from the public and private sectors, including the above 900 million euros (March 2022)
	Germany	●Decided to invest 700 million Euro in total in 6G technology R&D (2021 to 2025) (April 2021).
	Finland	●Started 6Genesis Flagship Program and budgeted 250 million Euro (about 33 billion yen) in eight years from 2019 to 2026 (May 2018)
Russia		●The Skolkovo Foundation announced a project to develop Russian 6G communications devices at the Skolkovo Institute of Science and Technology (Skoltech) and the Radio Research and Development Institute (NIIR), with an investment of **30 billion rubles (approximately 64.4 billion yen) from 2023 to 2025** (July 2022)
China		●Released **a digital economy plan to enhance 6G R&D as part of the 14 th five-year plan** (January 2022)
Korea		●Ministry of Science and ICT (MSIT) **announced a 6G R&D action plan**, including **220 billion won (about 21 billion yen) investment by 2025** (June 2021).

* The exchange rate at the time of publication was used for yen conversion.

Communications traffic in Japan is on the rise due to the progress of DX and other factors. There are concerns that the power consumption of information and communications networks will increase significantly unless technological innovations are made (**Figure 5-7-2-3**).

With this in mind, Japan has declared its international commitment to achieve carbon neutrality by 2050 as the need for initiatives to reduce power consumption in the information and communications field increases. For example, the government as a whole has set a policy of realizing a green and digital society and achieving carbon neutrality in the ICT industry by 2040. Therefore, in developing technologies and constructing networks for the next generation of information and communications infrastructures, it is inevitable to take drastic measures for greening, a global issue.

Figure 5-7-2-3 Trends of communications traffic and energy consumption in the ICT field



(2) Policy trends across government

The Kishida Cabinet has stated that it will accelerate bold investments in ICT and other digital fields by positioning the realization of "new capitalism" and the "Digital Garden City Nation Concept" as policy pillars.

Specifically, studies and implementation have been carried out in cooperation with relevant ministries and agencies at policy meetings such as the "Council for the Realization of New Capitalism" and the "Council for the Realization of the Digital Garden City Nation Concept," while the "Grand Design and Implementation Plan for New Capitalism 2023 Revised Edition" (approved by the Cabinet in June 2023) and the "Comprehensive Strategy for the Digital Garden City Nation Concept" (approved by the Cabinet in December 2022) have also been formulated. It has been suggested that these will aggressively promote technology strategy and research and development for Beyond 5G (6G).

As a means of promoting the "Digital Garden City Nation Concept," MIC announced in March 2022 the "Digital Garden City Nation Infrastructure Development Plan," which calls for the development of infrastructure such as optical fiber, 5G, data centers, and undersea cables, as well as accelerated efforts in research and development in order to begin operating next-generation Beyond 5G (6G) infrastructures as soon as possible. The revised "Digital Garden City Nation Infrastructure Development Plan (Revised Edition)" was released in April 2023, and the research and development of Beyond 5G (6G) aimed at social and overseas implementation will be aggressively promoted through efforts such as the Beyond 5G (6G) R&D Promotion Project.

The government's overall science, technology, and innovation policy also states that it will promote initiatives such as the fusion of cyberspace and physical space; the maintenance and development of next-generation infrastructures and technologies for Beyond 5G (6G), space systems, quantum technologies, and semiconductors; and research and development toward achieving carbon neutrality as a national strategy.

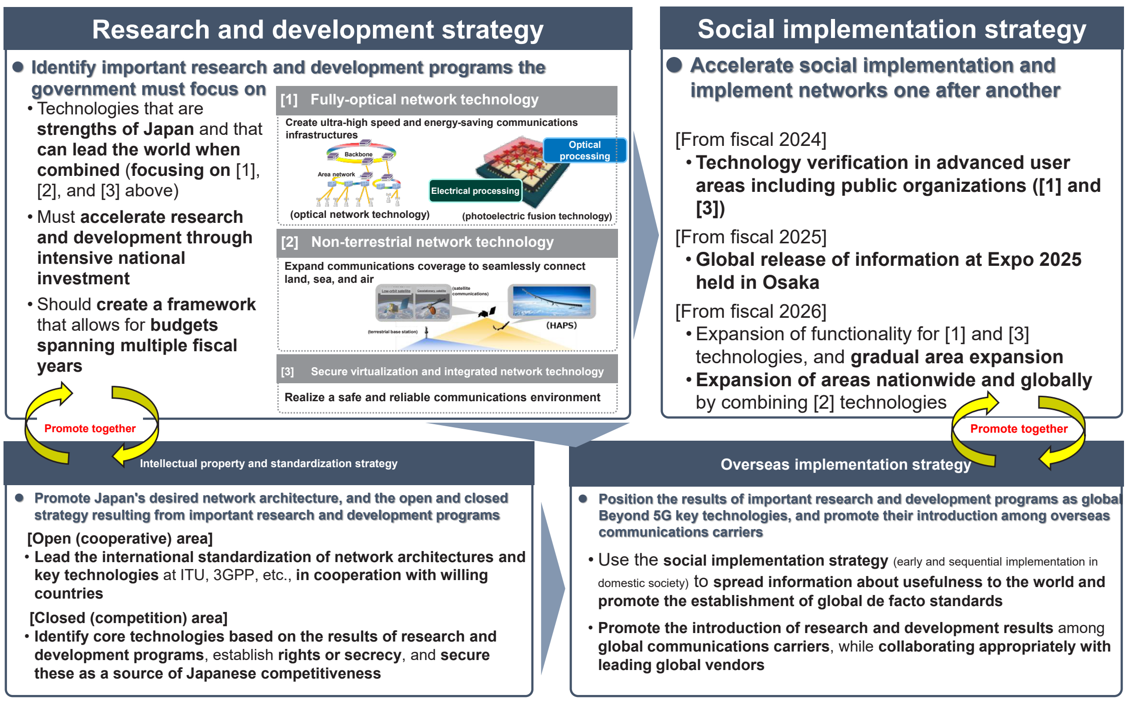
(3) Review and formulation of new information and communications technology strategies

Since the formulation of the "Beyond 5G Promotion Strategy" in June 2020, international development competition has intensified, and social issues such as strengthening international competitiveness, ensuring economic security, and the environment and energy fields have become apparent. For Beyond 5G (6G), there is a growing need for industry, academia, and government to work together in a strategic manner by implementing strategies for research and development, IP, and international standardization that Japan should pursue.

For this reason, MIC consulted with the Information and Communications Council on September 30, 2021 on the "Information and Communications Technology Strategy for Beyond 5G." The Technology Strategy Committee of the Information and Communications Technology Subcommittee deliberated on R&D, intellectual property, standardization, and other technology strategies while sharing information on the activities of industry, academia, and government (such as the "Beyond 5G Promotion Consortium") and the efforts and knowledge of various stakeholders (including major companies, universities, and national research and development agencies). An interim report was compiled on June 30, 2022.

The report significantly updates the research and development strategy for the "Beyond 5G Promotion Strategy." The strategy calls for Japan to take the lead in advanced technology development in order to become a game changer in the global communications infrastructure market, and to make strategic efforts to survive. It is necessary to consider our strengths, technological difficulties, autonomy assurance, national strategic positioning, and the need for acceleration based on prior investment, and must identify priority technology areas for Beyond 5G (6G) to focus on. Beginning in 2025, it is necessary to set a research and development strategy to work together to establish a framework that allows us to accelerate research and development and set budgets spanning multiple fiscal years, a social implementation strategy to take the results of important research and development projects and implement them into domestic networks and invest in the market, an intellectual property and standardization strategy focused on an open and closed strategy, and an overseas implementation strategy to set global de facto standards as quickly as possible **(Figure 5-7-2-4)**.

Figure 5-7-2-4 Strategy to accelerate research and development and social implementation of Beyond 5G (6G)



(4) Establishment of new funds to strengthen Beyond 5G (6G) research and development

In order to establish the elemental technologies necessary for the realization of Beyond 5G (6G), MIC has been providing research and development support to companies, universities, and other organizations through a time-limited Research and Development Fund (third supplementary budget of fiscal 2020) established at NICT based on the "Act Partially Amending the Act on the National Institute of Information and Communications Technology" in February 2021, and has been working to develop common facilities and equipment such as test beds.

Taking into account the further intensification of international development competition for Beyond 5G (6G), the progress of Beyond 5G research and development promotion projects, and the interim report of the Information and Communications Council in June 2022, the "Act Partially Amending the Act on the National Institute of Information and Communications Technology and Radio Act" (Act No. 93 of 2022) was enacted during the extraordinary Diet session in the fall of 2022 and came into effect on December 19 of the same year, enabling NICT to establish a permanent fund (the ICT Research and Development Fund) and to allocate radio wave usage fee resources to the fund **(Figure 5-7-2-5)**.

Figure 5-7-2-5 Act Partially Amending the Act on the National Institute of Information and Communications Technology and Radio Act

Act Partially Amending the Act on the National Institute of Information and Communications Technology and Radio Act (Act No. 93 of 2022)

[Related to supplementary budget, enacted on December 2, 2022]

- In order to promote the creation of innovative information and communications technologies that will serve as the foundation for Japan's economic and social development in the future, NICT will establish a research and development fund.

*NICT: National Institute of Information and Communications Technology

1. Summary of revisions

(1) Revision to the Act on the National Institute of Information and Communications Technology

Stipulates that NICT establish a fund (ICT Research and Development Fund) to be allocated to cover costs required for research and development through public recruitment for the creation of innovative information and communications technologies.

* Major revisions: Establishment of fund, separate accounting of fund operations, report to the Diet each fiscal year, abolition of the current time-limited fund

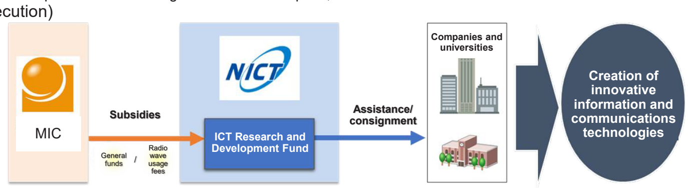
(2) Revision to the Radio Act

Clarifies that subsidies for research and development that contribute to the effective use of radio waves financed by radio wave usage fees may be allocated to the fund, and stipulates that the remaining amount of the fund and other usage of the fund be studied and publicized each fiscal year.

2. Effective date

The date specified by Cabinet Order (December 19, 2022) within a period not exceeding one month from the date of official announcement (December 9, 2022).
Provided, however, that the revision pertaining to the abolition of the current time-limited fund shall be made on the date specified by Cabinet Order within a period not exceeding six months from April 1, 2024.

(Execution)



(5) Implementation of the Beyond 5G R&D Promotion Project

Through the Innovative Information and Communications Technology (Beyond 5G (6G)) Fund project to be newly implemented by the above mentioned fund, R&D with the aim of social implementation and overseas expansion will be strongly promoted mainly in the following key technology fields based on the above mentioned interim report of the Information and Communications Council, and the development results will be gradually implemented in society from 2025 onward.

(1) Fully-optical network technology to bring ultra-high speed, ultra-low delay, and ultra-low power consumption to communications infrastructures

(2) Non-terrestrial network (NTN) technologies such as satellites and HAPS to expand communications coverage in a way that seamlessly connects land, sea, and air

(3) Secure virtualization and integrated network technology to ensure secure and reliable communications environments for users

In implementing the above funding project, MIC will focus on strategic research and development projects with a strong focus on social implementation and overseas implementation by making drastic development investments (including self-investment by companies), while keeping in mind the goal of technologies being utilized throughout the world ("global first") instead of the conventional idea of research and development itself being the main purpose or activities being centered on the domestic market.

In order to promote this funding project in an effective manner, the "Innovative ICT Project Working Group" composed mainly of outside experts specializing in management and business was newly established under the Information and Communications Council (Information and Communications Technology Subcommittee, Technology Strategy Committee) to examine how to appropriately evaluate and monitor research and development projects from a business perspective, and compiled "Recommendations on Conducting Appropriate Business Evaluations for the Beyond 5G R&D Promotion Project" on March 10, 2023.

MIC plans to establish related technologies over the next five years while monitoring progress appropriately, based on this report. MIC will also strive to improve the environment supporting Japanese companies competing in the global market by promoting international standardization and creating international consensus and rules, in order to more easily implement research and development results overseas.

(6) Promotion of the acquisition of IP and international standardization for Beyond 5G (6G)

The "Beyond 5G New Business Strategy Center" was established in December 2020 to strategically promote international standardization and the acquisition of intellectual property by industry, academia, and government. The center promotes the dissemination of information through conducting seminars on new business strategies and the development of human resources through workshops for young management candidates within companies. Efforts are also being made to establish an information infrastructure for future standardization, such as building an IP landscape to analyze the status of IP acquisition. MIC will engage in further analysis to promote IP and international standardization of Beyond 5G (6G) by utilizing the IP landscape announced in the interim report (June 30, 2022).

In order to promote international standardization activities from the early stages of research and development, international joint research is now being conducted with national and regional research institutions that are strategic partners that can be expected to provide synergy. Specifically, MIC began offering research and development funding for joint research with U.S. research institutes in fiscal 2016, and with German research institutes in fiscal 2019. In fiscal 2023, a total of three international joint research projects are now under way to develop and demonstrate technologies that will lead to the creation of use cases for more advanced use of 5G. Joint research projects on wireless link technology and 3D spatial data compression technology are being conducted between Japan and the U.S., while a joint research project on wireless communication technology in the manufacturing field is being conducted between Japan and Germany.

Furthermore, the "Beyond 5G Promotion Consortium" (established in December 2020 to aggressively and actively promote Beyond 5G [6G] in cooperation with industry, academia, and government) produced the "Beyond 5G White Paper" in March 2022, summarizing usage methods and performance targets for Beyond 5G, and then conducted additional interviews with various industries in March 2023 and published an updated 2.0 edition. Based on the results of the study on future technological trends and prospects of IMT summarized in the white paper, MIC has been promoting international standardization activities since the 38th meeting of ITU-R SG5 WP5D, such as continuing to submit contributing documents. The "Open RAN Promotion Subcommittee" was also established in March 2022 to discuss various issues related to Open RAN, with the goal of spreading and promoting Open RAN in Japan and helping domestic companies to expand overseas. The "Beyond 5G International Conference" was also held in October 2022 to strengthen cooperation between domestic and international stakeholders, and a memorandum of cooperation was signed[1] with three new organizations in fiscal 2022.

3. Quantum technology

(1) Quantum security network policy trends

Quantum technology is an innovative technology that will dramatically and discontinuously develop future societies and economies. It is also crucially important for economic security. Other countries, especially the U.S., European countries, and China are significantly increasing research and development investments in this technology and making strategic efforts including development of research and development sites and human resources.

Based on the "Quantum Technology Innovation Strategy" (decided by the Integrated Innovation Strategy Promotion Council in January 2020), the "Vision for the Quantum Future Society (a future society vision to realize through quantum technology, and strategies to realize this)" (decided by the Integrated Innovation Strategy Promotion Council in April 2022), and the "Quantum Future Industry Creation Strategy" (decided by the Integrated Innovation Strategy Promotion Council in April 2023), the government as a whole will support activities to strengthen research and development and commercialization in each technology area (such as quantum computers, quantum software, quantum security/networks, quantum measurement/sensing, and quantum materials), and will promote fundamental initiatives to create innovation (such as the formation of bases where industry, academia, and government work in unison from basic research to technology demonstration and human resource development).

(2) Research and development on quantum cryptographic communications technologies

There are concerns that modern encryption methods will be rendered useless in the age of quantum computers. Therefore, it is necessary to establish quantum cryptography that generally cannot be deciphered by any computer. MIC in collaboration with NICT is promoting research and development on quantum cryptographic communications technologies (quantum key distribution technologies), while at the same time establishing a "Quantum Security Hub" for the quantum security and network technology area at NICT based on the Quantum Technology Innovation Strategy in fiscal 2021 and tackling a broad range of activities including social implementation through construction and use of test beds and human resource development.

a Research and development on distance extension and networking of quantum cryptographic communications

One major issue with realizing the social implementation of quantum cryptographic communications is extending communications distances. With the aim of tackling the challenge of extending distances and developing global quantum cryptographic communications network, MIC has been engaged in research and development projects on linking and relaying terrestrial quantum encryption communications over long distances, since fiscal 2020. Since fiscal 2018, MIC has been engaged in research and development on using quantum cryptographic communications in microsatellites, with the aim of building secure satellite communications networks. Furthermore, in fiscal 2021, research and development for the construction of a global-scale quantum cryptographic communications network integrating terrestrial and satellite-based networks began.

[1] Signed with the 6G Smart Networks and Services Industry Association (Europe) and Next G Alliance (U.S.) in May 2022, and Northeastern University (U.S.) in November of the same year.

b Development of test beds for quantum cryptographic communications and promotion of social implementation

In Japan, NICT has been engaged in research and development of elemental technologies for quantum cryptographic communications since early on. In order to verify the principles of quantum cryptographic communications, NICT constructed a quantum cryptographic communications test bed called "Tokyo QKD Network" in 2010 and has been operating it since then. The basic specifications of quantum encryption communications devices developed based on the long-term operation of Tokyo QKD Network were adopted as international standards (ITU-T Y.3800 series) in 2020, which shows its high international competitiveness.

Because quantum cryptographic communications are expected to be used in financial, medical, and other commercial services in addition to use in public organizations handling confidential information, there are strong demands for its early practical application. With the aim of accelerating social implementation through verification of use in actual environments, MIC began working to develop broad-area test beds for quantum cryptographic communications in fiscal 2021, which are capable of demonstrating network architectures including routing control with architecture connecting multiple sites.

c Research and development for realizing the quantum Internet

The quantum Internet is the ultimate form of a quantum network that allows for communications in a quantum state. It is expected to become the communications technology that underlies the utilization of various quantum technologies such as secure communications, increases in computing power and distributed quantum computer enabled through increasing the number of qubits by connecting multiple quantum computers, and network connections of quantum sensors. In fiscal 2023, MIC began research and development efforts on elemental technologies to maintain the quantum state and realize stable long-distance quantum communications, in order to realize the quantum Internet.

Figure (related data) Global quantum cryptographic communications network
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00387
(Data collection)

4. AI technologies

Beginning with the advent of deep learning in 2006, the third AI boom has led to dramatic technological innovations in areas such as image recognition and natural language processing. In 2022, generative AI, which can automatically generate images and sentences based on learning data,[2] began to be put to actual use and is now showing signs of revolutionizing a wide range of industries.

Based on "AI Strategy 2022" (decided by the Integrated Innovation Strategy Promotion Council in April 2022), MIC is now working extensively on research and development projects and the social implementation of natural language processing technology, multilingual translation and speech processing technology, distributed federated machine learning technology, and brain cognitive model construction in cooperation with NICT, a core AI-related center.

For example, MIC is working with NICT on the research and development of multilingual translation technology to eliminate language barriers and realize the free exchange of information on a global basis. By utilizing NICT's multilingual translation technology incorporating the latest AI technology, practical level translation accuracy has been achieved in 17 languages for use in dealing with foreign visitors, foreign residents, and diplomatic situations. MIC and NICT are also promoting social implementation of multilingual translation technology. NICT provides "VoiceTra" as a research application targeting independent travelers. More than 30 private-sector services have been developed[3] through technology transfers and are now being used in a variety of fields including disaster management, transportation, and medical care in addition to government offices.

Figure (related data) Multilingual translation technology
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00388
(Data collection)

In order to prepare for Expo 2025 held in Osaka, MIC formulated the "Global Communication Plan 2025" in March 2020 to further advance NICT's multilingual translation technology. Based on this plan, MIC has

[2] 2022 saw the emergence of "Stable Diffusion" (an AI that can automatically generate images) and "ChatGPT" (an AI that can automatically generate sentences).

[3] Global Communication Development Promotion Council, examples of products/services of private enterprises using the multilingual translation technology of the National Institute of Information and Communications Technology (NICT): https://gcp.nict.go.jp/news/products_and_services_GCP.pdf

been developing a computer environment for NICT to conduct world-class AI research and development, and has been conducting research and development since fiscal 2020 to upgrade the technology (which used to be limited to the sequential translation of short sentences) to allow for simultaneous interpretation to be performed during business and international conference discussions.

Figure (related data) Efforts to further advance multilingual translation technology
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00389
(Data collection)

In addition to research and development on multilingual simultaneous interpretation, four additional languages will be added in order to deal with foreign visitors, foreign residents, and refugees from Ukraine.

5. Remote sensing technologies

NICT is conducting research and development on remote sensing technology to observe rainfall, water vapor, wind, and ground surface conditions with high temporal and spatial resolution, with the goals of quickly identifying sudden atmospheric phenomena such as linear precipitation zones and torrential downpours, helping clarify how these develop, and quickly determining damage during disasters.

In addition to conducting research and development on developing Dual Polarization Multi-Parameter Phased Array Weather Radar (MP-PAWR), which is capable of three-dimensional observation of rain clouds at high speed and high accuracy, and on promoting the utilization of data, research and development on technologies for estimating the amount of water vapor in the atmosphere using the propagation delay of terrestrial digital broadcasting waves, wind profiler technology to observe the wind velocity in the sky, and ground-based water vapor and wind lidar technology using an eye-safe infrared pulsed laser to simultaneously observe water vapor and wind are being promoted.

Figure (related data) Development of water vapor observation network in linear precipitation zone: Efforts to improve the accuracy of short-time rainfall forecasting
URL: https://www.nict.go.jp/press/2022/06/29-1.html

6. Space ICT

According to the Basic Space Plan based on the Basic Space Act (Act No. 43 of 2008) and its schedule, MIC is promoting the following research and development efforts related to space development and use.

(1) R&D of radio-optical hybrid communications technology for small satellite constellations and wireless communications technology using unused frequencies for space networks, in order to realize ultra-wide-band satellite optical communications systems through effective use of frequency resources
(2) R&D to establish core technologies for quantum cryptography in satellite communications and realize a global quantum cryptographic communications network through satellite networks, etc.
(3) R&D of technology to explore water energy resources on the lunar surface, to contribute to the international space exploration project (Artemis Program) proposed by the U.S.
(4) R&D of satellite communications system for Engineering Test Satellite-9 and optical communications technology to enable ground-satellite optical data transmission at 10 Gbps
(5) Development of space environment monitoring sensor technology to observe and analyze ionosphere, magnetosphere, and solar activities, to be used for space weather forecasting under 24-hour, 365-day human-crewed operation and to be mounted on the successor to the Himawari geostationary meteorological satellite

The importance of space weather forecasting is growing, especially for companies responsible for the stable operation of social infrastructures such as power, communications, broadcasting, and aviation. In light of the fact that solar activity is expected to increase, MIC held the “Study Group on the Advancement of Space Weather Forecasting” (January to June 2022), and compiled a report on proposals to enhance warning systems and effectively deal with impacts on social infrastructures. Based on this report, MIC is now considering and introducing new forecast and warning standards that take social impacts into account.

Figure (related data) Impact of solar flares on the Earth
Source: MIC, Material of the Study Group on the Advancement of Space Weather Forecasting (the 1st session)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00390
(Data collection)

Policy Focus Achieving Beyond 5G (6G)

1. Expectations and social implementation of Beyond 5G (6G)

(1) About Beyond 5G (6G)

The mobile communication system in Japan has undergone a generational change from the first generation (1G) to the fifth generation (5G) in about 10-year cycles. 4G is now widely used as a commercial service, while 5G commercial service was launched in 2020 and its use continues to spread. Beyond 5G (6G) is expected to serve as the next generation of information and communications infrastructure for a wide range of industrial and social activities in the 2030s. Rather than being an extension of wireless communications, Beyond 5G (6G) is considered to be an entire network encompassing wired and wireless; and land, sea, air, and space.

Figure (related data) Beyond 5G (6G) features
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00391
(Data collection)

(2) Society in the 2030s

Beyond 5G (6G) is expected to become a reality in the 2030s, with the aim of creating a resilient and vibrant society in which citizen's lives and economic activities can be maintained smoothly. Specifically, this calls for (1) an inclusive society in which everyone can play an active role, (2) a sustainable society in which people can grow, and (3) a dependable society in which people can live and work with ease. In light of the government's national strategy and Japan's social issues, these social goals are illustrated in **Figure 1**.

In order to achieve such a society, **Figure 2** shows the issues and future vision for the 2030s in a wide range of industries, not limited to the information and communications field, and identifies and arranges a wide range of information and communications usage scenes involving many industries and uses.

Figure 1 Society of the 2030s realized through Beyond 5G (6G)

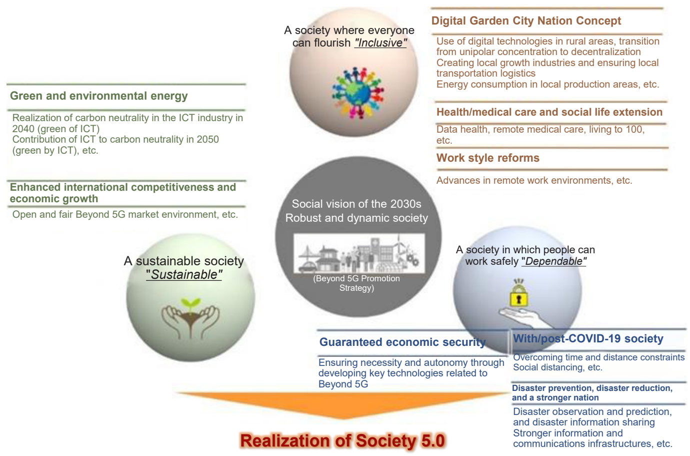
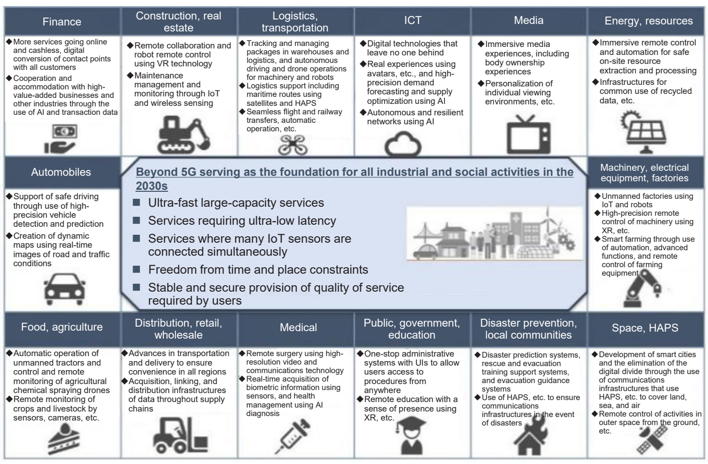
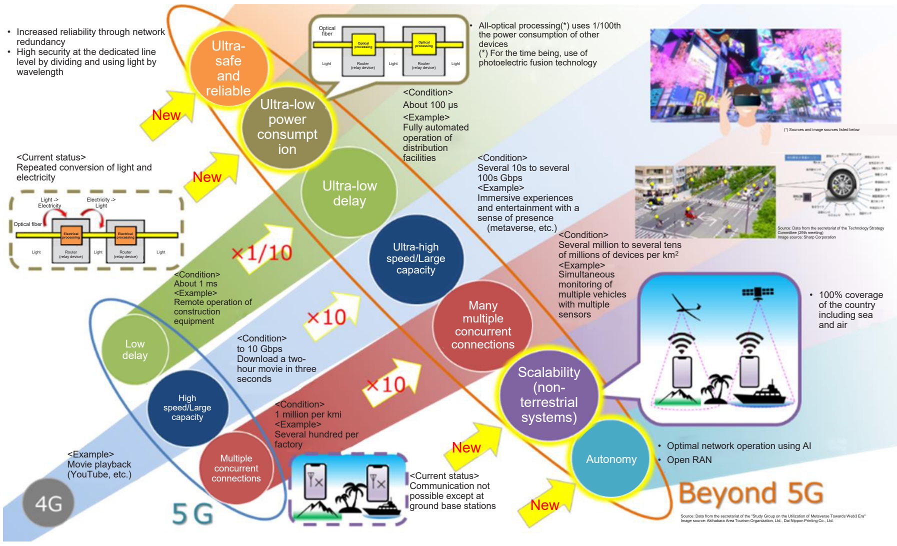


Figure 2 Beyond 5G (6G) use cases



In order to realize these use cases, solve various social problems, and realize a vibrant society, it is essential to develop technology for Beyond 5G (6G), which is expected to become the foundation of all industries and societies in the future. In addition to further upgrading 5G features (high speed and high capacity, low latency, and multiple simultaneous connections) new features such as ultra-low power consumption, scalability of communications coverage, autonomy, and high safety and reliability are expected (**Figure 3**).

Figure 3 Features and use scenes realized by Beyond 5G (6G)



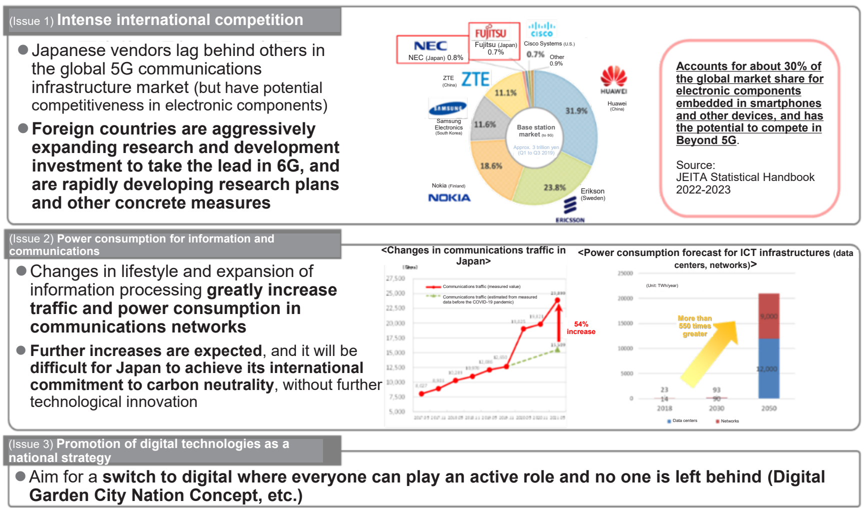
2. Challenges for Beyond 5G (6G)

Major overseas companies now account for a high proportion of the international market share of 5G base stations, and the international competitiveness of Japanese companies is low. Large-scale government research and development investments and research and development plans have been announced in countries outside of Japan, and global development competition is intensifying in order to secure technological superiority in Beyond 5G (6G).

Communications traffic in Japan is on the rise, and there are concerns that the power consumption of information and communications networks will increase significantly unless technological innovations are made.

It will be important as a part of national strategy to deliver the benefits of Beyond 5G (6G) to citizens in order to switch to digital technologies in a manner where everyone can play an active role and no one is left behind (**Figure 4**).

Figure 4 Major challenges for Beyond 5G (6G)



3. The ideal Beyond 5G (6G) network

Beyond 5G (6G) should not be regarded as an extension of current mobile communications (wireless communications) technologies and systems, but as an integrated network that includes data centers, devices, and terminals, and that encompasses wired and wireless; optical and radio wave; and land, sea, air, and space.

Innovative next-generation communications infrastructures that offer high speed, high capacity, low latency, high reliability, and low power consumption will be realized by tightly coupling fully-optical networks (fixed networks) with mobile networks, while making broad use of photoelectric fusion technology. It would also be seamlessly coupled with non-terrestrial networks such as satellites and HAPS to greatly expand communication coverage. Integrated networks capable of securely and optimally controlling these will be created by utilizing virtualization technology and other related technologies.

By aiming for such a Beyond 5G (6G) network, Japan will lead the global market, contribute to carbon neutrality by reducing the power consumption of entire communications networks, and realize a Digital Garden City Nation infrastructure that can cover a wide area of the country, including land, sea, and air. Strategic efforts are therefore needed to ensure that Japan remains a game-changer and winner in the global communications infrastructure market.

Figure (related data) The ideal Beyond 5G (6G) network
Source: Information and Communications Council, Summary of the interim report on the "Information and Communications Technology Strategy for Beyond 5G"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00396
(Data collection)

4. Initiatives to realize Beyond 5G (6G)

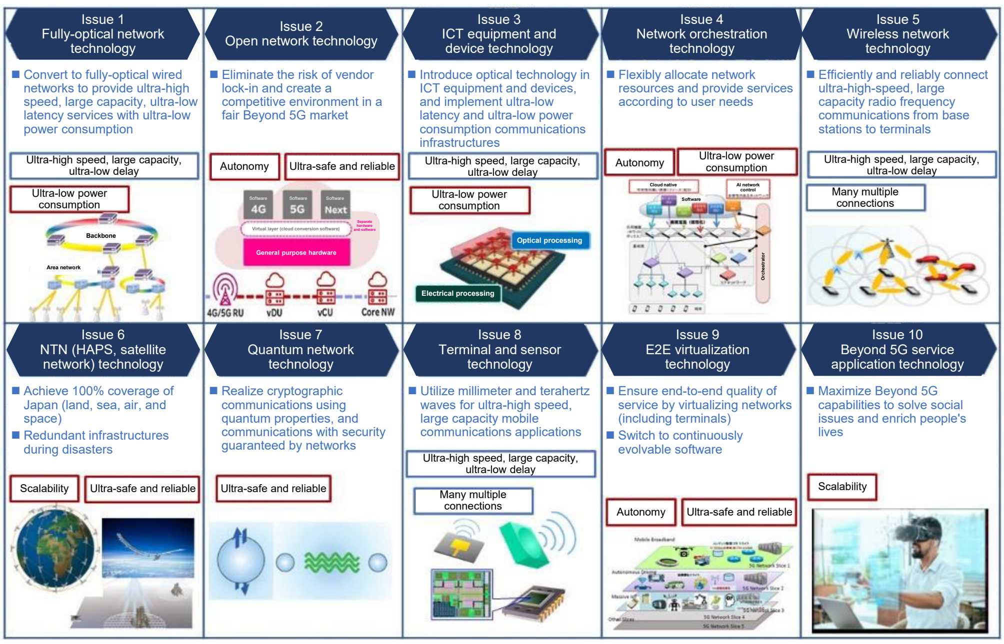
(1) Technology strategies to focus on research and development, social implementation, and overseas implementation of Beyond 5G (6G)

In order to promote initiatives to implement Beyond 5G (6G), MIC consulted with the Information and Communications Council in September 2021 on the "Information and Communications Technology Strategy for Beyond 5G," and an interim report was compiled in June 2022. The report presents four strategies: a research and development strategy, social implementation strategy, intellectual property and standardization strategy, and overseas implementation strategy.

a Research and development strategy

As shown in **Figure 5**, this report summarizes 10 Beyond 5G (6G) research and development issues to be addressed by industry, academia, and government, based on the ideal Beyond 5G (6G) network and Japan's strengths. Technologies related to fully-optical networks, non-terrestrial networks, and secure virtualization and integrated networks have also been set as priority technology areas from the perspectives of Japan's strengths, technological difficulties, autonomy assurance, national strategic positioning, and the need for acceleration based on prior investment. Research and development will be promoted strategically by concentrating national funds around these priority technology areas and working together to create a framework that allows for budgets spanning multiple fiscal years.

Figure 5 10 Beyond 5G (6G) research and development issues for industry, academia, and government



b Social implementation strategy

Our social implementation strategy is to apply what is learned in these priority technology areas in domestic networks and to bring these to market beginning in 2025. Realize the Beyond 5G (6G) migration scenario, share the results globally with industry, academia and government, including the Osaka and Kansai Expo.

c Intellectual property and standardization strategy

MIC will promote international standardization and intellectual property acquisition through an open and closed strategy, focusing on priority technology areas. In the open (cooperative) area, we will promote the international standardization of network architecture and key technologies in cooperation with willing countries based on the promotion of open architectures that lead to the creation of diverse businesses. In the closed (competitive) area, we will promote rights and secrecy of core technologies as a source of Japan's competitiveness.

d Overseas implementation strategy

MIC will define results in priority technology areas as global Beyond 5G key technologies, promote the implementation of these technologies in domestic society at an early stage, and communicate the usefulness of these technologies to the world as quickly as possible in order to promote the creation of global de facto standards. By working strategically with major global vendors, MIC will also encourage the adoption of these standards among global communications carriers.

Together, these four strategies will serve to accelerate the research and development and social implementation of Beyond 5G (6G).

Figure (related data) Strategy to accelerate research and development and social implementation of Beyond 5G (6G)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2023/data_collection.html#f00398
(Data collection)

(2) Establishment of promotion system by industry, academia, and government

Established in December 2020 by industry, academia, and government, the “Beyond 5G Promotion Consortium” continues to work on various initiatives. The consortium is working to develop white papers by examining use cases, concepts, and technical challenges for Beyond 5G (6G), and is working to strengthen international cooperation and dissemination through international conferences.

The “Beyond 5G New Business Strategy Center” was established in December 2020 as a framework to promote intellectual property and standardization strategies by industry, academia, and government. Based on a report released by the center, the report of the Information and Communications Council incorporated an international standardization roadmap and IP landscape for Beyond 5G. The center also holds seminars to disseminate information and conducts workshops to develop human resources to lead efforts in acquiring intellectual property, and setting standards.

(3) Sharing of an international vision (G7 Digital and Tech Ministers' Meeting)

In developing technology for Beyond 5G (6G), MC will focus on supporting research and development aimed at social implementation and overseas implementation. As for the latter, it will be important to create an environment in which technologies developed by Japan are widely accepted internationally.

MIC has therefore been working to disseminate Japan's vision of Beyond 5G (6G) through intergovernmental dialogue with countries such as the U.S., the EU, Germany, and Singapore in order to gain the understanding and approval of the international community. Japan has been pursuing dialogue with the aim of securing a leading position in the world in areas such as extremely energy-efficient photoelectric fusion technology that contributes to the realization of both DX and GX, and the promotion of open and interoperable networks.

“The G7 Digital and Tech Ministers' Declaration” was adopted during the “G7 Digital and Tech Ministers' Meeting in Takasaki, Gunma” chaired by Japan, held in April 2023, with the understanding and support of each participating country following discussions on building secure and resilient network infrastructures. Based on Japan's vision for Beyond 5G (6G), this declaration formulated a vision for the future of next-generation wireless and wired networks, and represents an agreement reached on the G7 Action Plan for Building a Secure and Resilient Digital Infrastructure.

MIC will steadily take measures in such way that the government and the private sector work together to develop Beyond 5G (6G), and then to implement it throughout society and overseas.

Section 8 Promotion of International Strategies for ICT

1. Summary

(1) Initiatives so far

Based on the government's "Infrastructure System Overseas Promotion Strategy 2025" (decided by the Infrastructure Strategy Economic Cooperation Meeting on December 10, 2020) and the "MIC World Development Action Plan 2025" (formulated by MIC on July 21, 2022), MIC has worked vigorously for the overseas implementation of ICT infrastructure systems through total support for enterprises, which includes human resource development, maintenance, and finance in accordance with the implementation stage (project identification, proposal, and formation).

MIC has also contributed to the formation of international frameworks through active participation in discussions on digital economy and the establishment of international rules in the ICT field, by taking opportunities for bilateral policy dialogues with the U.S. and other countries, and multilateral talks including G7 and G20.

As digital infrastructures such as optical undersea cables and 5G networks have become part of the basic infrastructure supporting citizen's lives and economic activities, efforts have also been made to ensure safety and reliability through international cooperation, from the viewpoint of economic security.

(2) Future challenges and directions

The transition of society and economy to digital is accelerating in the wake of the COVID-19 pandemic, and there is an increasing need for digital solutions that are effective in improving and upgrading communications networks and solving problems. The importance of high-quality infrastructures has come into focus as discussions on economic security have intensified. Under such circumstances, the implementation of high-quality Japanese infrastructures overseas utilizing bilateral and multilateral frameworks will contribute to solving not only the social issues of each country but also global issues such as climate change, and will further contribute to achieving SDGs. It is also important for the economic development of Japan to increase our international competitiveness and demonstrate our presence through the spread and development of Japanese digital technologies.

MIC is now working to implement digital technologies overseas and to establish international frameworks in the digital field through international cooperation, with the aim of strengthening the international competitiveness of Japan's digital technologies and solving global social challenges. As a means of promoting "MIC World Development Action Plan 2025," an emphasis will be placed on the implementation of one-stop ICT solutions in the medical and agricultural fields, in addition to ICT infrastructure systems such as 5G and optical undersea cables. It is necessary to contribute to global economic development and solving global social issues by utilizing Japanese technology and experience. Furthermore, in order to take a leading role in establishing international rules in the digital field, it is necessary to actively participate in international discussions at international conferences and other meetings.

2. Overseas implementation of digital infrastructures

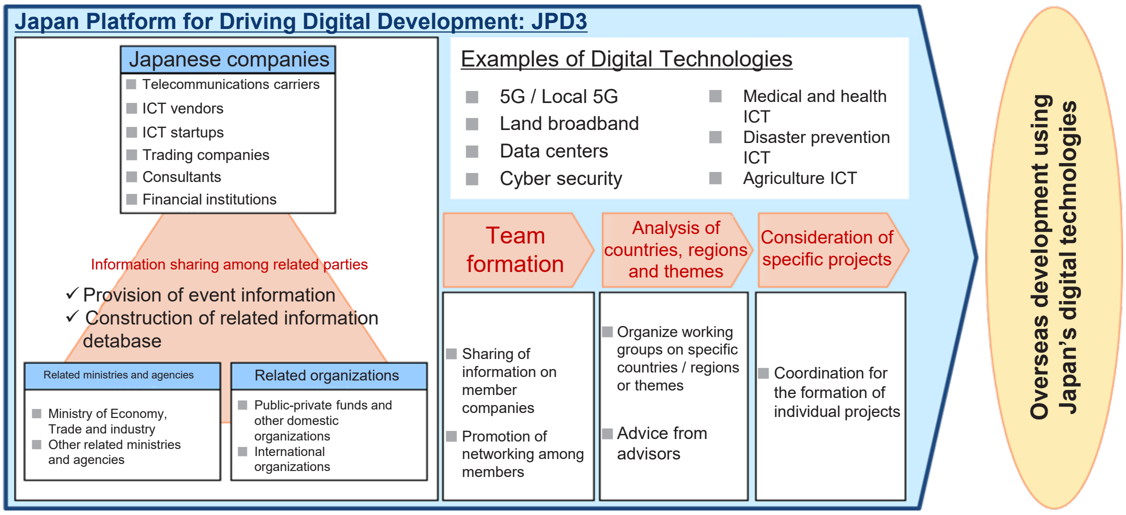
In light of the growing need for communications infrastructure and services worldwide amid the transition of society and the economy to digital, MIC is promoting support for the overseas implementation of digital infrastructures and other services with the aim of strengthening the international competitiveness of Japan's digital industries and promoting the use of digital technologies to solve global problems.

(1) Overseas implementation of support tools at MIC

MIC provides support for the overseas implementation of high-quality Japanese digital infrastructure in accordance with each phase from basic research to demonstration projects, taking into account each country's circumstances and challenges.

In February 2021, MIC established the "Japan Platform for Driving Digital Development," a public-private cooperation framework to support the implementation of Japanese ICT overseas under MIC's initiative (**Figure 5-8-2-1**). As of January 2023, over 100 members including Japanese ICT-related companies and relevant ministries, agencies, and organizations participated in the framework to share information on countries and regions (51 countries and one organization) in databases, hold workshops, form teams, and discuss specific projects.

Figure 5-8-2-1 Japan Platform for Driving Digital Development

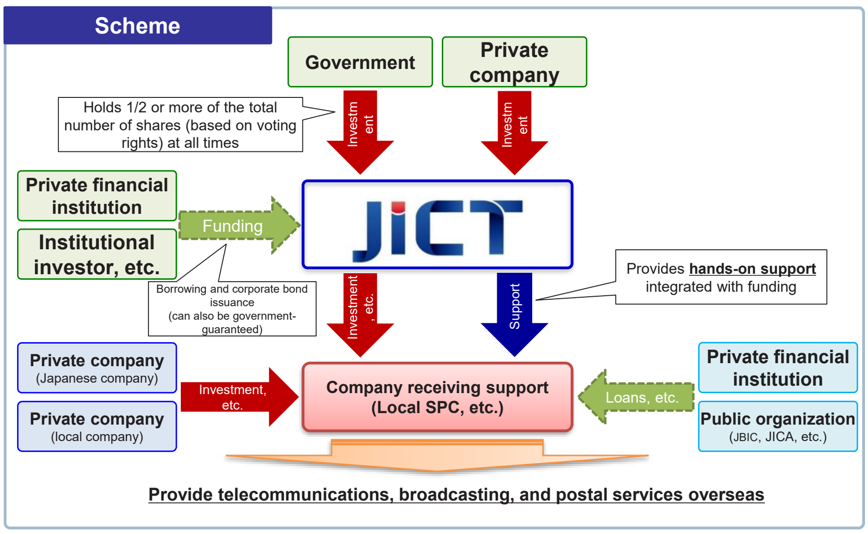


(2) Fund Corporation for the Overseas Development of Japan's ICT and Postal Services (JICT)

The Fund Corporation for the Overseas Development of Japan's ICT and Postal Services (JICT), a public-private fund under the control of MIC, supports investments and hands-on projects by entities providing overseas communications, broadcasting, or postal services and those supporting them (**Figure 5-8-2-2**). As of the end of March 2023, funds and loans totaling 102.9 billion yen have been allocated for support.

In light of recent developments and needs in ICT and policy trends around the world, JICT support standards were revised in February 2022 (MIC Notice No. 34 of 2022) to allow JICT to support projects that do not involve the development of hard infrastructure (ICT service projects) and to make LP investments in funds. As a result, JICT has established a system that makes it easier for not only large enterprises but also medium-sized, small, and local enterprises to support overseas expansion, and five new support decisions were made in fiscal 2022.

Figure 5-8-2-2 Support through the Fund Corporation for the Overseas Development of Japan's ICT and Postal Services (JICT)



(3) Initiatives toward overseas expansion for each field

a Core communications infrastructure

In 2021, the Ethiopian government granted a license to an international consortium including Japanese companies providing access Ethiopia's mobile phone business, and commercial communications services were then launched for mobile communications networks in October 2022. MIC plans to take this opportunity to promote the implementation of digital solutions in Ethiopia and throughout Africa (**Figure 5-8-2-3**).

JICT has provided support for optical undersea cable projects in Southeast Asia and elsewhere (with up to 78 million USD of the total project cost of approximately 400 million USD supported). Furthermore, Japanese companies began in September 2021 to participate in a project to lay optical undersea cables in the Indian Ocean that had been announced by Prime Minister Modi in August 2020. In addition, efforts are being made to improve communication environments in Pacific Island countries, which have relatively poor communication environments, in cooperation with voluntary countries, relevant ministries and agencies and organizations. The importance of safe and secure 5G networks is currently being discussed in the international arena. With regard to 5G and local 5G, “Open RAN” is attracting attention as a technology for realizing open and secure networks, and work on the overseas deployment of systems that utilize it is underway. For example, since fiscal 2021, MIC has been working with local communications carriers in Thailand and Chile to jointly examine the possibility of overseas expansion through construction of a local 5G network using 5G wireless equipment based on Open RAN and demonstration experiments for local 5G applications. Since fiscal 2022, a testing environment has been developed for Open RAN in the UK, conducting tests to confirm compatibility of RAN devices with interface specifications established by the O-RAN Alliance, and conducting surveys on the feasibility of implementing Open RAN in Vietnam and the Philippines.

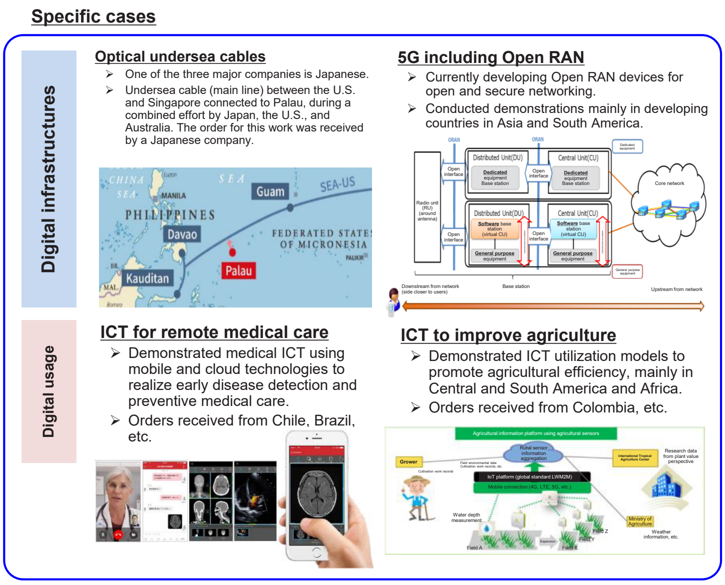
Since March 2021, Japanese companies have been participating in projects to improve the communications environment in Uzbekistan, including the development of data centers and other communications infrastructures. JICT has also supported the development and operation of data centers in India, with an investment of up to 86 million USD decided in October 2022.

A total of 20 countries mainly in Central and South America have adopted the Japanese digital terrestrial broadcasting system. In October 2022, Botswana became the first country to adopt the system overseas and switched off analog broadcasting throughout the entire country. In January 2023, Costa Rica did the same. MIC will continue to support the smooth transition to digital broadcasting.

b Digital technology use models

In the medical field, Japan has received orders for remote medical care systems using smartphones mainly in Central and South America, and since fiscal 2020, with the aim of expanding the use of endoscopy and medical AI diagnostic support systems in Southeast and Southwest Asian countries, which utilize high-definition imaging techniques, studies have been conducted through actual certification at local hospitals. In FY 2022, surveys and demonstrations were conducted in Vietnam. As for radio systems, preparations are under way to conduct demonstration tests in Thailand for the Ground-Based Augmentation System (GBAS), an aircraft approach and landing system utilizing GPS and other positioning satellites. Through these efforts, Japan aims to convince other countries of our technological superiority, promote the international use of highly efficient Japanese radio technologies, and promote the international coordinated use of radio frequencies.

Figure 5-8-2-3 Examples of overseas implementation of ICT



c Broadcast content

Japanese broadcasters have been working with local governments to produce broadcast content that conveys the appeal of Japan and disseminate it through overseas broadcasters and other organizations, and have been continuously supporting the overseas expansion of broadcast content through international trade fairs. This has had various benefits including economic ripple effects, such as the development of sales channels for regional products and the spread of Japan's appeal. In fiscal 2023, MIC began to develop a common platform for expanding Japanese broadcast content information overseas. With the goal of increasing overseas sales related to broadcast content by 1.5 times by fiscal 2025 (compared to fiscal 2020), MIC will continue to promote the expansion of broadcast content overseas, thereby strengthening our soft power.

d Other

(a) Firefighting

The “Memorandum of Cooperation in Firefighting between the Ministry of Internal Affairs and Communications of Japan and the Ministry of Public Security of the Socialist Republic of Vietnam” was signed on October 8, 2018. Since then, Japan has been promoting the high quality of its firefighting equipment by exchanging opinions on fire prevention policies and standards for firefighting equipment. In February 2023, basic training on firefighting techniques was conducted. MIC will continue to promote the overseas deployment of firefighting equipment that conforms to Japanese standards by providing encouragement to Vietnam and other Southeast Asian countries.

(b) Postal service

The government and the private sector are working together to promote international cooperation and overseas expansion through an approach that identifies opportunities and issues related to postal efficiency and modernization, and to share Japanese knowledge and experience to help solve these issues, mainly in emerging and developing countries in Asia and Eastern Europe. MIC has received requests for consultation on streamlining operations and have received orders for sorting machines from postal services in Vietnam and Slovenia. MIC has also taken other initiatives to expand business opportunities in postal service entities through the use of ICT.

(c) Administrative consultation and statistics

In the area of administrative consultation, coordination and cooperation are being carried out with the official ombudsmen of each country. In the area of statistics, MIC has been promoting support for digitization of the government by making use of its knowledge on the construction of highly reliable electronic government and statistical systems. For example, in Vietnam, Japan has supported the construction of a system for information coordination between central and local ministries.

3. Contribution to establishment of international rules on the digital economy

(1) Data Free Flow with Trust (DFFT)

The G7 Action Plan to cooperate on promoting Data Free Flow with Trust (DFFT) was formulated during the Meeting of G7 Digital Ministers in May 2022 and approved during the G7 Summit in June of the same year. DFFT was also discussed during the Meeting of G20 Digital Ministers in September of the same year.

MIC now actively participates in international discussions toward formulating concrete rules to promote DFFT, held during discussions such as G7, G20, OECD, and bilateral discussions.

(2) Response to discussions on international rules of cyberspace

a Creation of international rules of cyberspace

MIC attaches great importance to two points with regard to the creation of international rules of cyberspace. First, is giving maximum consideration to the free flow of information, which not only supports democracy but also serves as an engine for economic growth, as a source of innovation. Second is that it is crucial for private companies, academia, the local community, and all other relevant stakeholders utilizing the Internet to manage networks (multi-stakeholder framework) to participate in order to ensure cybersecurity. In addition to strengthening cooperation with fellow countries by discussing relevant topics in bilateral discussions such as the U.S.-Japan Policy Cooperation Dialogue on the Internet Economy (U.S.-Japan IED) and the EU-Japan ICT Strategies Workshop, MIC also continue to actively participate in discussions in multilateral meetings. In April 2022 “Declaration for the Future of the Internet” was established in core member countries (Japan, U.S., Australia, Canada, EU, and UK) and willing countries.

b Bilateral and multilateral talks on cybersecurity

MIC continues to participate in bilateral government discussions on cybersecurity. The fourth “Japan-India Cyber Dialogue” was held in June 2022, the sixth “Japan-France Cyber Dialogue” in July 2022, and the seventh “Japan-UK Cyber Dialogue” in February 2023. MIC continues to strengthen its cooperation with these countries by discussing situations, efforts, cooperation in the international arena, and support for capacity building.

MIC has also engaged in multilateral discussions on cybersecurity. MIC exchanges opinions and information on the state of each country's efforts and the state of support for capacity building in the ASEAN region at meetings such as the ASEAN-Japan Cybersecurity Policy Meeting. Cooperation on cybersecurity has also been agreed upon under initiatives of the so-called Quad consisting of Japan, the U.S., Australia, and India. Discussions have also been held to strengthen cooperation with fellow countries by the government as a whole, and the "Joint Principles of the Japan-U.S.-Australia-India Cybersecurity Partnership[1]" were announced in a joint statement of the summit in May 2022.

[1] https://www.mofa.go.jp/mofaj/files/100347891.pdf

(3) Promotion of trade liberalization in the ICT field

In order to complement a multilateral free trade system built around the World Trade Organization (WTO) and promote bilateral economic partnerships, Japan is actively working to conclude Economic Partnership Agreements (EPAs) and Free Trade Agreements (FTAs).

Since 2018, MIC has participated in discussions on the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (TPP11), the Japan-EU Economic Partnership Agreement (Japan-EU EPA), the Japan-U.S. Digital Trade Agreement, the Japan-UK Comprehensive Economic Partnership Agreement (Japan-UK EPA), and the Regional Comprehensive Economic Partnership (RCEP) Agreement, which were signed and came into effect. Negotiations on FTAs and other agreement between Japan, China, and South Korea are now under way. During EPA negotiations, MIC requests the relaxation or abolishment of restrictions on foreign investments in the telecommunications field, negotiates the development of rules for promoting competition including interconnection, and discusses cooperation between contracting parties in order to obtain a commitment toward liberalization at or above WTO levels.

(4) Promotion of strategic international standardization

International standardization in the ICT field is an important policy issue that can lead to the creation of a global market through common standards. Because strategic initiative in development of international standards is critically important for strengthening international competitiveness, MIC has been strategically promoting international standardization activities.

MIC has been conducting research on trends in de jure standards[2] as well as forum standards,[3] training human resources for international standardization, and engaging in efforts to deepen understanding of the importance of standardization activities. MIC has also been conducting joint research with the EU, the U.S., and Germany with the aim of establishing international standards, and are conducting R&D and demonstration experiments in fields where there are high expectations for social implementation (such as wireless factories).

4. Economic security in the digital field

In light of the economic security importance of the communications field including 5G, MIC is working with the U.S. and other fellow countries in the digital field to ensure the safety and reliability of global digital infrastructures, based on such efforts as the "Global Digital Connectivity Partnership (GDCP)" established during a summit meeting held between Japan and the U.S. in April 2021, and the "Memorandum of Cooperation on 5G Supplier Diversification and Open RAN" signed during a summit meeting held between Japan, the U.S., Australia, and India (the Quad) in May 2022.

Four systems were also established by the Act on the Promotion of Ensuring National Security through Integrated Implementation of Economic Measures enacted in 2022, including the "System for Ensuring the Stable Provision of Specified Social Infrastructure Services," which may regulate telecommunications, broadcasting, and postal services. Preparations are now under way to implement this system, including developing subordinate laws and regulations.

5. International cooperation in multilateral frameworks

MIC holds policy discussions through multilateral frameworks such as G7/G20, APEC, APT, ASEAN, ITU, the United Nations (UN), the WTO, and the OECD, and takes an active role in leading international cooperation efforts in the ICT field, such as promoting the free flow of information, creating a safe and secure cyberspace, developing high-quality ICT infrastructures, and contributing to the achievement of the Sustainable Development Goals (SDGs) of the UN.

(1) G7•G20

As information distribution, businesses, and services continue to spread across borders due to globalization and the shift of socioeconomic activities to digital, active discussions on policies for the development of the digital economy have been taking place within the framework of the G7 since the April 2016 meeting of G7 ICT Ministers' Meeting held in Takamatsu, Kagawa, in which Japan served as Chair.

Discussions on the digital economy also continue to take place within the framework of the G20, including China and India. In June 2019, MIC, MFA, and METI held the "G20 Ibaraki-Tsukuba Ministerial Meeting on Trade and Digital Economy" in Tsukuba, Ibaraki, and agreed on AI principles based on a "human-centered" concept for the first time at G20. These principles were also agreed upon at the G20 Osaka Summit. The idea of promoting the free flow of reliable data (DFFT) was also supported at the summit level, and its importance was reaffirmed at the G20 Ministerial Meeting on Digital Economy held in Saudi Arabia in 2020.

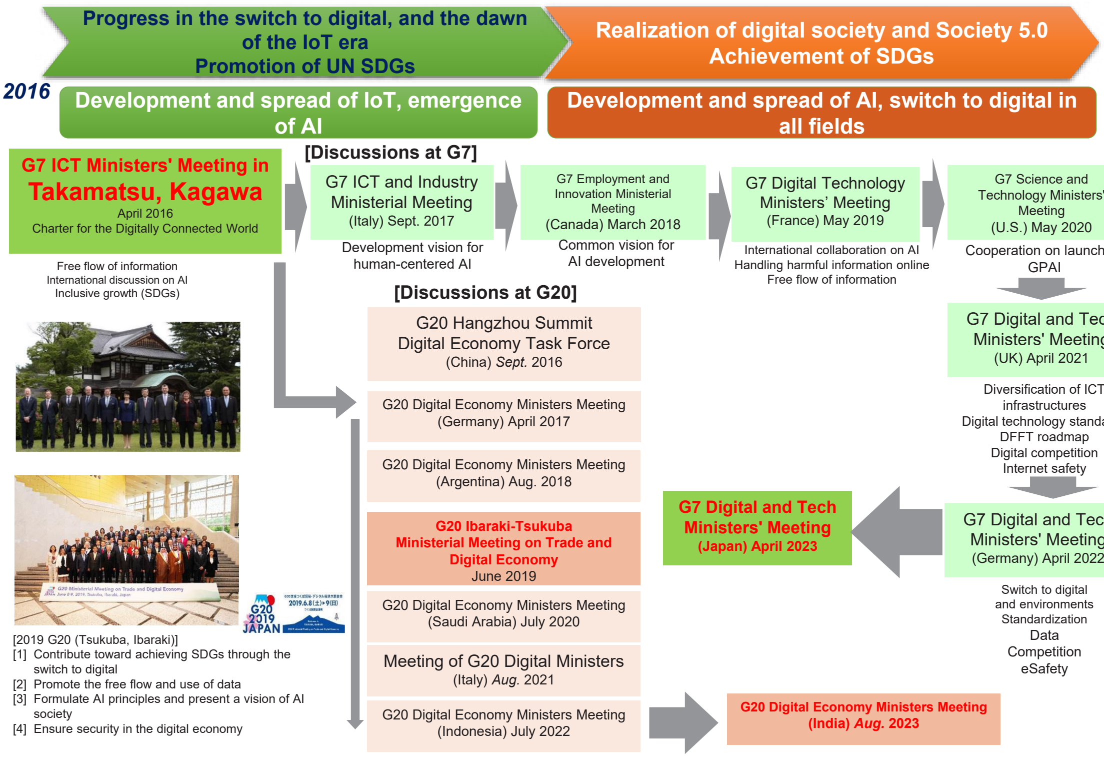
In May 2022, the Meeting of G7 Digital Ministers was held in Germany to express opposition to measures that

[2] Standards formulated by the International Telecommunication Union (ITU) or other public international standardization organizations.
[3] Standards formulated based on the agreement of multiple enterprises, universities, and other forum members.

could undermine democratic values in the digital age, including internet shutdowns and network restrictions, and to develop an action plan to promote DFFT. The action plan proposed to jointly commit to action in five areas: (1) strengthening the evidence base, (2) building commonality to promote future interoperability, (3) continuing regulatory cooperation, (4) promoting DFFT in the context of digital trade, and (5) sharing knowledge on the international data space landscape, which was approved at the G7 Summit in June of the same year.

Japan chaired the G7 in 2023, and discussions were held at the G7 Digital and Tech Ministers' Meeting in Takasaki, Gunma held in April of the same year on six topics: (1) promoting cross-border data distribution and the free flow of reliable data, (2) building a secure and resilient digital infrastructure, (3) maintaining and promoting a free and open Internet, (4) promoting economic and social innovation and emerging technologies, (5) promoting responsible AI and AI governance, and (6) setting competitive policies in digital markets. As a result, the "G7 Gunma Takasaki Ministerial Digital and Tech Declaration" including five annexes was adopted, contributing to international discussions on rulemaking on the digital economy, including the promotion of the DFFT[4] **(Figure 5-8-5-1)**.

Figure 5-8-5-1 History of G7/G20 ICT/digital discussions (overview)



(2) Asia-Pacific Economic Cooperation (APEC)

Asia-Pacific Economic Cooperation (APEC) is an international conference of major countries and regions in the Asia Pacific region for sustainable development of the region. Discussions on the telecommunications field are led by the Telecommunications and Information Working Group (TEL) and the Ministerial Meeting on Telecommunications and Information Industry (TELMIN).

As a result of the adoption of the "Aotearoa Plan of Action" at the APEC Summit in 2021, TEL is now advancing studies for the promotion of the innovation and digital technologies field listed as one of the three economic drivers in the plan.

MIC actively contributes to TEL operation through participation in discussions and promotion of projects related to digital government at TEL held twice a year, and through dissemination of ICT policies in Japan.

(3) Asia-Pacific Telecommunity (APT)

Asia-Pacific Telecommunity (APT) is an international organization in the information and communications field of the Asia Pacific region established in 1979 with the aim of achieving the balanced development of telecommunications and information infrastructures in the region. Its activities include human resource development through training and seminars, and regional policy coordination in standardization and radio communication. Masanori Kondo, a former senior MIC official from Japan is currently serving as secretary general.

[4] Refer to Policy Focus "G7 Digital Tech Meeting in Takasaki, Gunma" for an overview and results of the G7 Digital and Tech Ministers' Meeting in Takasaki, Gunma, held in April 2023.

Through contributions to APT, MIC supports activities including accepting trainees and exchanging ICT engineers and researchers in broadband and wireless communications and other ICT fields where Japan has strengths. In fiscal 2022, MIC supported eight training courses, four international joint research projects, and two pilot projects.

(4) Association of Southeast Asian Nations (ASEAN)

The Association of Southeast Asian Nations (ASEAN) is a regional cooperative organization consisting of 10 Southeast Asian countries. Its major purposes are promoting economic growth and social/cultural development, ensuring political and economic stability, and cooperating on challenges in the region. Policies in the digital field are discussed during the "ASEAN Digital Ministers Meeting (ADGMIN)."

a Contribution to achieving the goals of "ASEAN Digital Masterplan 2025"

Japan is cooperating on efforts toward achieving the goals of "ASEAN Digital Masterplan 2025" formulated in January 2021. Japan has been implementing joint projects with ASEAN countries utilizing the Japan-ASEAN Information and Communications Technology (ICT) Fund, which was established with contributions from Japan. In fiscal 2022, Japan worked to implement initiatives to establish standards for disaster-related data and information exchange in the ASEAN region.

b Strengthening of systems of cooperation in the field of cybersecurity

MIC continues to conduct cybersecurity exercises including Cyber Defense Exercise with Recurrence (CYDER) for the cybersecurity personnel of government agencies and critical infrastructure operators in ASEAN countries online or at the ASEAN-Japan Cybersecurity Capacity Building Centre[5] (AJCCBC). Face-to-face exercises were resumed in October 2022, and a number of students exceeding the initial target of 700 completed these exercises over four years. Recognized by ASEAN, this activity has been carried out for about four years since 2018, and is scheduled to continue from 2023 to 2026 with the addition of new exercises.

MIC also regularly holds the ASEAN-Japan Cyber Security Workshop for ISP operators in ASEAN countries, in order to promote information sharing among stakeholders and to build and enhance collaboration systems. The first face-to-face meeting in three years was held in January 2023, along with an exhibition of Japanese cybersecurity products and services.

c 50 years of collaboration by ASEAN and Japan

The year 2023 marks an important milestone as it is the 50th anniversary of Japan-ASEAN friendship and cooperation. Japan-ASEAN relations must be strengthened further, but it is also an opportunity to further develop Japanese digital technologies in the ASEAN region. In anticipation of the ASEAN-Japan Special Summit on the 50th anniversary of Japan-ASEAN friendship and cooperation scheduled to be held in Tokyo from December 16 to 18, 2023, Japan will contribute to the deepening of ASEAN-Japan relations and bilateral relationships with ASEAN countries while providing support in a manner consistent with the digital policy goals of the ASEAN region through the use of the Japan-ASEAN ICT Fund, in light of "ASEAN-Japan Digital Work Plan 2023" approved during the ASEAN-Japan Digital Ministers' Meeting (February 2023, Philippines).

(5) International Telecommunication Union (ITU)

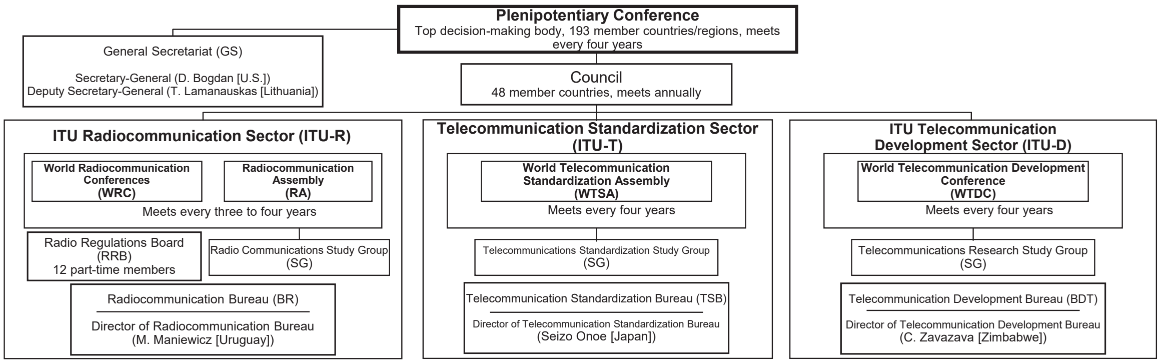
The International Telecommunication Union (ITU) is a specialized agency of the United Nations (UN) that is headquartered in Geneva, Switzerland and has 193 member countries and regions. Its purpose is to extend international cooperation for the improvement and rational use of telecommunications, and to promote the development and efficient operation of technical means to efficiently improve, popularize, and spread telecommunication services. ITU consists of the following three sectors, and is involved in various activities including allocating frequencies, standardizing telecommunications technologies, and providing development in the telecommunications field in developing countries (**Figure 5-8-5-2**).

(1) ITU-R: ITU Radiocommunication Sector
(2) ITU-T: ITU Telecommunication Standardization Sector
(3) ITU-D: ITU Telecommunication Development Sector

An election was held during the Plenipotentiary Conference in September 2022, with Seizo Onoe (former Chief Standardization Strategy Officer [CSSO] of Nippon Telegraph and Telephone Corporation) of Japan being elected as Director of the ITU Telecommunication Standardization Sector. He then assumed office in January 2023 (four years per term, with a maximum of two terms).

[5] AJCCBC https://www.ajccbc.org/index.html

Figure 5-8-5-2 International Telecommunication Union (ITU) organization



a Initiatives at ITU-R

In order to ensure the rational, efficient, economical, and fair use of radio frequencies in all radio communication services, ITU-R conducts research on the use of frequencies and formulates standards related to radio communications. The Radiocommunication Assembly (RA) aims to approve recommendations submitted by each Study Group (SG) and discuss issues and systems for the next SG period, while World Radiocommunication Conferences (WRC) aim to revise radio regulations governing international frequency distribution. These are among the largest ITU-R meetings held every three to four years, and MIC has actively contributed to discussions.

b Initiatives at ITU-T

ITU-T studies international standards of communications network technologies and operation methods, and conducts technical studies necessary for formulating these standards.

The World Telecommunication Standardization Assembly (WTSA) is the highest decision-making meeting of ITU-T. Held once every four years, the next meeting is scheduled to be held between October and December 2024. The Telecommunication Standardization Advisory Group (TSAG) is responsible for providing advice on WTSA resolutions and the standardization activities of ITU-T Study Groups (SGs). The group held its first meeting of this session in December 2022, in which it developed and agreed upon a project plan to discuss the possibility of restructuring the ITU-T by analyzing data indicators identified during discussions at the previous session.

In fiscal 2022, FG-MV (metaverse) was established as a Focus Group (FG) activity that is open to non-ITU members.

c Initiatives at ITU-D

ITU-D assists in the development of the information and communications fields of developing countries.

The World Telecommunication Development Conference (WTDC) is the supreme decision-making meeting of ITU-D, and is held once every four years. Most recently, WTDC-22 was held in Kigali, Rwanda in June 2022.[6] During the current SG period (2022-2025), activities such as implementing ICT development support projects and conducting ICT human resource development are being promoted based on the strategic goals and action plans adopted at WTDC-22. ITU and MIC have been working together since 2022 on a separate project to implement the Connect2Recover initiative, in order to strengthen the resilience of digital infrastructures.[7]

(6) United Nations

a United Nations General Assembly Second Committee, Economic and Social Council (ECOSOC)

During the United Nations General Assembly Second Committee (dealing with economy and finance), the “Commission on Science and Technology for Development (CSTD)” established under the Economic and Social Council (ECOSOC) leads discussions on issues such as promoting global digital cooperation toward an inclusive digital society and the public nature of the Internet. Through participating in CSTD annual meetings and other activities, Japan contributes to international discussions on Internet governance and the information and communications field.

---

[6] This was originally scheduled to be held in 2021, but was delayed by one year due to the worldwide spread of COVID-19.
[7] Although support initially targeted Africa, where Internet connectivity is low, more countries began supporting the project and so the project has expanded to cover Asia Pacific island countries, Central and South America, Europe, and the whole world.

Chapter 5

b Internet Governance Forum (IGF)

The Internet Governance Forum (IGF) is an international forum for dialogue on various public policy issues regarding the Internet.

In November and December of 2022, the 17th meeting was held in Ethiopia, in which Japan hosted an open forum on Internet shutdowns. During the closing session, Takeaki Matsumoto (Minister for Internal Affairs and Communications) appeared in a video to announce that the IGF would be held in Kyoto in 2023, with the goal of maintaining and developing a free, open, secure, and undivided Internet. Thereby, Japan actively contributed to the meeting.

(7) World Trade Organization (WTO)

There has been no progress in the telecommunications field since the basic telecommunications negotiations agreed upon in 1997, due to the stagnation of the Doha Round negotiations that began in 2001. However, due to the recent increase in attention paid to the field of e-commerce (which deals with the distribution of data on the Internet), negotiations on e-commerce officially began in 2019 as an initiative of willing countries in the WTO. As co-chair, Japan is now working together with Australia and Singapore on leading discussions.

(8) Organisation for Economic Co-operation and Development (OECD)

Pioneering discussions on the ICT field are held at the Committee on Digital Economy Policy (CDEP) of the Organisation for Economic Co-operation and Development (OECD). MIC provides personnel and financial support to the OECD Secretariat and actively contributes to policy discussions at OECD as exemplified by many MIC officials serving as CDEP chair (since January 2020) or vice-chairs of Working Parties under CDEP.

CDEP has been working on AI-related initiatives since 2016. In May 2019, CDEP adopted and published the “Recommendation of the Council on Artificial Intelligence,” which is the first intergovernmental consensus document on AI, and provides principles to be shared by those involved in AI and matters to be addressed by governments. Since then, it has continued to work actively on initiatives, including launching an online platform on AI called “AI Policy Observatory (OECD.AI)” in January 2020 and establishing the Working Party on Artificial Intelligence Governance (WP AIGO) in May 2022.

In December 2022, a ministerial meeting on the digital economy was held in Gran Canaria, Spain, and a ministerial declaration on a reliable, sustainable, and inclusive digital future was adopted, which summarized issues and directions for DFFT, reliable AI, and next-generation infrastructure development.

In March 2023, the fourth OECD Global Forum on Digital Security for Prosperity was held jointly by MIC and OECD in Paris, France. Panel discussions were held on the topics of digital security for IoT products, digital security for AI, and interaction between policymakers and engineers.[8]

(9) GPAI

The Global Partnership on Artificial Intelligence (GPAI) is an international public-private cooperation organization established to realize the development and use of responsible AI based on a human-centered approach. The launch of GPAI was advocated at the Biarritz Summit (France) in 2019, and the organization was then established in June of the same year after the G7 agreed to cooperate on the launch at the G7 Science and Technology Ministers' Meeting in May 2020.

The third annual meeting of GPAI Summit 2022 was held in November 2022, and Japan has held the presidency since then. During the Council of Ministers, the GPAI Summit adopted a Ministerial Declaration at the initiative of the chairing country, Japan. In the declaration, countries agreed to promote the use of AI based on human-centered values, oppose the illegal and irresponsible use of AI, and contribute to a sustainable, resilient, and peaceful society. It was the first declaration of its kind.

(10) ICANN

IP addresses, domain names, and other internet resources are absolutely necessary for Internet use, and it is important to ensure that these resources are managed and coordinated appropriately throughout the world, including preventing overlapping assignments. The international management and coordination of Internet resources is currently handled by the Internet Corporation for Assigned Names and Numbers (ICANN), which was launched as a nonprofit corporation in 1998. In addition to assigning IP addresses and coordinating domain names, ICANN coordinates the operation and deployment of root servers and systems, and establishes policies related to these services.

Representing Japan in this area, MIC actively contributes to ICANN activities as a member of its Governmental Advisory Committee, consisting of the representatives of the governments of member countries. For example, during the 70th to 77th meetings of ICANN, countermeasures against DNS misuse was considered in cooperation with other organizations within ICANN and made proposals for revising the terms of contracts between ICANN and registrars.

[8] https://www.oecd.org/digital/global-forum-digital-security/

6. International cooperation in bilateral relationships

(1) Policy cooperation with the U.S.

Based on the “U.S.-Japan Competitiveness and Resilience (CoRe) Partnership[9]” issued after the Japan-U.S. Summit Meeting on April 16, 2021, the “Global Digital Connectivity Partnership (GDCP)[10]” was launched in May of the same year to promote secure connectivity and a vibrant digital economy **(Figure 5-8-6-1)**. With the launch of GDCP, the “U.S.-Japan Policy Cooperation Dialogue on the Internet Economy” (U.S.-Japan IED) is now positioned as a framework to promote GDCP.

A fact sheet on the “U.S.-Japan Competitiveness and Resilience (CoRe) Partnership” was released among the documents resulting from the summit meeting between Japanese Prime Minister Kishida and U.S. President Joe Biden held on May 23, 2022, in which both countries agreed to cooperate on open wireless access networks (Open RAN) and cybersecurity.

The 13th U.S.-Japan IED intergovernmental and public-private meetings were held on March 6 and 7, 2023, combining face-to-face and online methods. Participants discussed a wide range of topics, including 5G and Beyond 5G (6G), cross-border privacy rules (CBPR), Data Free Flow with Trust (DFFT), cooperation in the international arena, and future cooperation between Japan and U.S. This was followed by the release of the “Joint Statement on the 13th U.S.-Japan Policy Cooperation Dialogue on the Internet Economy.”[11] In this document, both sides agreed to change the name of the U.S.-Japan IED to “U.S.-Japan Dialogue on the Digital Economy.”

The fifth expert-level working group meeting of the GDCP was held in April 2023. Opinions were then exchanged on further promoting Japan-U.S. cooperation with third countries, based on the results of this meeting.

Figure 5-8-6-1 Global Digital Connectivity Partnership (GDCP)

GDCP concept

Toward secure connectivity and vibrant digital economies with cooperation of Japan and the United States, GDCP promotes: [1] cooperation in third countries, [2] multilateral collaboration and [3] bilateral collaboration with a view to global development (especially 5G and Beyond 5G)

Cooperation in third countries	Cooperation for ICT infrastructure development and human resource development in third countries (with focus on the Indo-Pacific, but including other regions)
Multilateral collaboration	Enhanced collaboration in multilateral frameworks including ITU, G7/G20, OECD and APEC
Bilateral collaboration	Investments in R&D environments for 5G and Beyond5G (6G)

(2) Cooperation with Europe

a Cooperation with the European Union (EU)

MIC and the Directorate-General for Communications Networks, Content and Technology of the European Commission hold a series of meetings to discuss related topics. The “EU-Japan ICT Policy Dialogue” is held to exchange information and opinions on ICT policy, with the latest being the 28th meeting held in February 2023. The “EU-Japan ICT Strategies Workshop” is held to promote public-private collaboration and cooperation in the digital field, with the latest being the 13th meeting held in April 2022.

During the 28th EU-Japan ICT Policy Dialogue, discussions were held on smart cities, 5G and Beyond 5G (6G), cybersecurity, secure and equitable online environments, and AI. More specifically, the social concept and use cases of Beyond 5G (6G) were explained, along with the ideal network to achieve. The establishment of a new research and development fund and the status of activities of the Beyond 5G Promotion Consortium were introduced as the latest initiatives. Participants from the EU explained the budget for research and development projects, and exchanged opinions on future cooperation.

The EU-Japan Digital Partnership was also launched in May 2022. The partnership covers priorities in the digital field shared by Japan and the EU, with the Digital Agency, MIC, and METI (from Japan), and the Directorate-General for Communications Networks, Content and Technology of the European Commission, playing leading roles.

b Bilateral cooperation with European countries

(a) The UK

MIC, together with the Digital Agency and METI launched the UK-Japan Digital Group with the UK in May 2022, as a director-level meeting based on a framework for addressing joint priorities between Japan and the UK in the digital field. The first meeting was held in October of the same year. In order to accelerate cooperation between Japan and the UK at a high level, a minister-level meeting of relevant ministries and agencies was held between Japan and the UK in December of the same year. The meeting was positioned above the direc-

[9] https://www.mofa.go.jp/mofaj/na/na1/us/page1_000951.html
[10] https://www.soumu.go.jp/menu_news/s-news/01tsushin08_02000119.html
[11] https://www.soumu.go.jp/menu_news/s-news/01tsushin08_02000149.html

tor-level meeting, re-establishing the UK-Japan Digital Partnership. MIC will continue to serve as the secretariat for Japan.

(b) Germany

MIC holds ICT policy dialogues with the Federal Ministry for Digital and Transport of Germany, in order to deepen mutual understanding between Japan and Germany on policy aspects in the ICT field, and to promote collaboration and cooperation between both countries. The sixth meeting was held online in March 2022. During the meeting, both countries discussed government initiatives to promote Open RAN, progress in research and development toward Beyond 5G, global digital governance, digital platform policies, data utilization, and AI. Japan and Germany agreed to continue collaborating during these discussions. Public-private sessions were also held to exchange information on 5G and other initiatives in Japanese and German industries.

Cooperation in joint research and development upgrading 5G has been underway with the Federal Ministry for Economic Affairs and Climate Action since fiscal 2022.

(c) France

MIC holds ICT policy discussions with the Ministry of the Economy, Finance and the Recovery of France,[12] in order to share information on the latest initiatives regarding important topics in the ICT field. The 21st such meeting was the latest to be held, in June 2021.

(3) Cooperation with Asia-Pacific countries

MIC cooperates with the information and communications ministries and agencies of Asia-Pacific countries in the ICT field, including communications infrastructure development and ICT usage.

a India

In May 2022, the seventh meeting of the Japan-India Joint Working Group was held online between MIC and the Ministry of Communications of India, in order to share information on efforts in the ICT field such as 5G, Beyond 5G, and Open RAN, and to exchange views on future cooperation between Japan and India.

b Southeast Asia

Japan and Vietnam have been holding meetings of the Japan-Vietnam ICT Joint Working Group since 2018. During the sixth meeting of the working group (held in December 2022), Japan and Vietnam shared information and exchanged opinions on digital transformation, 5G, and postal services, and agreed to strengthen cooperation between Japan and Vietnam in the future.

In February 2023, Japan signed a memorandum of understanding on ICT cooperation with the Department of Information and Communications Technology of the Philippines and agreed to further strengthen cooperation in the ICT field, including support for the construction of 5G networks including Open RAN.

c Australia

The “Australia-Japan Policy Dialogue for Telecommunications Resilience” was established in response to a joint statement made in July 2022. This framework consists of MIC and the Department of Home Affairs and Department of Infrastructure, Transport, Regional Development, Communications and the Arts of Australia, and is designed to ensure and improve digital connectivity in the Indo-Pacific region with the aim of realizing a “Free and Open Indo-Pacific” (FOIP) through regular information sharing and discussions in the information and communications field using 5G, optical undersea cables, and satellite communications, including Open RAN.

The first policy dialogue was held in February 2023. The meeting covered a wide range of topics in the field of information and communications, and both countries agreed to establish the “Track 1.5 Meeting” subordinate to the policy dialogues in order to engage in active public and private sector discussions in the information and communications field.

(4) Cooperation with Central and South America

With regard to Central and South America, Japanese digital terrestrial broadcasting has been adopted in 14 countries, starting with Brazil in 2006. Japan continues to support efforts in each country to switch over from analog broadcasting, as well as the introduction of the Japanese Emergency Warning Broadcast System (EWBS) in countries such as Peru and Ecuador.

MIC also holds 5G seminars in various countries in Central and South America to explain the importance of constructing open and secure 5G networks, and helps Japanese enterprises with excellent technologies in this field to expand business in this region.

In order to encouraging initiatives to use Japan's advanced ICT technologies to solve social challenges in these countries, MIC conducts smart city demonstration projects including the protection of world heritages

[12] Ministries were restructured in 2022, and this ministry is now called the Ministry of Economy, Finance, Industry and Digital Sovereignty.

in Cartagena, Colombia, and demonstrations of agriculture ICT solutions using IoT data and AI to improve the operational efficiency of agricultural producers in Ecuador and Brazil. Demonstrations of medical ICT solutions using local 5G has been conducting in Chile.

(5) Cooperation with other regions

a Cooperation with Africa

ICT cooperation with African countries has progressed with the adoption of Japanese digital terrestrial broadcasting in Botswana in 2013 and Angola in 2019, and the complete switchover to digital in Botswana in October 2022. In August 2022, the eighth Tokyo International Conference on African Development (TICAD 8) was held in Tunisia. MIC held an online seminar on digital transformation (DX) and an online exhibition to promote Japanese companies as official side events, and adopted the “TICAD 8 Tunis Declaration” following the meeting, which includes a statement on cooperation between Japan and Africa in the ICT field.

Since fiscal 2019, demonstration experiments on communications infrastructures were conducted in Kenya and Senegal; agricultural ICT in Ethiopia and Botswana; medical ICT in Egypt, Ghana, Kenya, and the Democratic Republic of the Congo; remote education in Senegal; and smart cities in Egypt, in order to contribute toward solving social issues in Africa and to support Japanese companies expanding into the area.

b Cooperation with the Middle East

MIC has strengthened its cooperative relationship with Saudi Arabia. Based on “Japan-Saudi Vision 2030” (2017) and a memorandum of cooperation with Saudi Arabia on cooperation in the ICT field signed with the Minister of Communications and Information Technology of Saudi Arabia in 2019, MIC has established cooperative relationships between enterprises in both countries and supported the development of technology by Japanese enterprises by dispatching a public-private mission to Saudi Arabia in fiscal 2018 (the mission was suspended from fiscal 2019 to 2020 due to the COVID-19 pandemic) and public-private online ICT workshops in January 2022. Demonstration experiments for ICT medical treatment using VR technology were also conducted in fiscal 2021 and perinatal remote medical care in fiscal 2022.

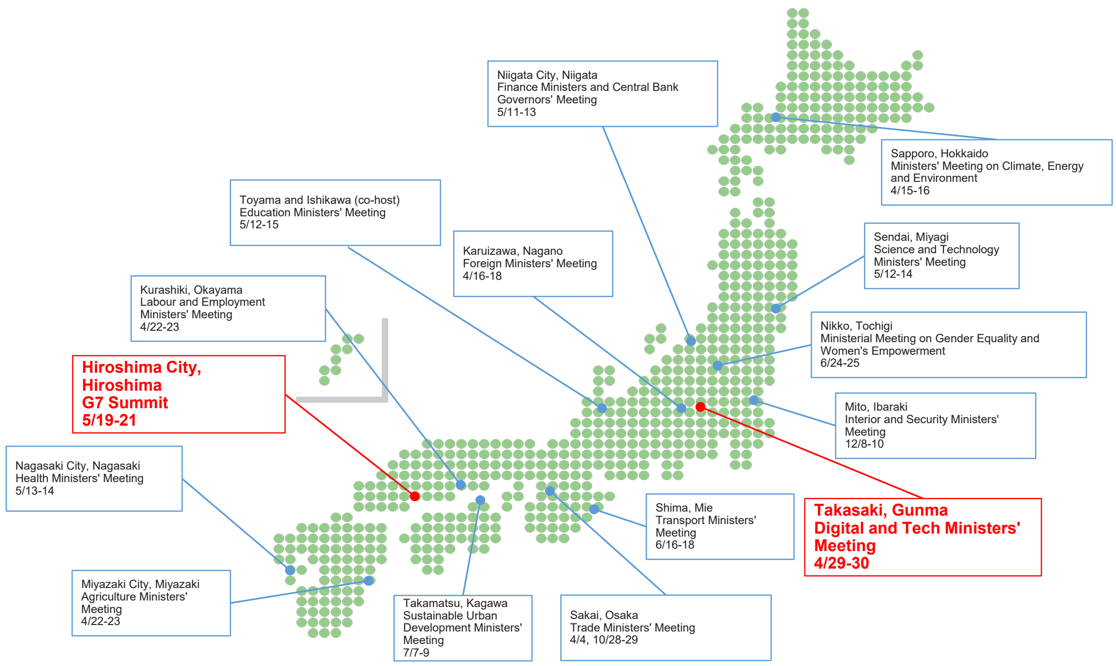
In April 2023, a memorandum of cooperation in telecommunications technology and postal service was signed with the Ministry of Communications of Israel, on the occasion of the 70th anniversary of the establishment of diplomatic relations with Israel.

Policy Focus G7 Digital and Tech Ministers' Meeting in Takasaki, Gunma

1. Overview of G7 Digital and Tech Ministers' Meeting in Takasaki, Gunma

On April 29 and 30, 2023, MIC, the Digital Agency, and METI held the "G7 Digital and Tech Ministers' Meeting in Takasaki, Gunma." The meeting was one of the ministerial meetings related to the G7 Hiroshima Summit, which was held from May 19 to 21 of the same year. Invited countries and relevant international organizations participated in the meeting, in addition to the G7 members.

Figure 1 G7 Summit and related ministerial meetings



2. Results of G7 Digital and Tech Ministers' Meeting in Takasaki, Gunma

(1) Discussions thus far

International policy coordination is indispensable for the world as a whole to reap the benefits of digital technologies, leading to economic growth and the creation of jobs. Discussions on the digital economy have been ongoing within the framework of the G7 and G20, since the G7 ICT Ministers' Meeting in Takamatsu, Kagawa in April 2016 with Japan serving as Chair. The promotion of digital technologies has continued to be discussed as an even more important issue in the face of significant changes in society due to the impact of COVID-19, even after the G20 Ministerial Meeting on Trade and Digital Economy in Tsukuba, Ibaraki was held in June 2019. In May 2022, the Meeting of G7 Digital Ministers was held in Germany to discuss issues the G7 should work together on in order for digital technologies to lead to further socio-economic development.

(2) Overview of the results of G7 Digital and Tech Ministers' Meeting in Takasaki, Gunma

The goal of this year's meeting was to demonstrate a united response as agreed up by the G7 in digital fields such as DFFT (Data Free Flow with Trust), digital infrastructures, Internet governance, and AI, while also aiming to accelerate efforts in digital fields through collaboration with the Global South. Held under the co-chairs of Takeaki Matsumoto (Minister for Internal Affairs and Communications), Taro Kono (Minister for Digital Affairs), and Yasutoshi Nishimura (Minister for Economy, Trade and Industry), the aim of the meeting was to work toward achieving a strong recovery from the severe impact of the spread of COVID-19 and the Russian invasion of Ukraine on the global economy, and in light of the crises currently unfolding such as trends among authoritarian countries and the modulation of the global economy. Participants discussed six topics: (1) promoting cross-border data distribution and free distribution of reliable data, (2) building secure and resilient digital infrastructures, (3) maintaining and promoting a free and open Internet, (4) promoting innovation and emerging technologies in the economy and society, (5) promoting responsible AI and AI governance, and (6) setting competition policy in digital markets. As a result of these discussions, the "G7 Gunma Takasaki Ministerial Digital and Tech Declaration" (including five annexes) was adopted. The main points of the ministerial declaration on each of these six topics are described below.

(1) Promoting cross-border data distribution and Data Free Flow with Trust (DFFT)
Participants established an international framework to implement DFFT (IAP), and agreed on the "G7 Vision for Operationalising DFFT and Its Priorities."

(2) Building secure and resilient digital infrastructures
Participants formulated a vision for the future of networks in the Beyond 5G and 6G era, with elements such as high-capacity and low-latency communications, energy efficiency, multi-layered networks, openness, and interoperability, and agreed upon the "G7 Action Plan for Building a Secure and Resilient Digital Infrastructure."[1]

(3) Maintaining and promoting a free and open Internet
Participants agreed upon the "G7 Action Plan for Open, Free, Global, Interoperable, Reliable, and Secure Internet."[2]

(4) Promoting economic and social innovation and emerging technologies
Participants agreed to ensure interoperability of digital infrastructures, address software vulnerabilities in the digital supply chain, and use governance methods that are friendly to innovative technologies and innovations. Participants also agreed to hold further discussions on the use of digital technologies such as the metaverse.

(5) Promoting responsible AI and AI governance
Participants recognized the importance of promoting the interoperability of AI governance in different countries and regions in order to promote a common vision of trustworthy AI based on democratic values, and agreed upon the "Action Plan for Promoting Global Interoperability of AI Governance." Participants also agreed to hold a forum to discuss generative AI as soon as possible.[3]

(6) Setting competition policy in digital markets
Participants agreed to hold a Digital Competition Summit this fall to share information on common issues in designing and enforcing existing laws and new legal systems in the digital competition fields.

Figure 2 G7 Digital and Tech Ministers' Meeting in Takasaki, Gunma

[1] Participants welcomed efforts to diversify suppliers in the ICT supply chain, and continue to discuss market trends toward an open and interoperable approach. Participants agreed upon the importance of developing, implementing, and maintaining multi-layered networks consisting of terrestrial and non-terrestrial networks, undersea cables, and other elements, and agreed to deepen cooperation with fellow countries.

[2] Participants agreed that the G7 would promote a global and undivided Internet, oppose any intention or action toward division, and jointly counter activities such as Internet shutdowns and network restrictions by authoritarian countries. Participants also agreed that they would cooperate with various stakeholders and work together toward the success of the IGF 2023 Kyoto Conference. Participants also agreed that existing measures against disinformation should be compiled as a set of practices and published at the IGF 2023 Kyoto Conference.

[3] Participants also recognized the need to gain a quick understanding of the opportunities and challenges posed by generative AI technologies and to promote safety and reliability in the development of these technologies, agreed to establish a forum at G7 to discuss the possibility of using generative AI in a responsible manner, as well as AI governance, intellectual property rights protection, transparency, and measures against disinformation that international organizations such as the OECD and GPAI have used amid the rapid growth of generative AI.

(Reference)
Discussions at the G7 Hiroshima Summit (main points of the summit communiqué)

Based on the results of the G7 Digital and Tech Ministers' Meeting in Takasaki, Gunma, the "G7 Hiroshima Summit Communiqué" issued on May 20, 2023, stressed the importance of global governance for emerging technologies such as AI and the metaverse in the digital field, support for efforts to realize DFFT, as well as the need to build secure and resilient digital infrastructures and address digital disparities. The main points of the summit communiqué are summarized below.

AI:

Relevant ministers were directed to launch the "Hiroshima AI Process" through a G7 working group in collaboration with the OECD and GPAI and in an inclusive manner, for discussions later this year on generative AI including topics such as governance of generative AI, protection of intellectual property rights, promotion of transparency, combating of disinformation, and the responsible use of technologies.

Metaverse:

The potential of immersive technologies and virtual spaces, such as the metaverse, that can provide innovative opportunities and promote sustainability in all industrial and social sectors was recognized, and relevant ministers were directed to consider joint approaches in this area, including interoperability, portability, and standards, with the support of OECD.

DFFT efforts:

The establishment of the Institutional Arrangement for Partnership (IAP) was approved to realize DFFT.

Secure and resilient digital infrastructures and the digital divide:

A commitment to deepening cooperation with the G7 and fellow countries to support and strengthen network resilience by means such as extending secure undersea cable routes was confirmed. Views on aspects and opportunities related to open configuration and security were also exchanged, in light of the early introduction of Open RAN with Japan serving as G7 Chair. The need to close the digital divide was recognized, and the G7 commitment to support other countries to expand digital access was reaffirmed under the principles of equity, universality, and affordability.

Section 9 Promotion of Postal Administration

1. Summary

(1) Initiatives so far

The network of post offices that had been established throughout Japan since the foundation of the postal service in 1871 had increased to more than 24,000 offices nationwide just before privatization occurred on October 1, 2007. However, post offices are even now being established with the intention of being used throughout the country.

MIC continues its efforts to secure universal service that post offices provides throughout the nation and to utilize post offices as regional hubs to provide service for residents in the local area.

(2) Future challenges and directions

The social environment of Japan has changed significantly in recent years, such as the declining birthrate and aging population, an increasing concentration of populations in urban areas, frequent natural disasters, and the conversion of society as a whole to digital (including taking administrative procedures online). The importance of the post office as a public infrastructure is increasing as public enterprises that play essential roles in daily life are being shut down and local government branches that provide administrative services are being closed. This is especially true in rural areas.

It is important for Japan Post Group to maintain its network of post offices and universal service over the medium-to-long term while also performing adequately as a private company. It is also important for post offices and the services they provide to bring convenience to users and contribute to local communities.

MIC must continue to ensure that Japan Post Group is managed soundly, ensures fair and free competition, provides stable universal service through post offices, effectively utilizes its network of approximately 24,000 post offices, and responds accordingly as society switches increasingly to digital. It is essential to develop diverse and flexible services and improve operational efficiency as times change, in order to bring more convenience to citizens and users, and to contribute to local communities.

2. Promotion of postal administration

(1) Universal postal service

a Subsidy/contribution system to support the maintenance of the post office network

In order to ensure that universal postal service continues to be provided, a subsidy/contribution system to help maintain the post office network was established in June 2018 and then launched in April 2019. The Organization for Postal Savings, Postal Life Insurance and Post Office Network provides subsidies and collects contributions. In fiscal 2023, subsidies totaling approximately 300 billion yen were provided to Japan Post, with contributions of approximately 243.6 billion yen from Japan Post Bank and approximately 56.5 billion yen from Japan Post Insurance.

(2) Post offices contributing to communities

a How post offices should contribute to communities in a digital society

In Japan, the low birthrate, aging population, and declining population, coupled with the COVID-19 pandemic, are further straining local communities. Expectations for post offices to contribute to communities across the country are growing. It will be important for post offices to identify the merits of digital technologies that will allow them to overcome geographical and temporal constraints, and the ways in which they can contribute to communities by leveraging their usefulness as regional hubs. In October 2022, MIC consulted with the Information and Communications Council on how post offices should contribute to communities in a digital society, and the council's Postal Policy Committee began deliberating on the matter. The committee deliberated two major topics. First, was how post offices should cooperate with the public infrastructures in the region such as local governments. Second, was how post offices should contribute to communities through DX and data utilization. In December of the same year, the committee compiled an interim report on the topic of popularizing and using Individual Number Cards through post offices.

In October 2022, MIC established a project team consisting of related departments to study how to implement local revitalization measures through post offices. In addition to promoting the popularization and use of Individual Number Cards through post offices, the team identified various measures such as firefighting, disaster prevention, and administrative consultation (including promoting the handling of local government service affairs at post offices), and publicized these measures in March 2023. The report states that measures will be widely spread to local governments and post offices throughout the country in order to promote regional initiatives to promote cooperation between post offices all throughout the country and local governments.

b Promotion of the popularization and use of Individual Number Cards through post offices

The Individual Number Card serves as a sort of passport for residents to a new digital society, and it is becoming indispensable as society as a whole goes increasingly digital.

All post offices throughout the country are required by law to maintain universal service, and the post office network continues to be maintained even in sparsely populated areas. Post offices have therefore become an important infrastructure supporting the lives of the elderly and other local residents. They are increasingly becoming the last operations hub with full-time employees as the population declines, especially in sparsely populated areas.

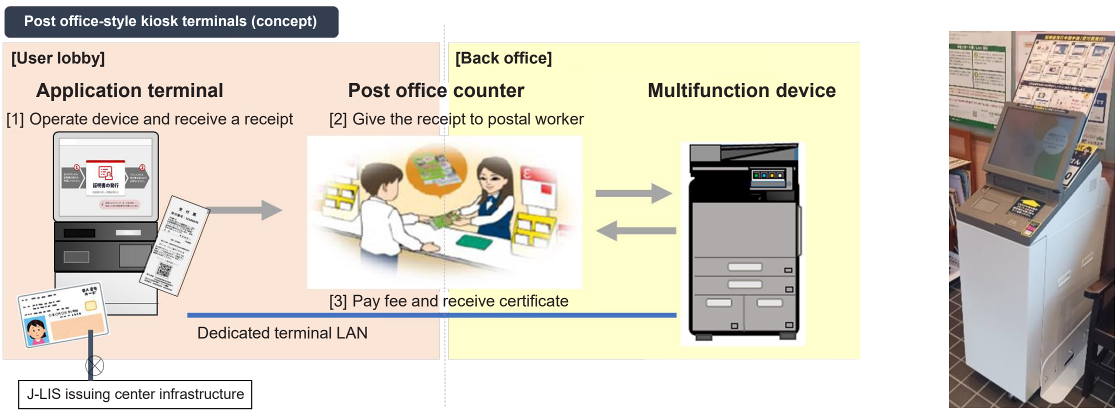
In December 2022 the Postal Policy Committee of the Information and Communications Council identified measures to promote and use Individual Number Cards in post offices, in an interim report on how post offices should contribute to communities in a digital society, based on the belief that the unique nature of post offices could be leveraged in promoting the popularization and use of Individual Number Cards.

The interim report described several initiatives that Japan must urgently implement: (1) a request for expanded support for applications at post offices, (2) a request for municipalities to actively provide post office space for Individual Number Card onsite applications, (3) efforts to encourage residents to apply for Individual Number Cards (such as posting posters at post offices), (4) consideration of legal amendments necessary for Individual Number Cards to be issued at post offices, (5) promotion of outsourcing of administrative functions related to issuing/renewing digital certificates and changing/initializing PIN codes, (6) support for the introduction of automatic certificate issuance service terminals in post offices (mainly in municipalities without convenience stores), and (7) local fiscal measures related to the introduction of automatic certificate issuance services at post offices. Concrete initiatives were then implemented, including support for Individual Number Card applications at 848 local governments and 3,511 post offices (as of March 31). MIC continues to promote procedures for revising laws necessary for issuing Individual Number Cards at post offices, assist local governments and post offices in promoting the popularization of Individual Number Cards, encourage residents to obtain Individual Number Cards at post offices, and encourage local governments and post offices to handle affairs related to Individual Number Cards at post offices.

c Promotion of use as a contact point for administrative services

MIC has developed and demonstrated post office-style individual number card terminals (post office-style kiosk terminals) that can be introduced at low cost in the supplementary budget for fiscal 2021. This terminal allows for digital technologies to be used for procedures required for issuing certificates such as residence certificates, making it possible to issue certificates at post offices without having to go through local governments (**Figure 5-9-2-1**). The second supplementary budget for fiscal 2022 supports the introduction of these post office-style individual number card terminals in post offices, mainly in municipalities that do not have convenience stores. In order to improve resident services using Individual Number Cards, local governments have also implemented special tax measures (0.7%) since fiscal 2023 to cover the cost of introducing automatic certificate issuance services at post offices and other locations.

Figure 5-9-2-1 Post office-style kiosk terminal



d Cooperation between post offices and local public infrastructures

From fiscal 2019 to fiscal 2021, MIC ran the "Post Office Revitalization Project (by Post Offices and Local Governments Using ICT)," which leveraged the strengths of post offices to conduct demonstrations in order to solve various local issues and promote greater user convenience, and then developed the project nationwide as a model project. In January 2022, a post office monitoring service that uses smart speakers that was developed through demonstrations during this project was launched as a service for local governments by Japan Post. By the end of December of the same year, Japan Post had been entrusted with post office monitoring by 29 local governments.

MIC has also been conducting demonstrations since fiscal 2022 to help resolve local issues by leveraging the power of digital technology through collaboration between post office, which has sites all over the country and local public infrastructures of local governments, as the “Project to Promote Cooperation between Post Offices and Public Regional Infrastructures”. (**Figure 5-9-2-2**). Demonstration projects were run in fiscal 2022 on supporting local MaaS by linking Individual Number Cards and transportation-related IC cards at post offices (Maebashi, Gunma), making public use of post office drones in hilly and mountainous areas (Kumano, Mie), and supporting shopping services where customers can order goods at post offices (Yatsushiro, Kumamoto) (**Figure 5-9-2-3**). In fiscal 2023, the results of these projects will be implemented nationwide, and demonstration projects such as online medical care at post offices will be implemented. MIC will continue to create model cases for solving local problems through cooperation between post offices and local public infrastructures.

Figure 5-9-2-2 Project to Promote Cooperation between Post Offices and Public Regional Infrastructures

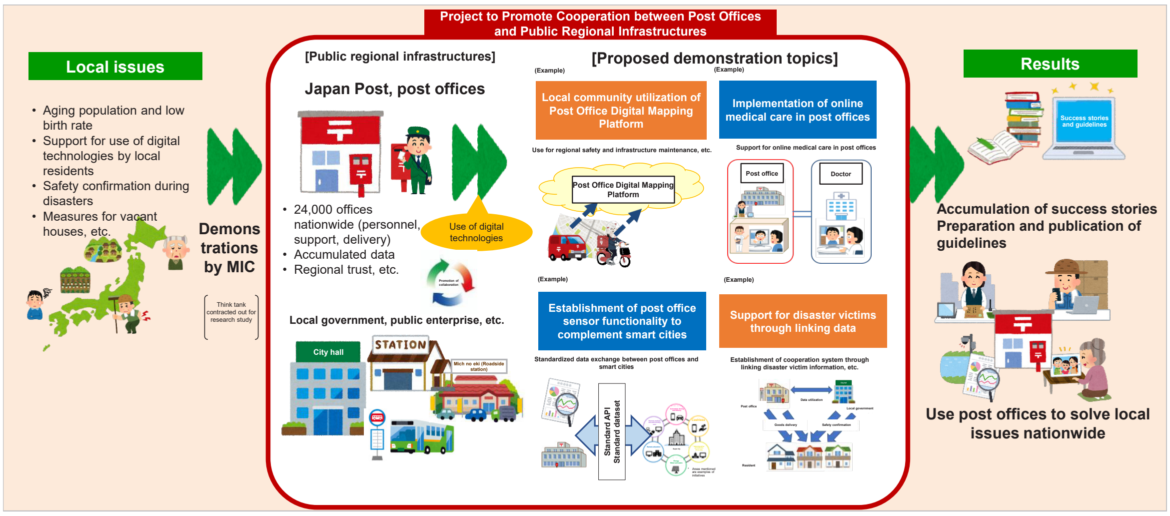
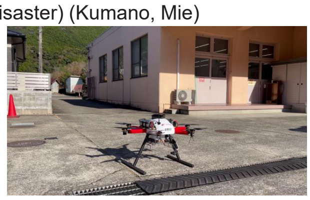


Figure 5-9-2-3 Regional demonstrations

Linking Individual Number Cards and transportation-related IC cards at post offices (Maebashi, Gunma)

Public use of post office drones in hilly and mountainous areas (trial delivery of emergency relief supplies during disaster) (Kumano, Mie)



Shopping services at post office counters (Yatsushiro, Kumamoto)

(3) Utilization of data acquired by post offices

a Study Group on the Utilization of Post Office Data and Protection of Privacy

In order to promote the effective use of data acquired by post offices, while also ensuring that confidential correspondence, confidential information, and personal information are handled appropriately, MIC has held meetings of the "Study Group on the Utilization of Post Office Data and Protection of Privacy" since October 2021. In addition to revising the commentary on guidelines on the protection of personal information in postal services (MIC Notice No. 167 of 2017, "Postal Service Guidelines" below), the study group published a report in July 2022. This report presents a basic approach for utilizing post office data, summarizes efforts of Japan Post Group and Japan Post, and describes measures to be implemented by MIC, in the form of the "Roadmap for Promoting the Utilization of Post Office Data." It also mentions several items to be addressed by MIC, such as establishing a Post Office Data Utilization Advisory Board and strengthening supervision through means such as the "Postal Administration Monitoring Meeting."

b Post Office Data Utilization Advisory Board

In response to the above report, MIC has been holding meetings of the "Post Office Data Utilization Advisory Board" since December 2022, with the aim of obtaining advice from experts and others in implementing the initiatives and measures described in the "Roadmap for Promoting the Utilization of Post Office Data." It has also been working on specific means of providing data to public organizations (disaster, tax, and bar association inquiries) added to the commentary on the Postal Service Guidelines, and regularly follows up on measures by Japan Post Group and Japan Post to utilize data.

(4) New financial services from Japan Post Bank and Japan Post Insurance

In March 2022, MIC and the Financial Services Agency granted Japan Post Bank approval under the Postal Service Privatization Act for intermediary operations for concluding investment blanket contracts. Since May of the same year, investment blanket services have been offered at all Japan Post Bank branches.

Japan Post Insurance also submitted notifications based on the Postal Service Privatization Act,[1] regarding the revision of products due to the introduction of the contract renewal system in June 2022, and then the revision of student loan insurance products in December of the same year. The contract renewal system was introduced in October of the same year, and the student loan insurance system was introduced in April 2023 at Japan Post Insurance and post offices nationwide.

3. Promotion of postal administration in the international field

(1) Response to the Universal Postal Union (UPU)

The Universal Postal Union (UPU) is a specialized agency of the United Nations that has been implementing various cooperative projects and formulating fair and open rules for international postal services, in order to develop postal network services worldwide and further improve the convenience of international postal services. As an organization responsible for formulating an appropriate international postal framework for the expansion of cross-border e-commerce, UPU is now expected to play a major role in the development of international logistics.

Masahiko Metoki of Japan has served as Director General (four years per term, with a maximum of two terms) of the UPU since January 2022, and is expected to lead various efforts there.

MIC has also been actively supporting the leadership of Director General Metoki. For example, the Ministry has increased its contributions to the UPU and has strengthened its support for various cooperative projects in the UPU.

Based on a memorandum of cooperation with the UPU, MIC has supported the implementation of cooperative projects with UPU member countries in several areas: (1) efforts to build disaster-resilient postal networks, (2) efforts to respond to climate change through the construction of postal networks with a low environmental impact, (3) efforts to utilize postal networks as a basis for addressing social needs such as financial inclusion, infectious disease control, and the development of new businesses, and (4) efforts to improve the added value of postal network services using cutting-edge technologies such as ICT. The memorandum of cooperation was renewed in March 2022, immediately following the appointment of the Director General, to expand implementation projects (such as strengthening efforts to respond to climate change) in light of the increase in contributions to the UPU.

In fiscal 2022, support was also provided for postal services in Ukraine through contributions to the Emergency Solidarity Fund (ESF)[2] established by the UPU. Through such efforts, Japan is contributing to the further development of global postal network services and actively contributing to the development of fair and open rules for international postal services in the UPU.

[1] In June 2021, Japan Post Group disposed of more than half of its shares in Japan Post Insurance, and new business operations of Japan Post Insurance migrated from an approval system to a notification system.
[2] A UPU fund to provide emergency assistance to member states affected by disasters, etc.

(2) Support for the overseas expansion of Japanese-style postal infrastructures

MIC is promoting the expansion of Japanese-style postal infrastructure systems overseas as part of the Government's "Infrastructure System Overseas Promotion Strategy 2025"[3] (June 2022 Supplement) and the "MIC World Development Action Plan 2025" (July 2022[4]). Aimed mainly at emerging and developing countries in Asia and Eastern Europe, this initiative provides superior technologies and operational knowledge related to Japanese postal services, and supports the modernization and upgrading of postal services in these countries. Sorting machines are at the core of postal infrastructures. In addition to seizing opportunities to update and expand these machines, MIC is acquiring peripheral businesses such as equipment used in division centers, and working to identify needs and issues related to postal services in other countries. MIC is also exploring new business possibilities such as e-commerce, digital transformation (DX), and green transformation (GX), in order to promote the expansion of Japanese companies with technology and knowledge in related fields.

MIC will continue to develop cooperation projects with other countries, and will promote the expansion of Japanese-style postal infrastructure systems overseas by building relationships with postal organizations in other countries through active participation in international postal conferences and conducting basic research on postal services in each region, in order to discover new opportunities for cooperation with other countries.

4. Trends in correspondence delivery

The Act on Correspondence Delivery by Private Business Operators (Act No. 99 of 2002) allows private business operators to run correspondence delivery services. As of the end of fiscal 2022, 583 entities have entered the specified correspondence delivery business, which provides only those services that do not interfere with the provision of universal postal services. A range of services are provided in response to customer needs, including correspondence collection and delivery services on certain routes, rapid delivery services provided within a relatively close distance or limited area, and services similar to telegrams to deliver messages of congratulation or condolences together with a decorated card.

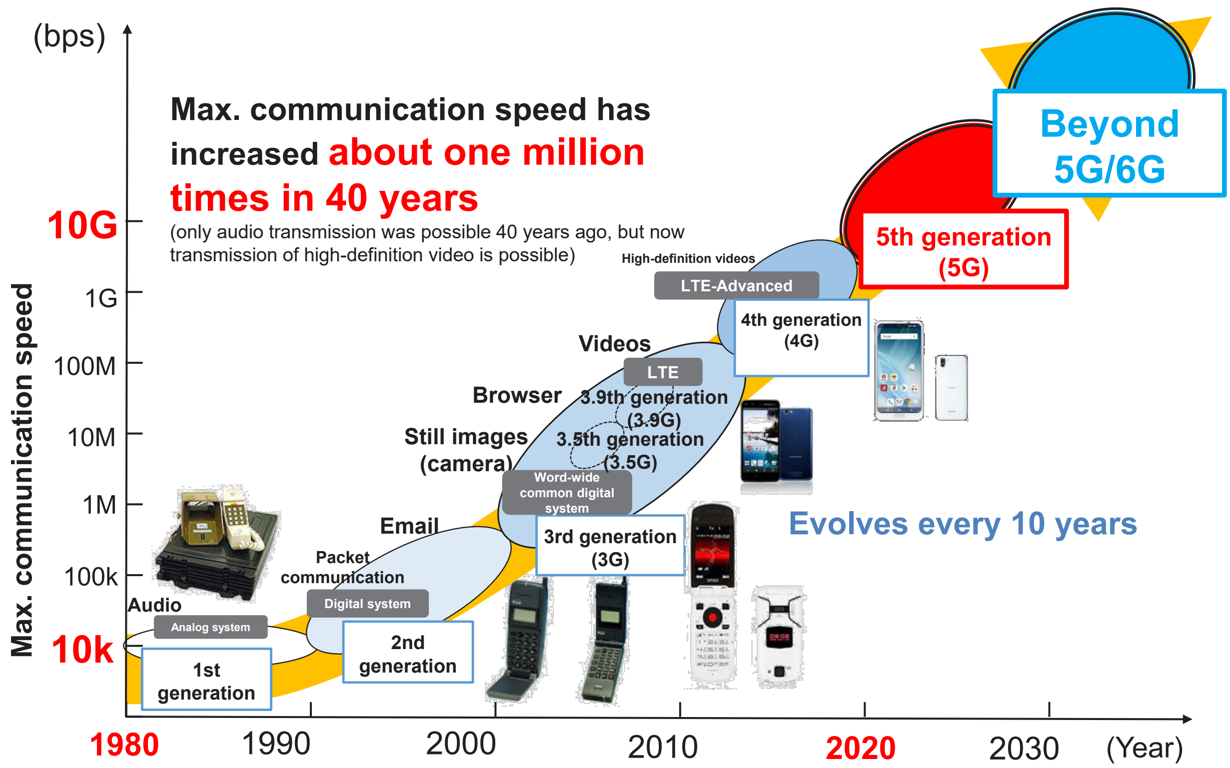
MIC continues to promote understanding of the purpose and specifics of correspondence delivery, define what correspondence is, and spread information on the correspondence delivery system, in order to ensure that correspondence is sent appropriately.

[3] Infrastructure System Overseas Promotion Strategy 2025 (June 2022 Supplement): https://www.kantei.go.jp/jp/singi/keikyou/dai54/infra.pdf
[4] MIC World Development Action Plan 2025 (formulated in July 2022): https://www.soumu.go.jp/main_content/000842643.pdf

Chapter 1

Section 1

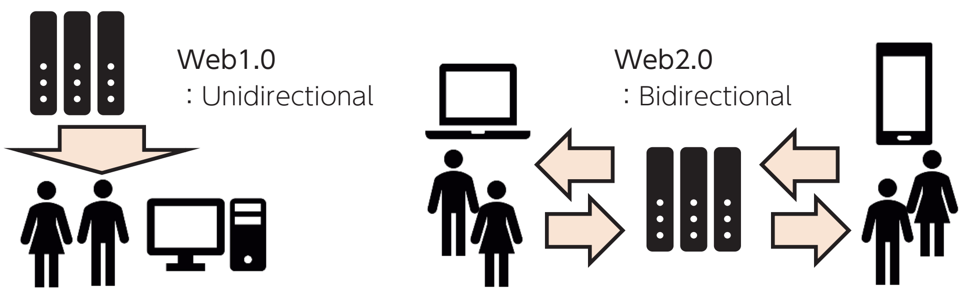
1. Evolution of mobile communications systems (Figure1-1-2-1 in White Paper)



(Source) Material created by MIC

Section 2

1. Changes from Web 1.0 to Web 2.0 (Figure1-2-2-1 in White Paper)



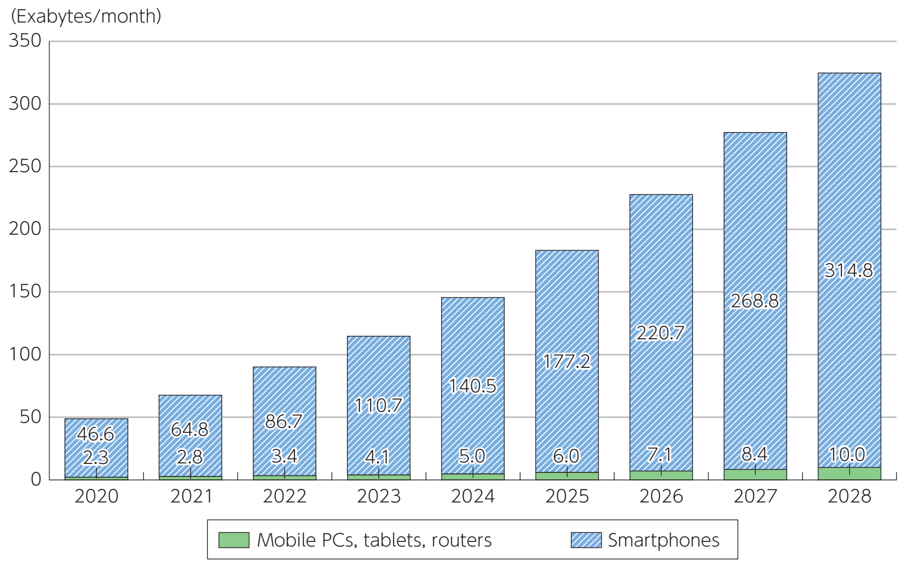
	Web1.0	Web2.0
Flow of data and information	Unidirectional (Information disseminating centered on single websites)	Bidirectional (Information sharing centered on social media)
Devices	Computers	+ smartphones
Main services	Websites, email, etc.	+ social media, e-commerce, etc.

(Source) Based on Document 1-2 from the first meeting of the MIC Study Group on the Utilization of Metaverse Toward Web 3 Era

Chapter 2

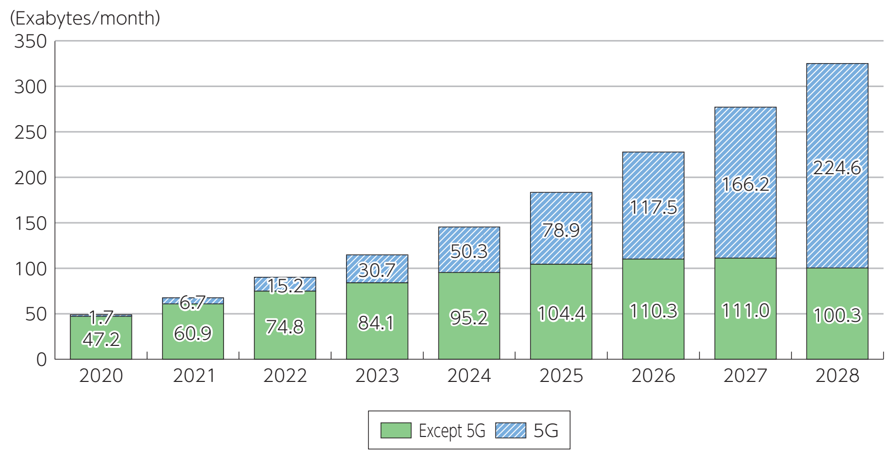
Section 1

1. Predicted global mobile data traffic by device (Figure2-1-1-1 in White Paper)



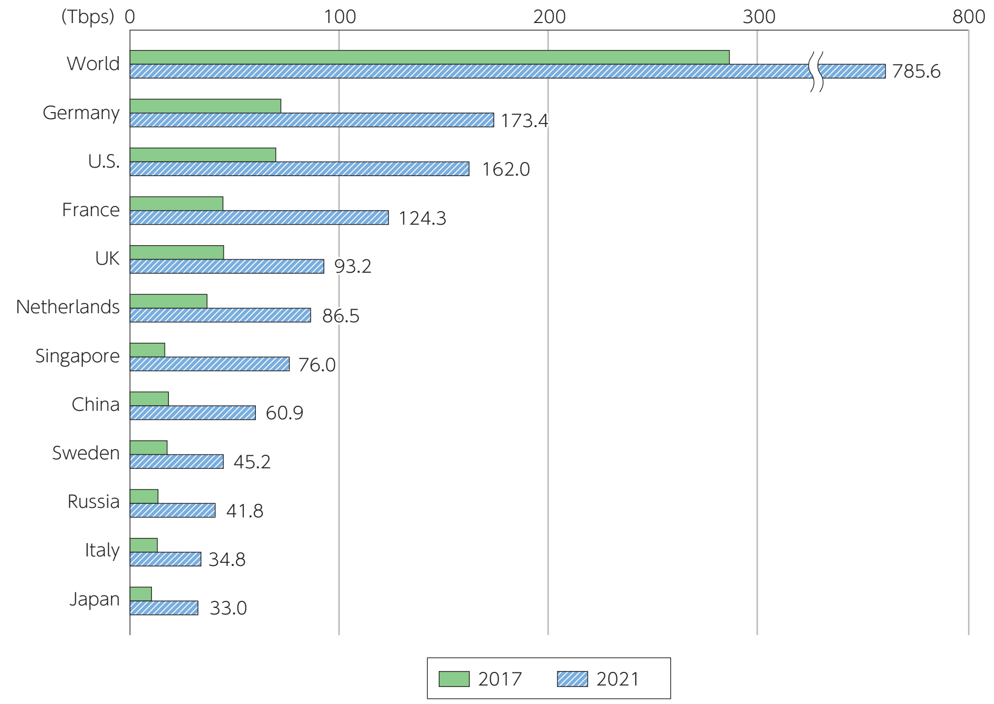
(Source) Prepared based on "Ericsson Mobility Visualizer by Ericsson"

2. Global mobile data traffic forecast (5G and Non-5G)



(Source) Prepared based on "Ericsson Mobility Visualizer by Ericsson"

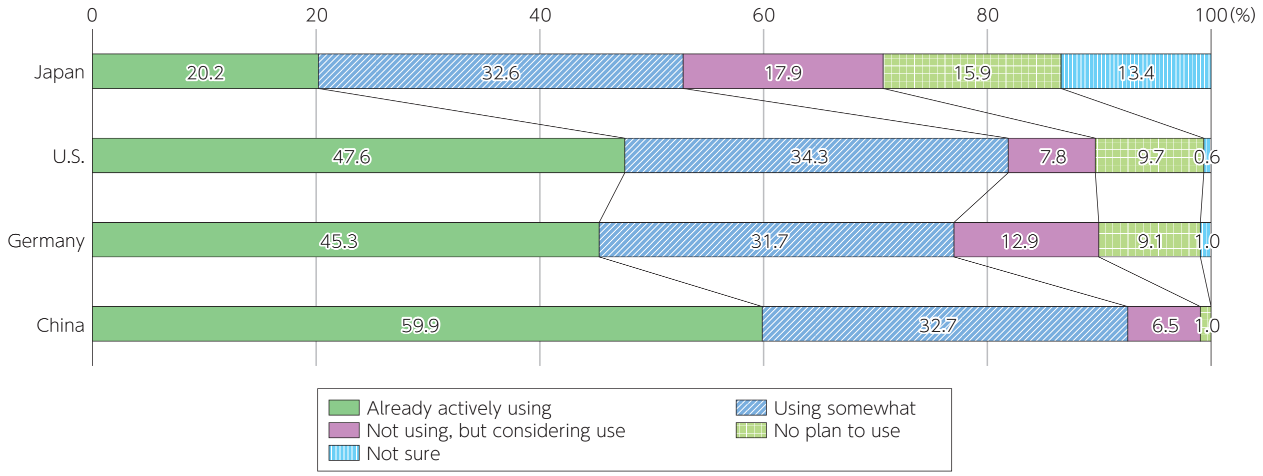
3. Cross-border Internet bandwidth by top countries and regions (Figure2-1-1-2 in White Paper)



* The classification of regions is based on TeleGeography's definition, and the regional totals are the sums of the countries for which data is available.

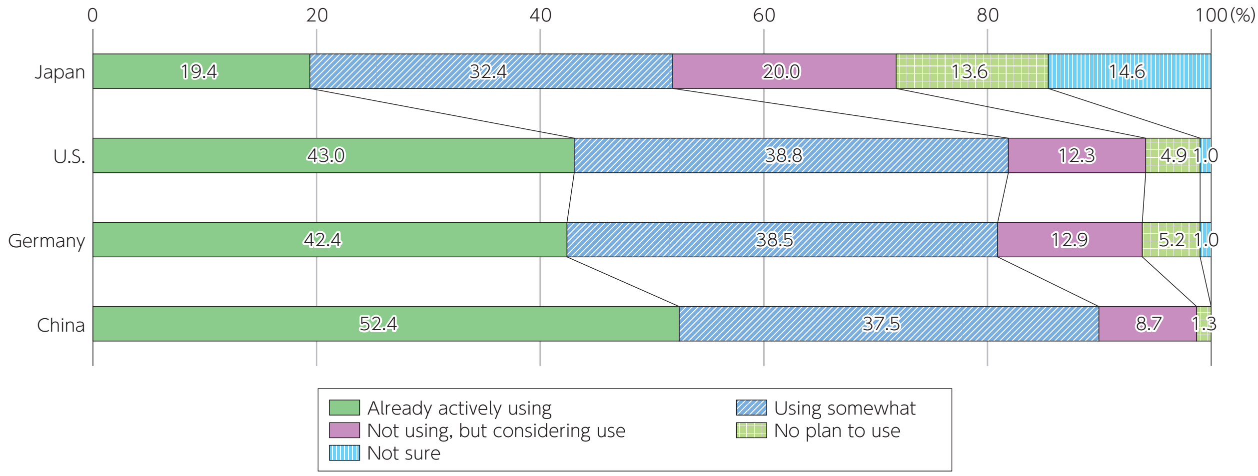
(Source) Japan External Trade Organization (JETRO) (Aug. 2, 2022) "The data environment is now (worldwide) - A look at cross-border data flows, investment and trade rules"

4. Utilization of personal data by companies in each country (Figure2-1-2-1 in White Paper)



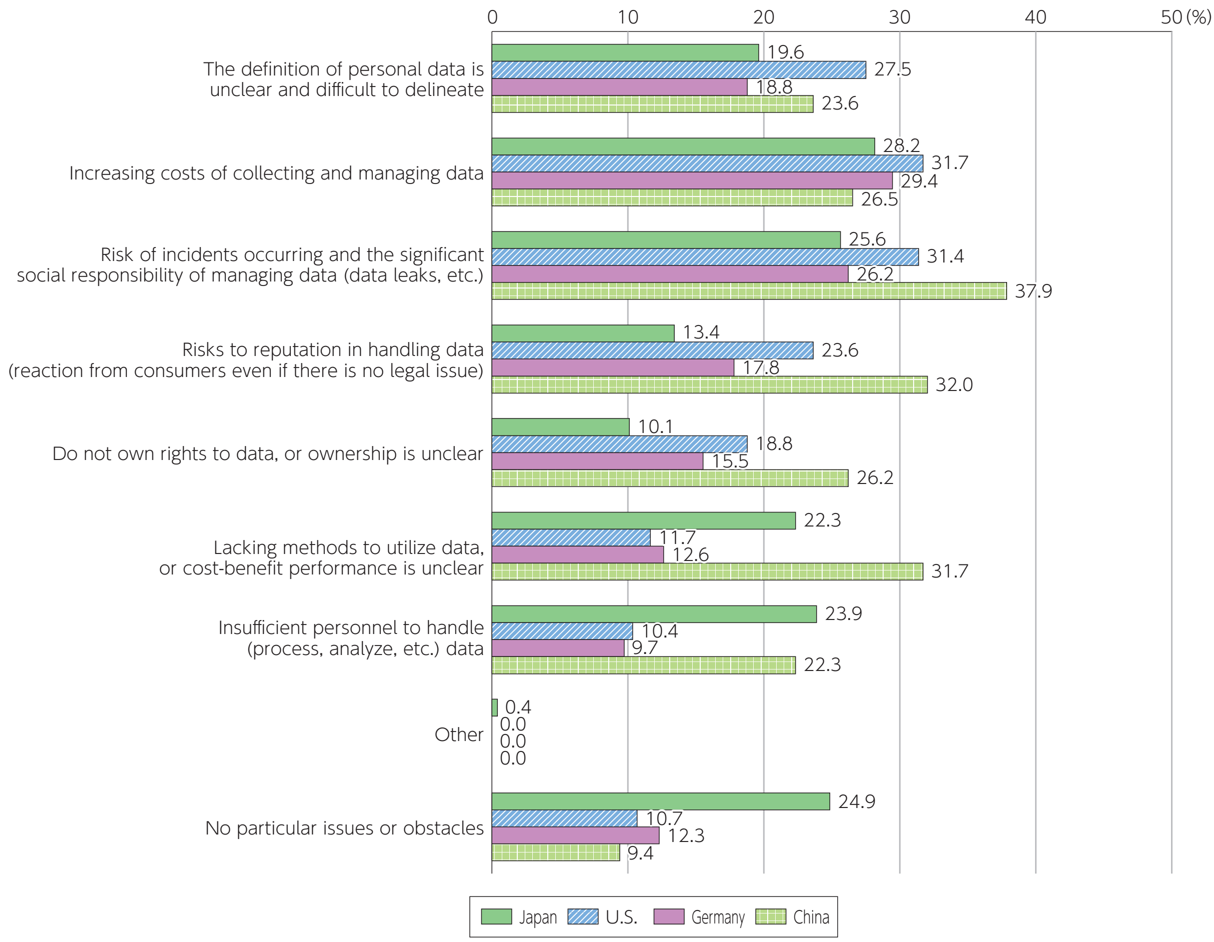
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

5. Utilization of data other than personal data



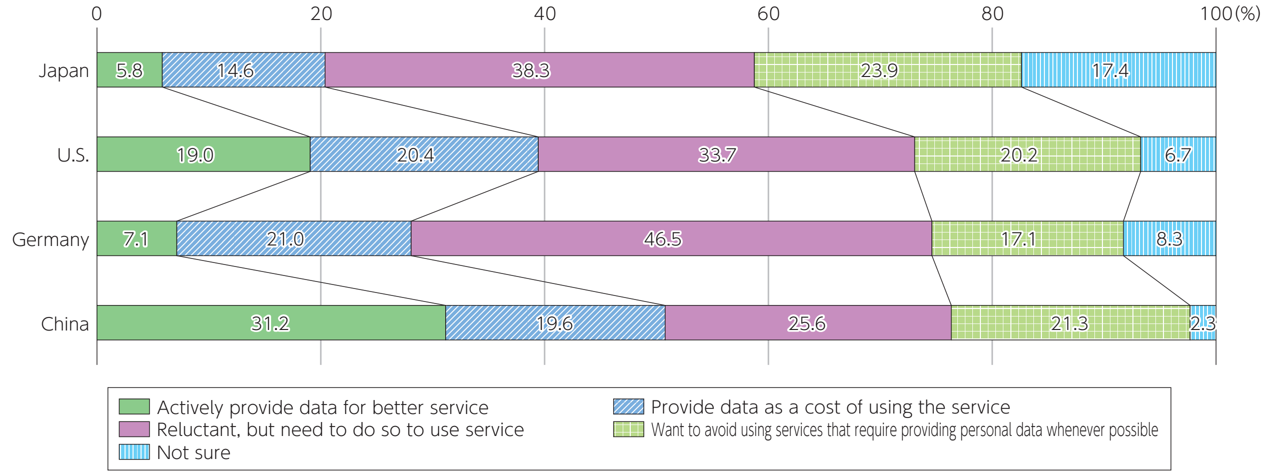
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Useof Digital Technologies in Japan and Abroad"

6. Issues and barriers envisaged in the handling and use of personal data (Figure2-1-2-2 in White Paper)



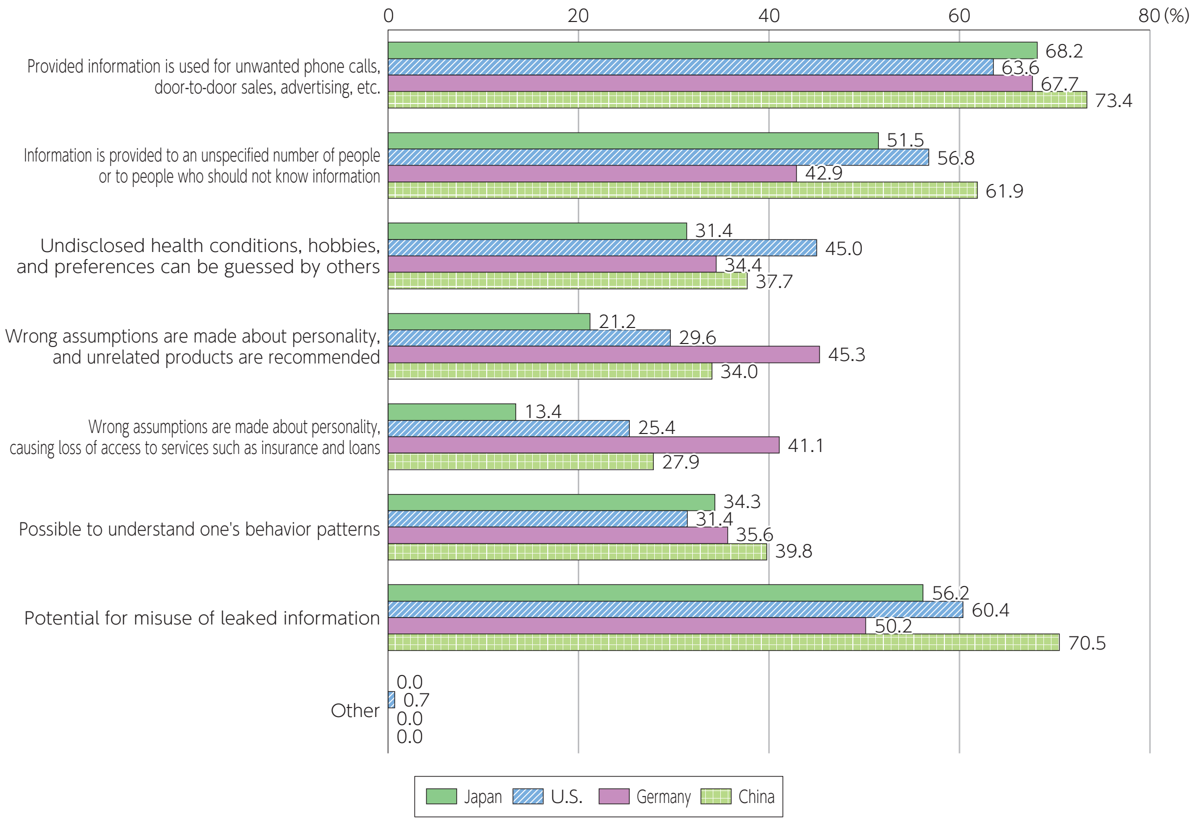
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

7. Intent regarding using services that require the provision of personal data (Figure2-1-2-3 in White Paper)



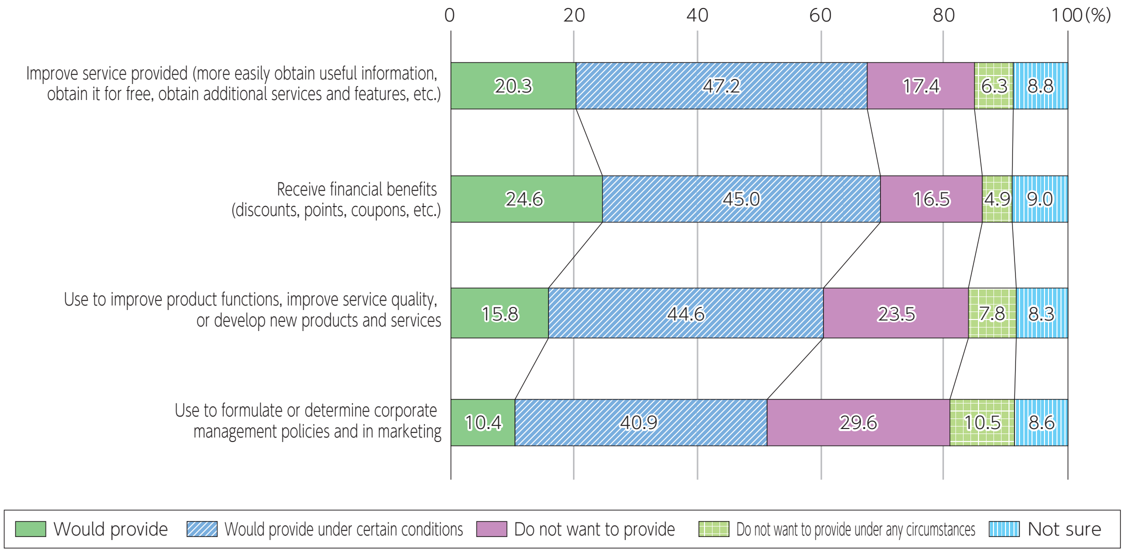
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

8. Reasons for reluctance to provide personal data when using services (Figure2-1-2-4 in White Paper)



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

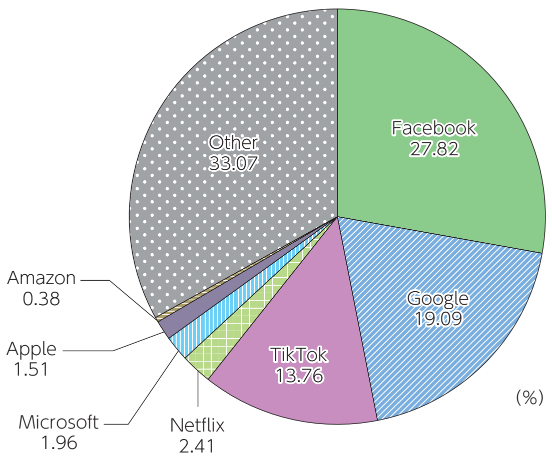
9. Conditions for providing personal data to companies



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Useof Digital Technologies in Japan and Abroad"

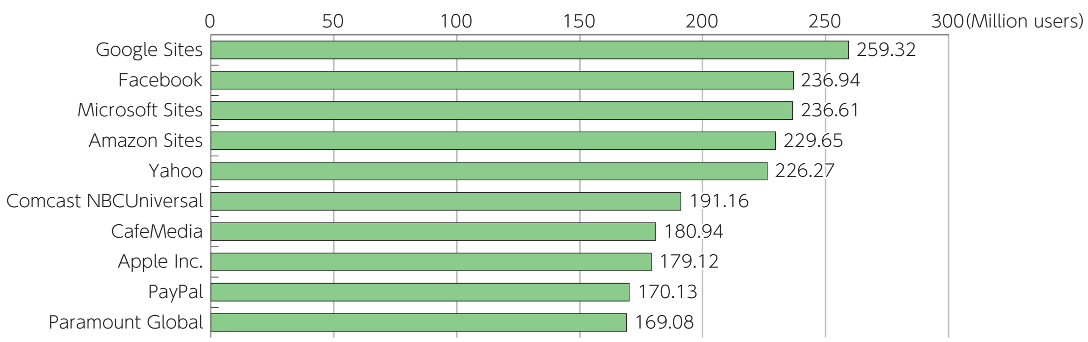
Section 2

1. Mobile Internet traffic by application (first half of 2022) (Figure2-2-1-1 in White Paper)



(Source) Prepared based on "PHENOMENA (THE GLOBAL INTERNET PHENOMENA REPORT JANUARY 2023)" by SANDVINE.

2. Platforms with the most monthly unique users in the U.S. (July 2022)



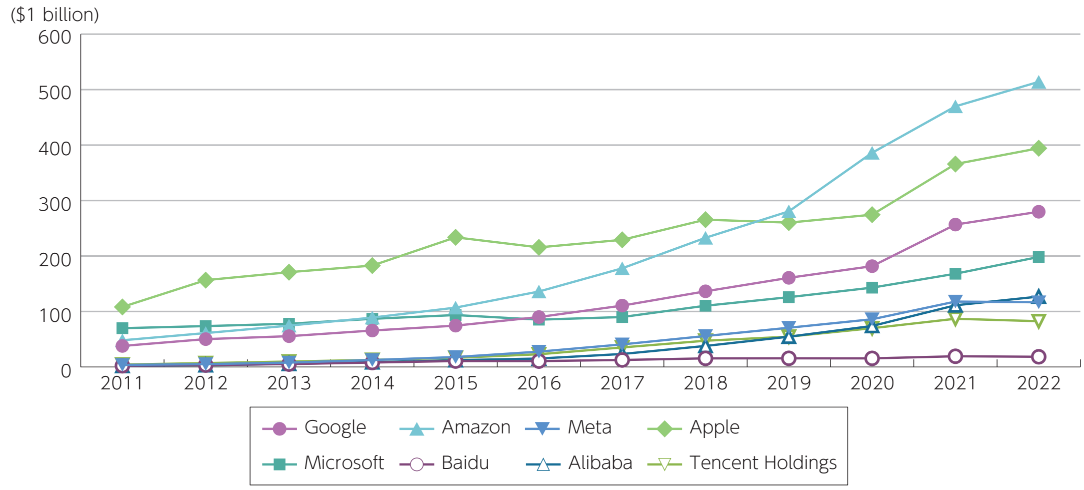
(Source) Statista "Most popular multi-platform web properties in the United States in July 2022, based on number of unique visitors"

3. Example of data items collected by platform providers (Figure2-2-1-2 in White Paper)

Data item	Platform			
	Google	Facebook	Amazon	Apple
Name	○	○	○	○
User name	–	–	○	–
IP address	○	○	○	○
Search word	○	–	○	○
Content	–	○	–	–
Link between content and displayed ads	○	○	–	–
Time, frequency, and duration of activity	○	○	–	○
Purchasing activity	○	–	○	–
Persons with whom you communicated	○	○	–	–
Activity in third-party apps	○	–	–	–
Browsing history	○	–	○	–

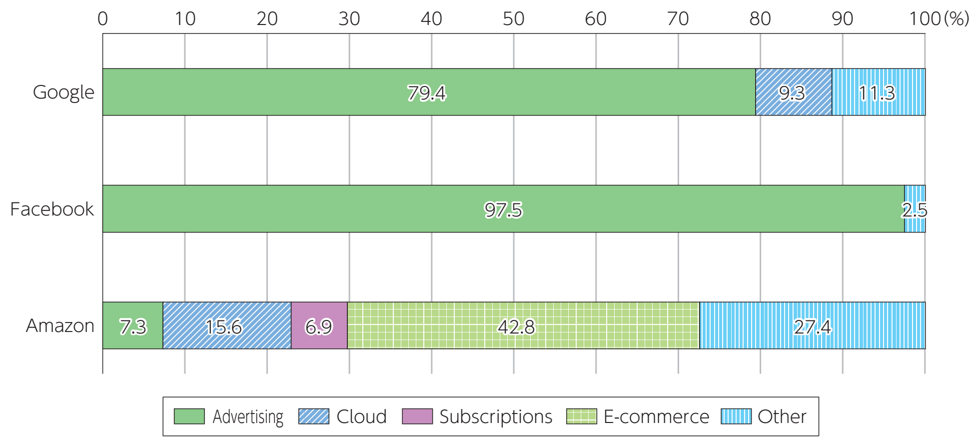
(Source) Prepared using an extract from "The Data Big Tech Companies Have On You" by Security.org

4. Sales trends of major platform providers (Figure2-2-2-1 in White Paper)



(Source) MIC (2023) "Survey Research on ICT Market Trends in Japan and Abroad"

5. Advertising spending as a percentage of platform provider sales (2022) (Figure2-2-3-1 in White Paper)



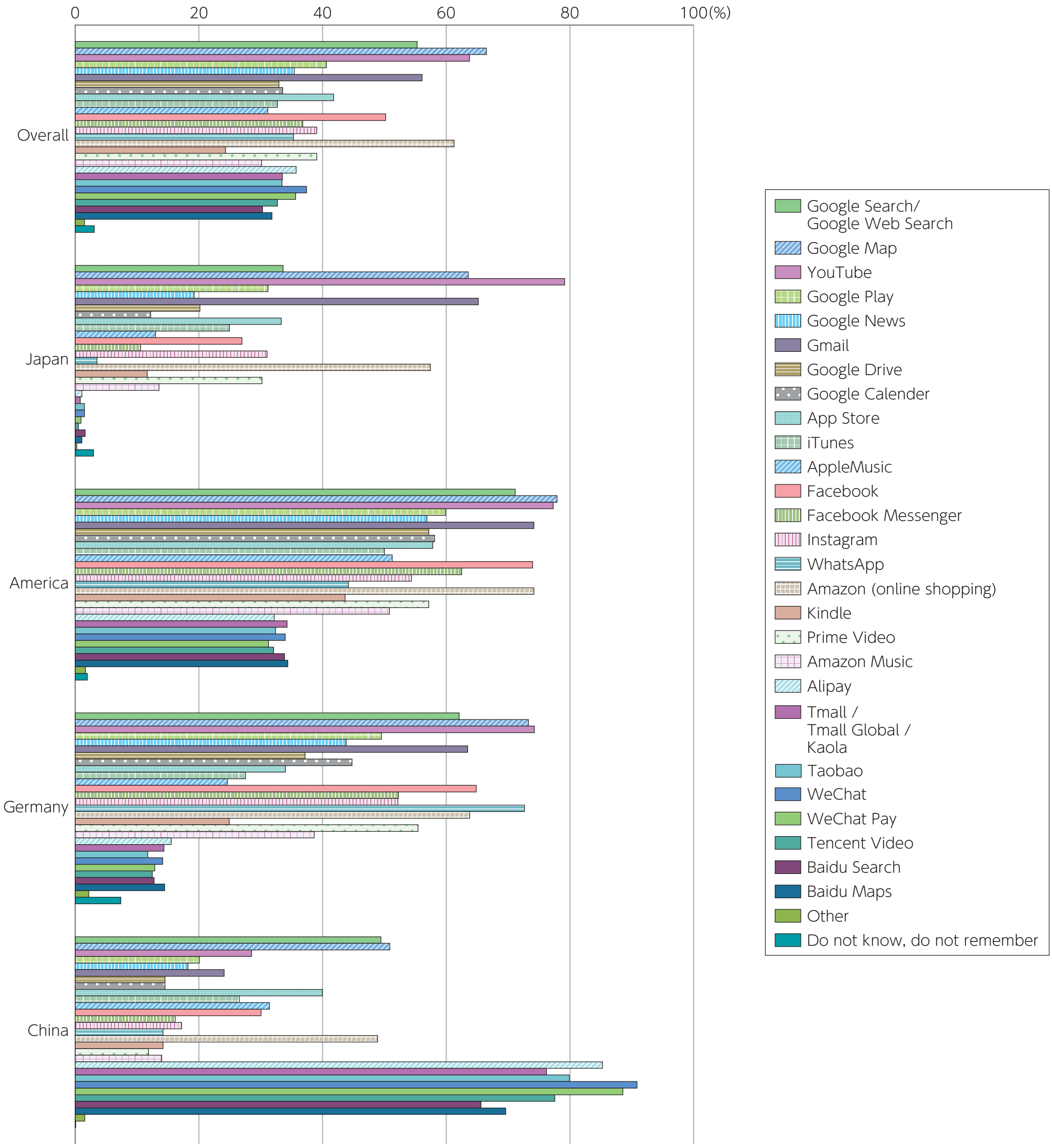
(Source) Prepared based on the published data of each company

6. Cases of investigation and prosecution of platform providers (Figure2-2-3-2 in White Paper)

Overview	Details
Use search data to lower search rankings of other companies' shopping sites (Google)	• In December 2017, the European Commission sued Google for using user search data to rank its Google Shopping service higher than other similar services. In November 2021, the European General Court upheld the European Commission's complaint. • In February 2022, Swedish price comparison service PriceRunnner sued Google for similar reasons.
Leverage data from third-party sellers who use Amazon to develop their own products (Amazon)	• In 2020, the Wall Street Journal reported that Amazon was using sales data for third-party products to develop its own products. • In April 2022, the U.S. Securities and Exchange Commission (SEC) began investigating the case.
Facebook linked to Facebook Marketplace (Meta)	• In December 2022, the European Commission linked Facebook to Facebook Marketplace, an advertising service for the sale of goods between individuals, and warned Meta for distorting competition in the market for similar services. • The European Commission also pointed out that Meta imposes adverse conditions on competing business operators that advertise on Facebook and Instagram, which allowed them to leverage data related to competing ads.

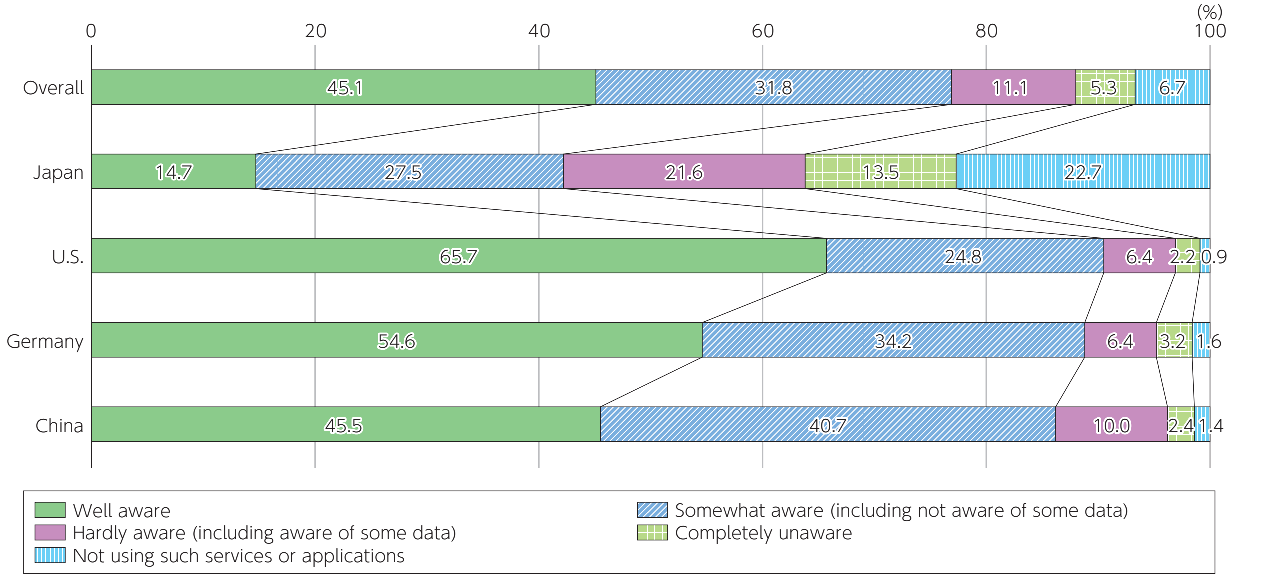
(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

7. Services that individuals have used (multiple responses)



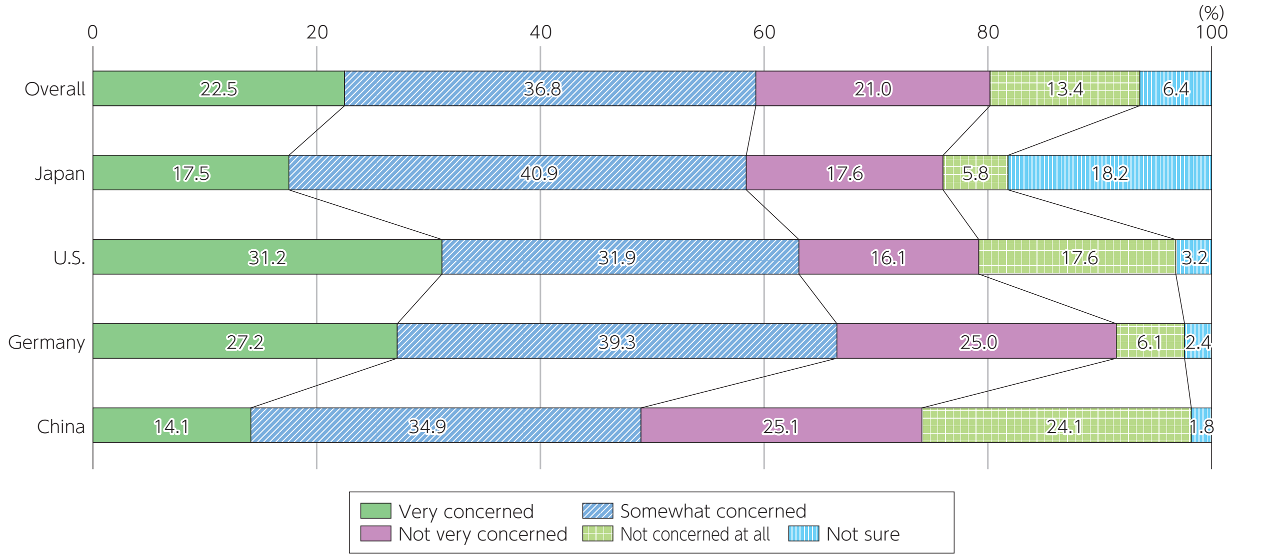
(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

8. Awareness regarding the provision of personal data (Figure2-2-3-3 in White Paper)



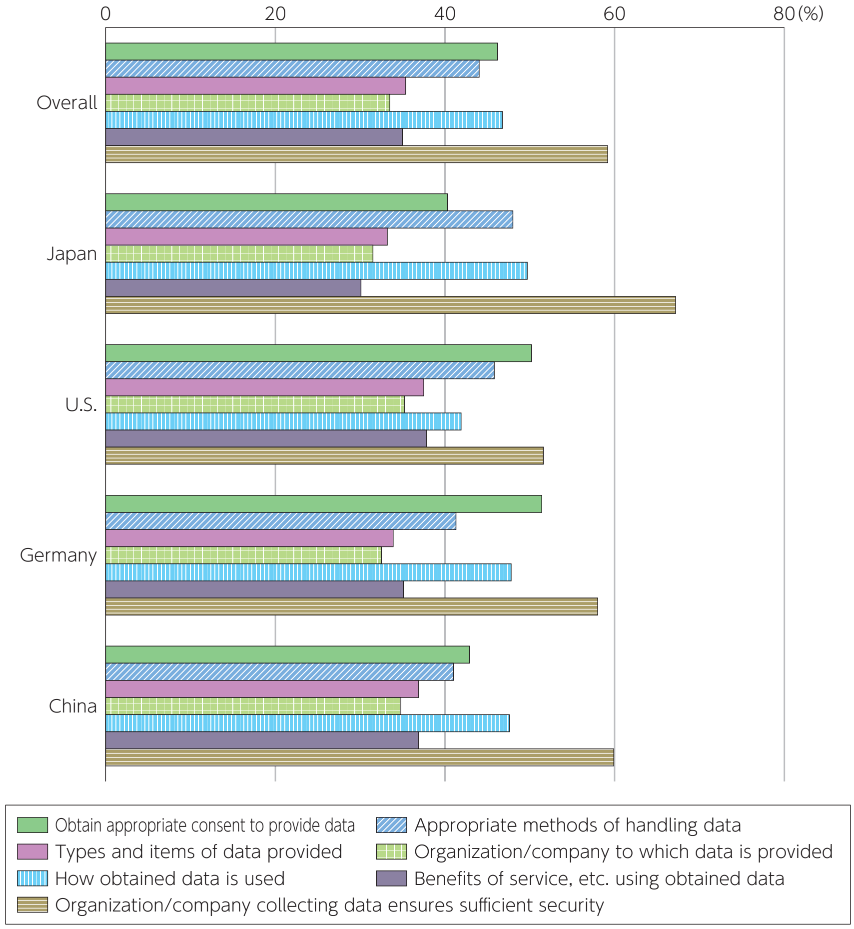
(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

9. Concerns over the provision of personal data (Figure2-2-3-4 in White Paper)



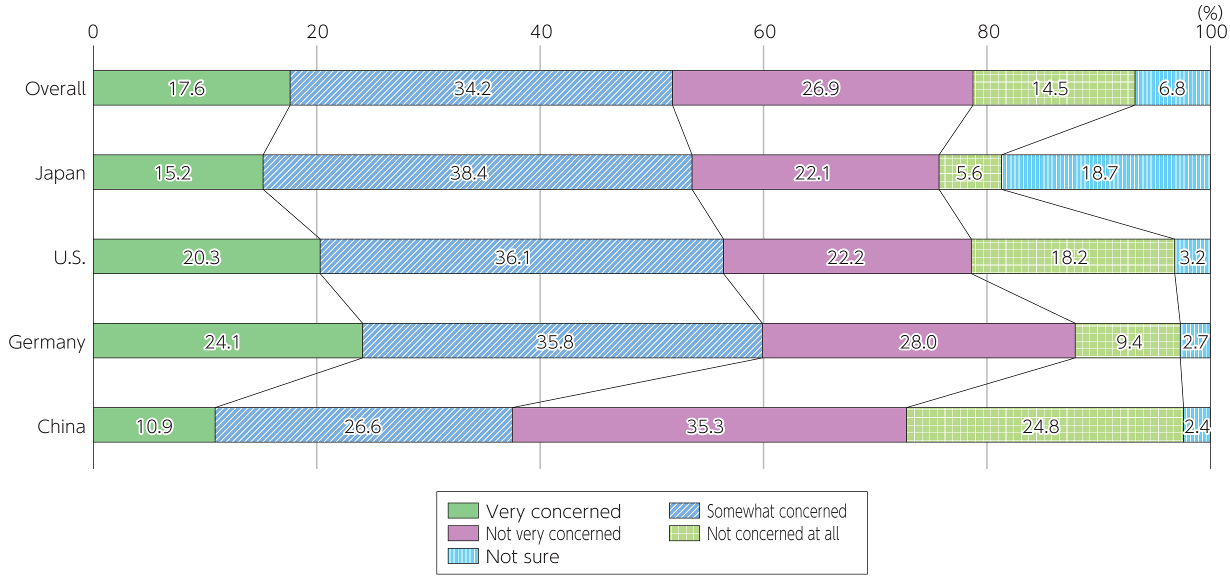
(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

10. Points to consider when providing personal data (Figure2-2-3-5 in White Paper)



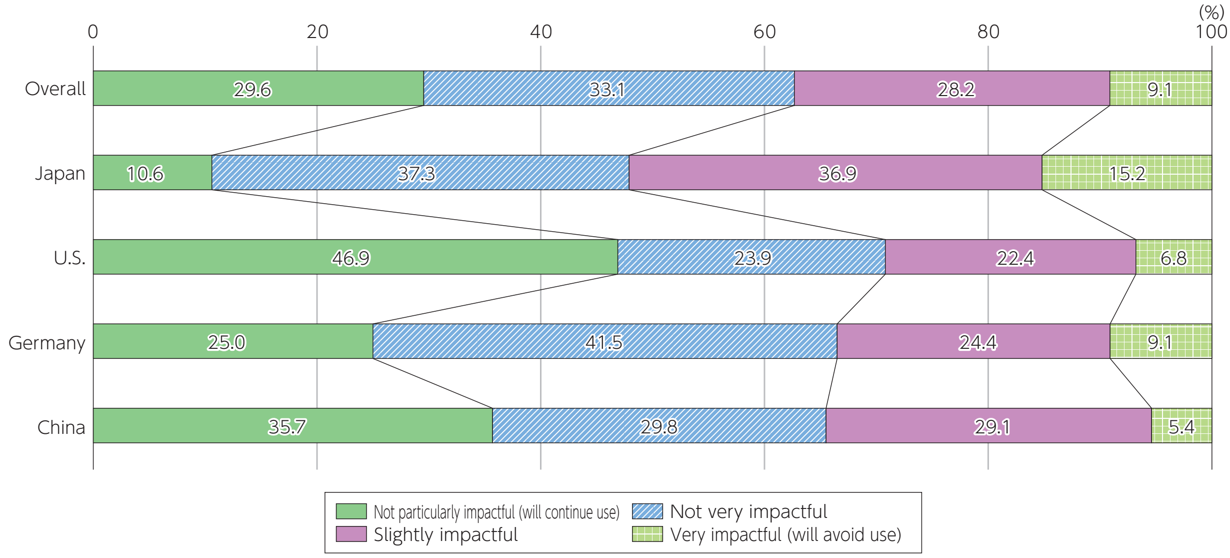
(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

11. Concerns over the display of personalized search results and advertisements, etc. (Figure2-2-3-6 in White Paper)



(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

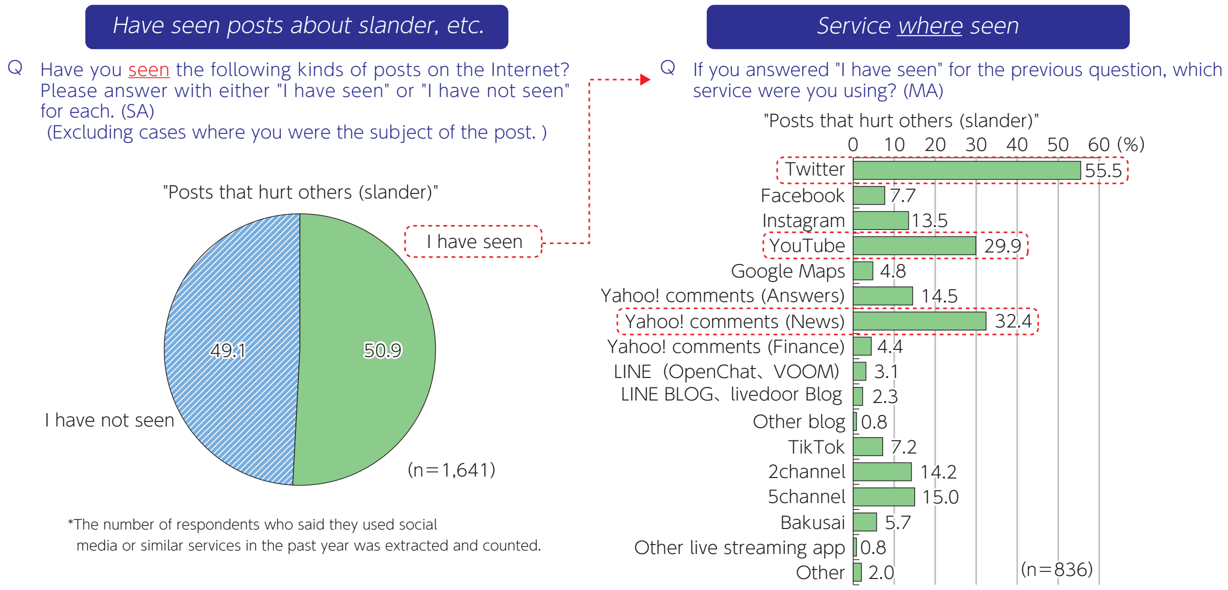
12. Impact of the display of personalized advertising on usage (Figure2-2-3-7 in White Paper)



(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

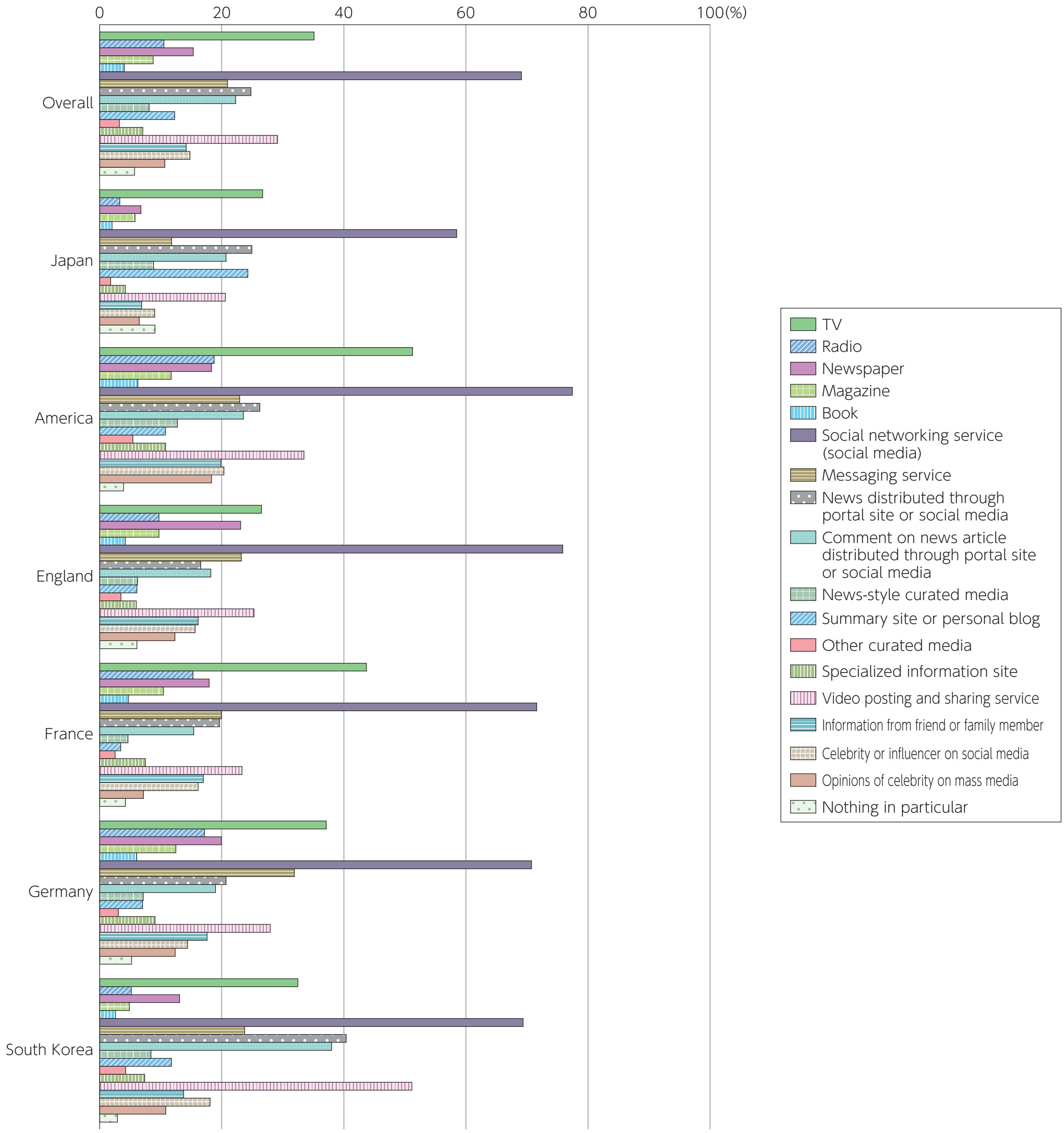
Section 3

1. Questionnaire survey of social media users (personal experience) (Figure2-3-1-1 in White Paper)



(Source) MIC Platform Service Study Group (40th meeting) - Material 2

2. Media services in which disinformation was seen



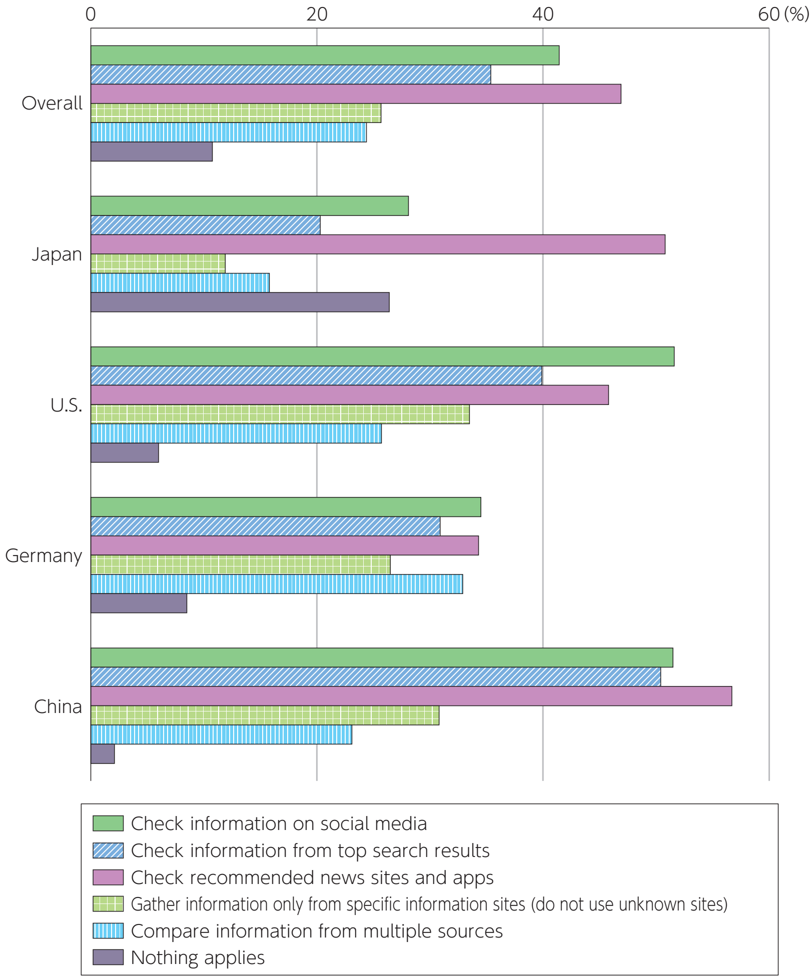
(Source) MIC "Fiscal 2021 Survey on Awareness of Disinformation in Japan and Other Countries"

3. Recent deepfake cases (Figure2-3-1-2 in White Paper)

Year	Area	Details
2021	U.S.	A mother was arrested for allegedly using deepfake technology to create obscene images and videos of her daughter's cheerleading teammates in order to get them removed from the team.
	Europe	European MPs conducted video conference calls with Russian MPs unaware that they were watching deepfakes.
2022	Global	A video of President Zelensky talking about surrendering to Russia was posted on YouTube.
	Japan	Stable Diffusion was used to create a hoax image of flooding in Shizuoka Prefecture caused by a typhoon, which was posted on Twitter.
	U.S.	The image generation AI called NovelAI Diffusion used images from the website Danbooru that may be reproducing other people's copyrighted works without permission for AI learning.
	UK	Pornographic videos of women campaigning against non-consensual deepfake pornography were created and published on Twitter.
2023	U.S.	A political activist created a video of President Biden announcing the start of World War III. The creator explained that it was created with AI, but many people shared the video without explanation.
	U.S.	The founder of Bellingcat used Midjourney to create and publish a fake image of former President Trump being arrested that went viral on Twitte.

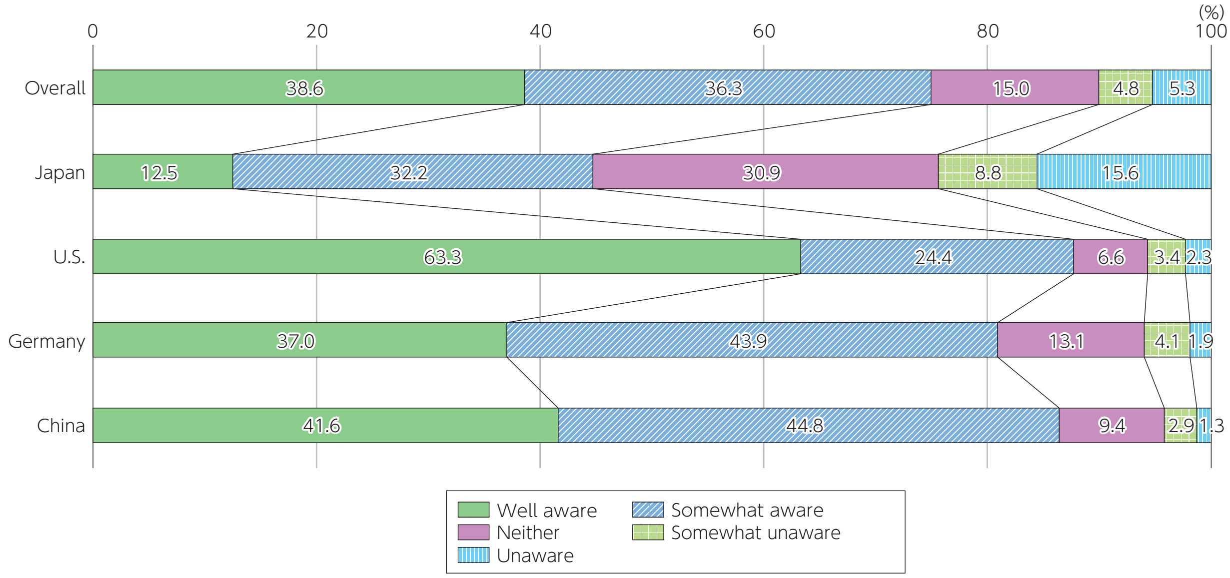
(Source) MIC "Fiscal 2021 Survey on Awareness of Disinformation in Japan and Other Countries"

4. What to do when you want the latest news online (Japan, U.S., Germany and China) (Figure2-3-2-1 in White Paper)



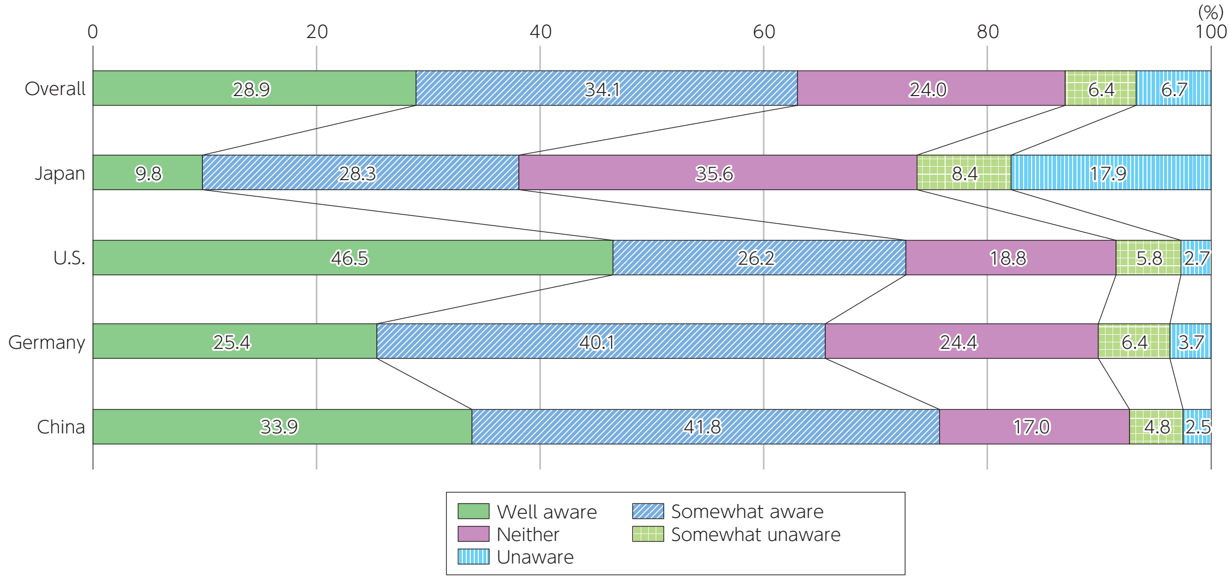
(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

5. Awareness of whether or not the information displayed in search results, social media, etc. is personalized (Figure2-3-2-2 in White Paper)



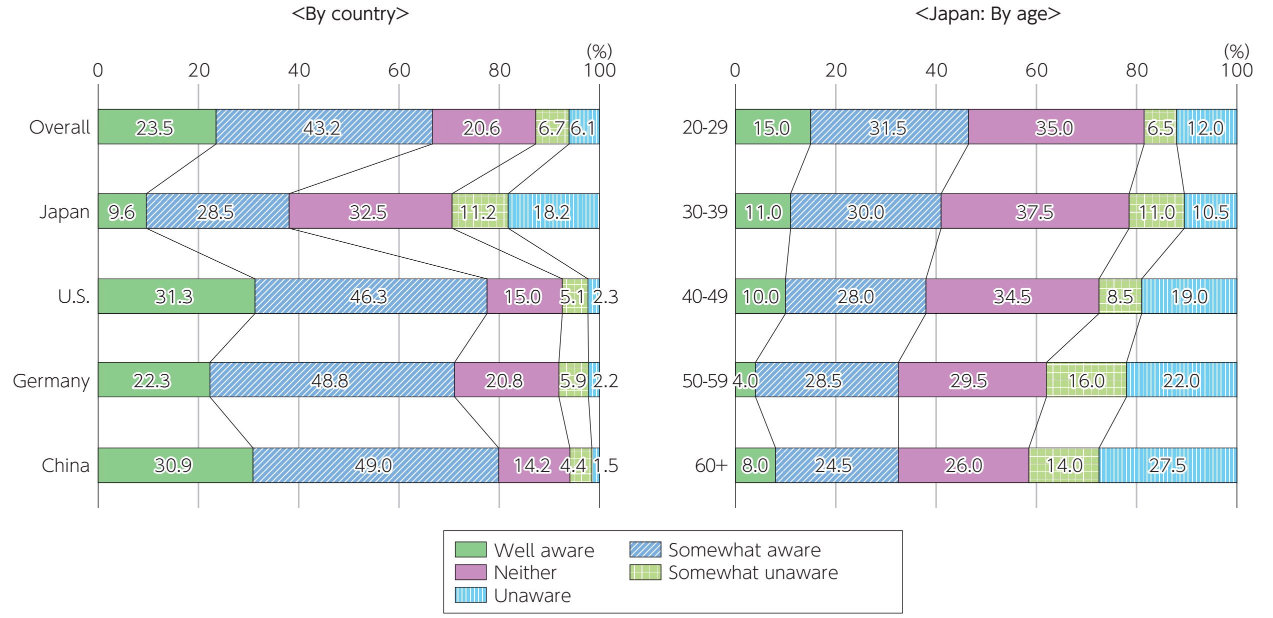
(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

6. Awareness of whether or not the service provider is presenting you with accounts or content they want you to see (Figure2-3-2-3 in White Paper)



(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

7. Awareness of the tendency for opinions and information close to your own views to be displayed in social media, etc. (Figure2-3-2-4 in White Paper)



(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

8. Regression analysis of media literacy and information literacy and the behavior of judging and spreading disinformation and misinformation (Figure2-3-3-1 in White Paper)

Effect on determining validity of false information and misinformation related to COVID-19 vaccines

- Increase in media literacy of one point => **12% more likely to recognize** false information and misinformation
- Increase in information literacy of one point => **1.8% more likely to recognize** false information and misinformation

The more literate a person is, the more likely he or she is to recognize false information and misinformation. Media literacy has a particularly strong correlation.

Effect on the spread of false information and misinformation related to COVID-19 vaccines

- Increase in media literacy of one point => **9% less likely to spread** false or misinformation
- Increase in information literacy of one point => **2% less likely to spread** false or misinformation

The more literate a person is, the less likely he or she is to spread false information and misinformation. Media literacy has a particularly strong correlation.

(Source) Innovation Nippon Report (April 2022) "Understanding the Reality of Disinformation and Misinformation in Japan and Examining Social Countermeasures — Empirical Analysis of Disinformation and Misinformation Regarding Politics and Coronavirus Vaccines, etc."

9. Initiatives for improving digital literacy in Japan (Figure2-3-3-2 in White Paper)

Entity	Example	Details
Government (MIC, etc.)	Collection of Internet problems	•Case summaries of various problems that occurred on the Internet
	Educational website "Use the Internet wisely! Guide to Using the Internet Safely and Securely"	•An educational site for all generations regarding safe and secure Internet use. Posted "Slander on Social Media, etc." as a special feature
	Educational material for raising awareness about disinformation and misinformation "Facing the Internet: How to avoid being deceived by disinformation and misinformation"	•Developed and published educational materials and guidelines for instructors in fiscal 2021 created with the aim of contributing to comprehensively promoting media information literacy
	Spring Anshin Net - Simultaneous Action for the New Semester	•Awareness-raising activities conducted intensively in line with the new semester and enrollment period.
Private rganizations and companies, etc.	Yahoo! Internet Common Sense Test, Yahoo! News Checkup	•Conducted the Internet Common Sense Skills Mock Exam in which one learns basic knowledge good to have when using the Internet and how to handle common Internet problems •Provided Yahoo! News Checkup to prevent readers being misled by uncertain information
	LINE MIRAI Foundation - Online visiting classes	•Carried out online visiting classes that provided information ethics training for children and parents at schools and local governments, etc. nationwide
	Google: First Media Literacy Course	•Online training to develop the ability to independently examine and use information
	Meta: Digital Classroom for All	•Provided visiting classes at schools, etc., online classes, and content on Instagram that anyone can learn from in order to help users acquire the skills required in the digital world and to build a global community of responsible digital citizens
	ByteDance	•Provided visiting classes at schools, etc. and awareness-raising seminars for parents and children •Raised awareness on safety and security together with video production experience
	Foundation for Multimedia Communications (FMMC) - e-Net Caravan	•Free on-site lectures held nationwide in school settings, etc. for students, parents/guardians, and teachers, etc.

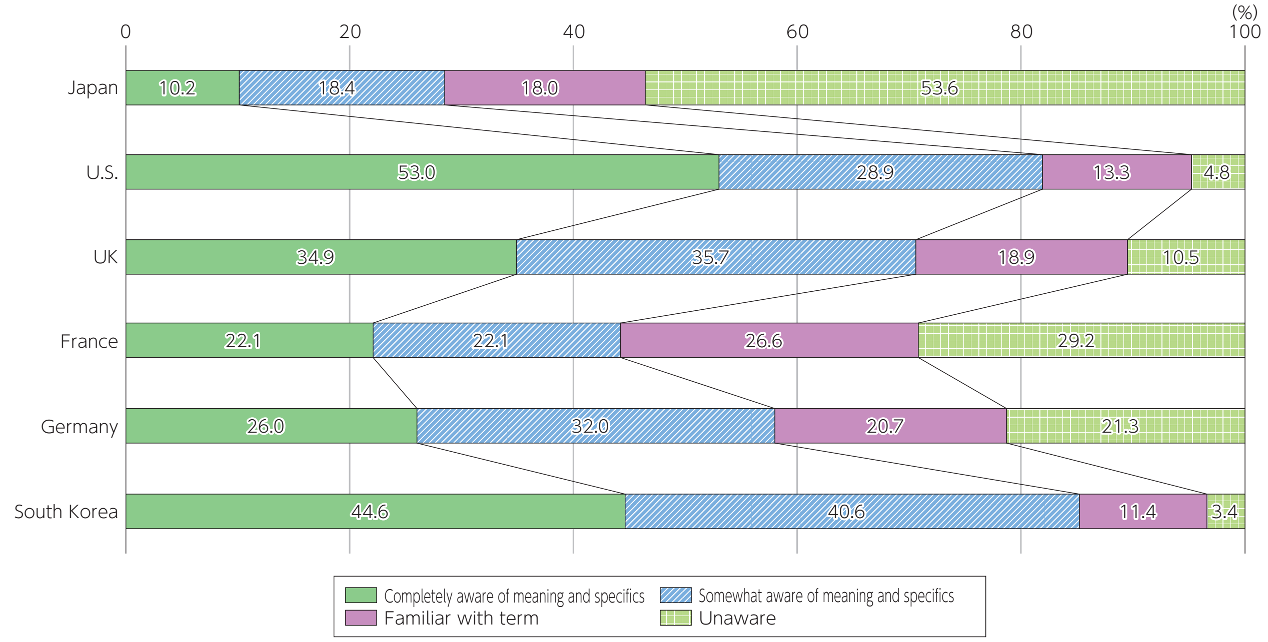
(Source) Prepared by MIC based on various published materials

10. Precedents of media information literacy education in Europe and the U.S. (Figure2-3-3-3 in White Paper)

Entity	Case name	Details
State,international organization, etc.	EU: Spot and fight disinformation	Students learn about the risks of disinformation and misinformation and how to protect themselves through example exercises and group discussions, etc. Designed to be implemented within the school classroom framework
	UNESCO: Media and information literate citizens: think critically, click wisely!	Lectures in which one learns media information literacy, distinguishing disinformation and misinformation, reading advertisements and various media, and the structure of communication on platforms. etc.
	CISA: Resilience Series Graphic Novels	Graphic novels in which one learns about the risks of disinformation and misinformation through fictional stories inspired by the real world
Platform providers	Google: Be Internet Awesome	Learn the five principles of becoming a digital citizen (e.g., Share with Care) in an online game
	Meta: Get Digital!	Literacy programs customized for youth, educators and parents/ guardians. Learn how to use digital tools
Academic research institutions	Washington State University, Check Please! Starter Course	Online course for learning how to research sources, evaluate highly specialized information, and find reliable and similar information

(Source) MIC (2022) "Report on the Survey on the Current Status and Issues of Measures for Improving Media Information Literacy"

11. Level of awareness of fact-checking (Figure2-3-4-1 in White Paper)



(Source) MIC "Fiscal 2021 Survey on Disinformation Awareness in Japan and Other Countries"

12. Activities of fact-checking organizations, etc. in other countries (Figure2-3-4-2 in White Paper)

Name and location of the organization	Overview, etc.
Name and location of the organization	• The Poynter Institute is a media research and professional development organization. IFCN is an internal organization • Partnerships with Google, Facebook, Tiktok and others to support the work of the world's leading fact-checking organizations. • Establishes standards for fact-checking organizations and implements certification. Signatory organizations carry out activities while presenting their certification marks. • Signatory fact-checking organizations collaborate to fact-check issues of international concern, including COVID-19 and the Ukraine crisis.
Poynter Institute IFCN (U.S.)	• Runs a website called Politifact that examines the veracity of statements made by politicians. Transcribes and evaluates statements for verification on a six-point scale called the Truth-O-Meter in addition to making their own evaluation comments.
Full Fact (United Kingdom)	• Established to publicize fact-checking results and suggest ways to reduce misinformation • Fact-checking of high-interest issues in the UK
Seoul National University (SNU) Fact-Check Center (Korea)	• Organization affiliated with the Seoul National University's Institute of Communication Research • Results of fact-checking conducted by mass media and online media in Korea are summarized and published on the center's website, SNU FactCheck. • Fact-checked articles published on the center's website, in conjunction with the major portal site NAVER, are also published on NAVER's Fact-Check page.
Taiwan Fact-Check Center	• Taiwan's first fact-checking organization and center established in 2018 provides educational content on its website to enable ordinary users to determine the authenticity of information on their own.

(Source) Prepared by MIC based on various published materials

13. An example of a confidence score using Microsoft Video Authenticator (Figure2-3-5-1 in White Paper)

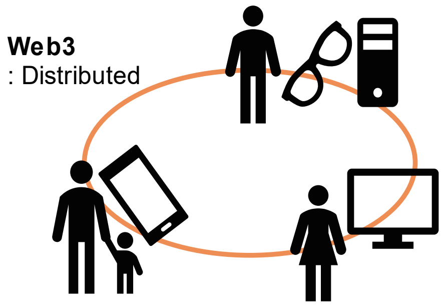
* The trustworthiness of the video is shown in real time. The red box indicates the deepfaked part.

(Source) Microsoft "New Steps to Combat Misinformation"

Chapter 3

Section 1

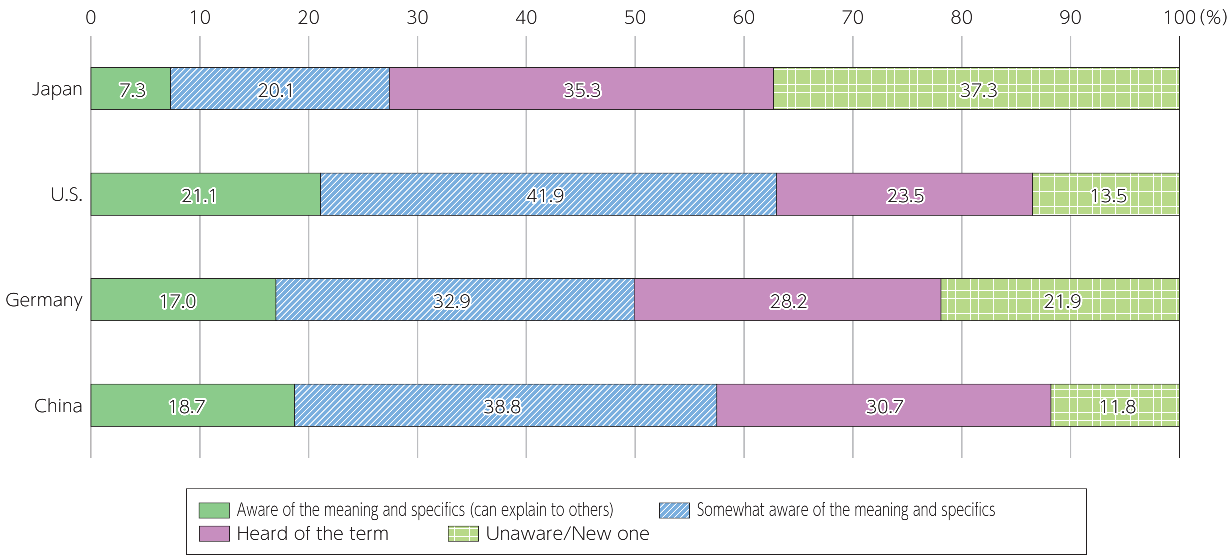
1. Features of Web3
(Figure3-1-1-1 in White Paper)



	Web3
Flow of data and information	Distributed (information and rights are not biased by distribution management)
Core technology	Blockchain

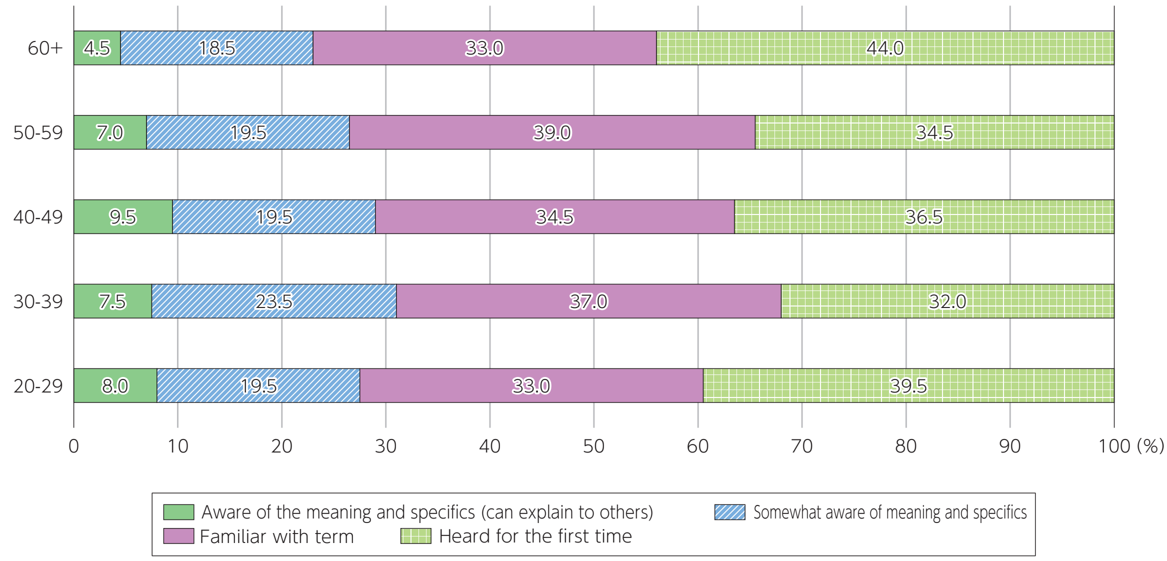
(Source) Based on Document 1-2 from the 1st meeting of the MIC Study Group on the Utilization of Metaverse Towards Web3 Era

2. Awareness of metaverses by country
(Figure3-1-2-1 in White Paper)



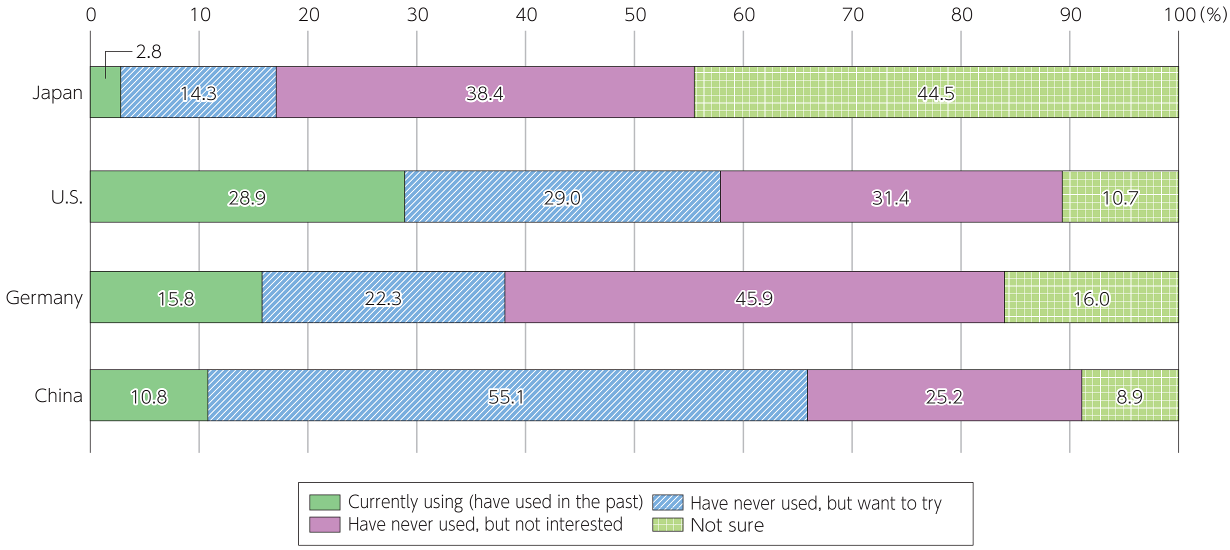
(Source) MIC (2023) "Survey Research on Advancement of ICT Infrastructure and Flow of Digital Data and Information"

3. Awareness of metaverses by age



(Source) MIC (2023) "Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information"

4. Experience of using a metaverse (by country) (Figure3-1-2-2 in White Paper)



(Source) MIC (2023) "Survey Research on Advancement of ICT Infrastructure and Flow of Digital Data and Information"

5. Metaverse School of Engineering, the University of Tokyo (Figure3-1-2-3 in White Paper)

(Source) The University of Tokyo

6. Virtual Shibuya (Figure3-1-2-4 in White Paper)

(Source) Shibuya 5G Entertainment Project

7. Metaversity (U.S.) (Figure3-1-2-5 in White Paper)

Real university

Metaverse-based university

(Source) Publicly available information provided by VictoryXR, Inc. and others

8. Metaverse Seoul (Korea) (Figure3-1-2-6 in White Paper)

(Source) Publicly available information provided by Seoul City and others

9. Promotion measures for metaverses in other countries (Figure3-1-2-7 in White Paper)

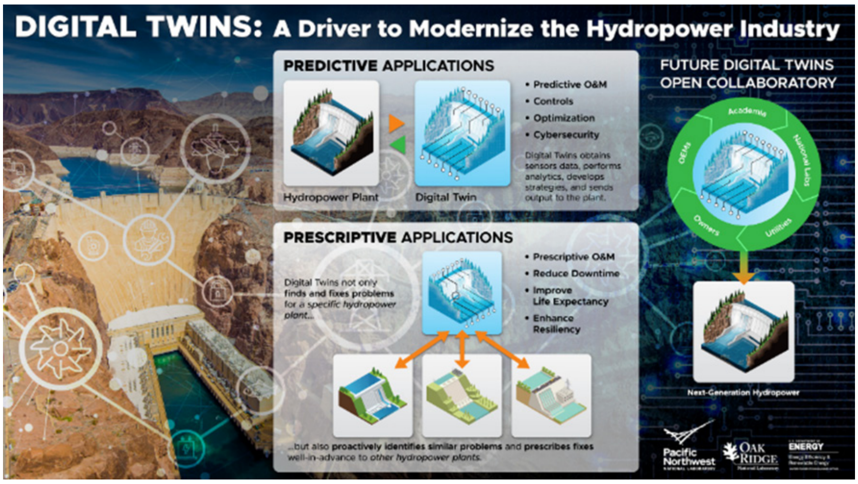
Country	Overview, etc.
U.S.	In August 2022, the Congressional Research Service released a report titled "The Metaverse: Concepts and Issues for Congress" that summarizes the policy issues that should be considered by Congress, such as metaverse technologies and concepts. The report lists issues such as the appropriate use of content, the protection of personal information such as biometric information, the domination of platforms by major companies, and the disparity between those who have access to high-speed communications environments and those who do not.
EU	In March 2023, a policy paper title "Metaverse - Virtual World, Real Challenges" was published. The report provides an overview of metaverses (definition, history of metaverses, future fields of application, development time span, elements and related technologies, countries and companies considered to play a major role) and summarizes potential challenges and opportunities in the EU (why and how the EU should engage with metaverses).
South Korea	In January 2022, the Ministry of Science and ICT published the Korea Metaverse New Business Leading Strategy. In line with the development of metaverses, the strategy states that the Korean government will take measures such as the development of a sustainable metaverse ecosystem based on public-private cooperation, human resource development, development of industry-leading companies, and the establishment of sound and exemplary infrastructure, as well as undertake initiatives to support platform development, develop practical human resources, establish funds, and develop rules, etc.
China	In July 2022, the Shanghai Municipal People's Government in China released its 14th Five-Year Plan for the development of Shanghai's digital economy. In the metaverse field, the plan states that virtual reality technologies will be enhanced, platforms will be developed, and new digital entertainment such as virtual concerts will be fostered.

(Source) Based on Document 7-2 from the 7th meeting of the MIC Study Group on the Utilization of Metaverse Towards Web3 Era

10. VIRTUAL SHIZUOKA (Figure3-1-2-8 in White Paper)

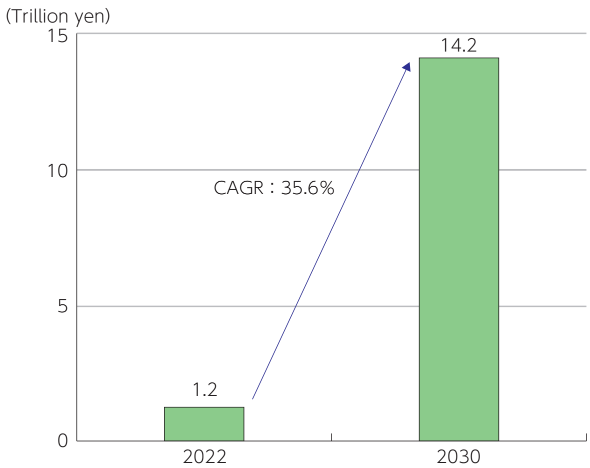
(Source) Shizuoka Prefecture

11. Digital twin for hydroelectric systems (U.S.) (Figure3-1-2-9 in White Paper)



(Source) Oak Ridge National Laboratory HP

12. Global market size of generative AI (Figure3-1-3-1 in White Paper)



(Source) Survey by Grand View Research Inc.

Section 2

1. Examples of recent telecommunications services outages (Figure3-2-1-1 in White Paper)

Area	Date occurred	Details
Global	June 2022	Cloudflare: An outage occurred in 19 data centers throughout the world.
UK	July 2022	Google, Oracle: An outage occurred in cloud services due to a heatwave.
Japan	July 2022	KDDI: A communications outage occurred due to human error.
Japan	Aug. 2022	NTT West: A communications outage occurred in the FLET'S Hikari Internet service due to equipment failure.
Japan	Sept. 2022	Rakuten Mobile: A communications outage occurred due to an equipment error.
Japan	Sept. 2022	Softbank: A communications outage occurred due to human error.
South Korea	Oct. 2022	Naver, Kakao: A service outage occurred due to a fire at an SK C&C data center. Service was restored in South Korea on the day of the outage for Naver, and then five days later for Kakao.
Japan	Dec. 2022	NTT Docomo: A communications outage occurred due to an equipment error and human error.
U.S.	Feb. 2023	T-Mobile: A communications outage occurred.
Japan	April 2023	NTT East, NTT West: A communications outage occurred in services such as "HIKARI DENWA."

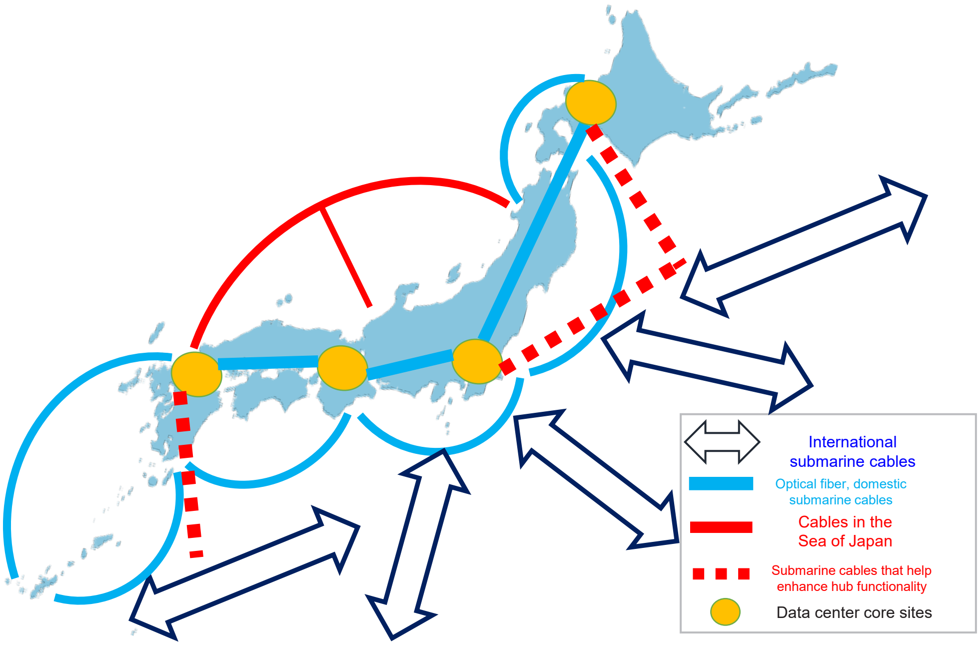
(Source) Created by MIC based on publicly available documents released by various companies

2. Efforts by Japanese telecom operators to utilize and introduce satellites, etc. (Figure3-2-1-2 in White Paper)

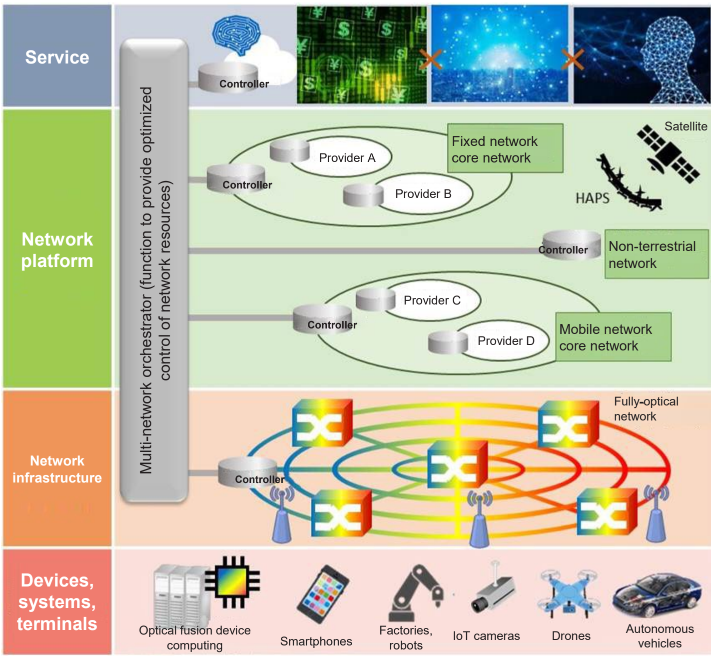
	Overview
NTT	Established Space Compass, jointly funded by SKY Perfect JSAT. Aims to begin providing low-delay communications services within Japan using High Altitude Platform Station (HAPS) in fiscal 2025.
KDDI	Signed contract with SpaceX (U.S.) to use Starlink as the backhaul link to au base stations. Began operating in Hastushima (Atami, Shizuoka Prefecture) in December 2022, and plans to expand service to approximately 1,200 locations throughout Japan.
SoftBank	Currently developing an NTN solution to provide communications networks from outer space and the stratosphere, using three services: (1) satellite phone service provided by THURAYA, (2) LEO satellite communications service provided by OneWeb, and (3) HAPS provided by HAPSMobile (a subsidiary of SoftBank).
Rakuten Mobile	Working with AST SpaceMobile (U.S.) on the "SpaceMobile" project to build mobile broadband networks utilizing LEO satellites. Aims to allow smartphones to communicate directly with satellites.

(Source) Created by MIC based on publicly available documents released by various companies

3. Image of data center and submarine cables maintenance (Figure3-2-1-3 in White Paper)



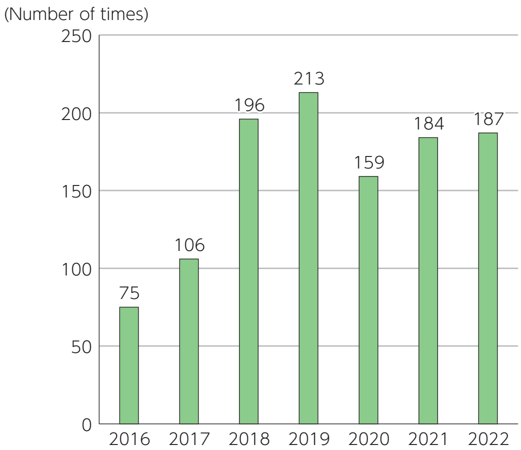
4. The ideal Beyond 5G network (Figure3-2-2-1 in White Paper)

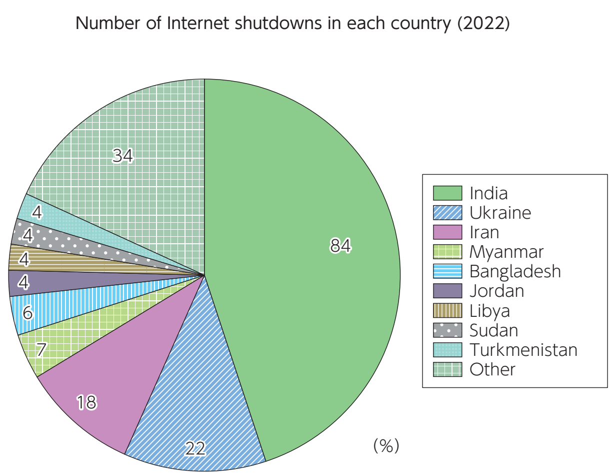


(Source) Summary of the Information and Communications Council's interim report on the "Information and Communications Technology Strategy Beyond 5G"

Column

5. Internet shutdowns in the world (Figure1 in White Paper)



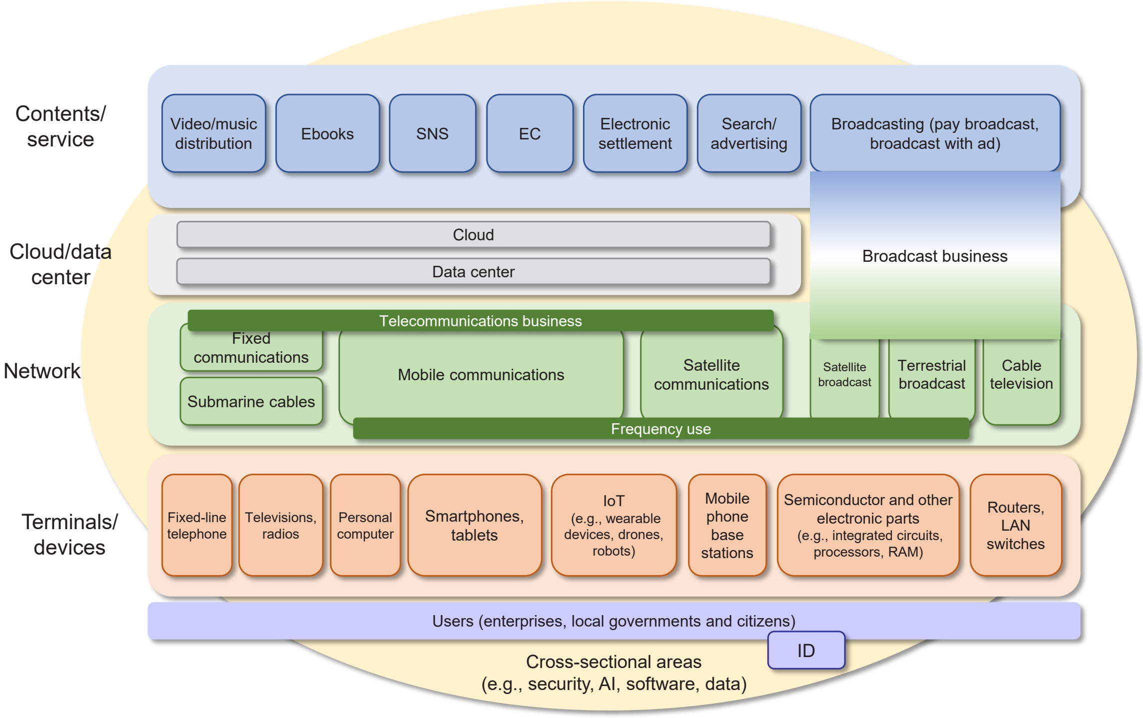


(Source) Created based on "WEAPONS OF CONTROL, SHIELDS OF IMPUNIT"

Chapter 4

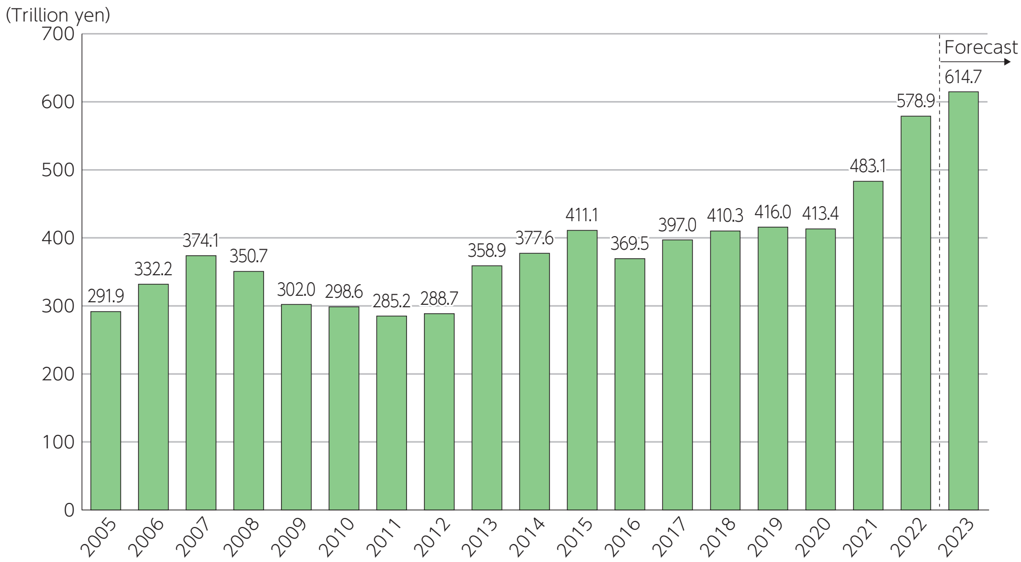
Section 1

1. Structure of the ICT market by layer (Figure4-1-1-1 in White Paper)



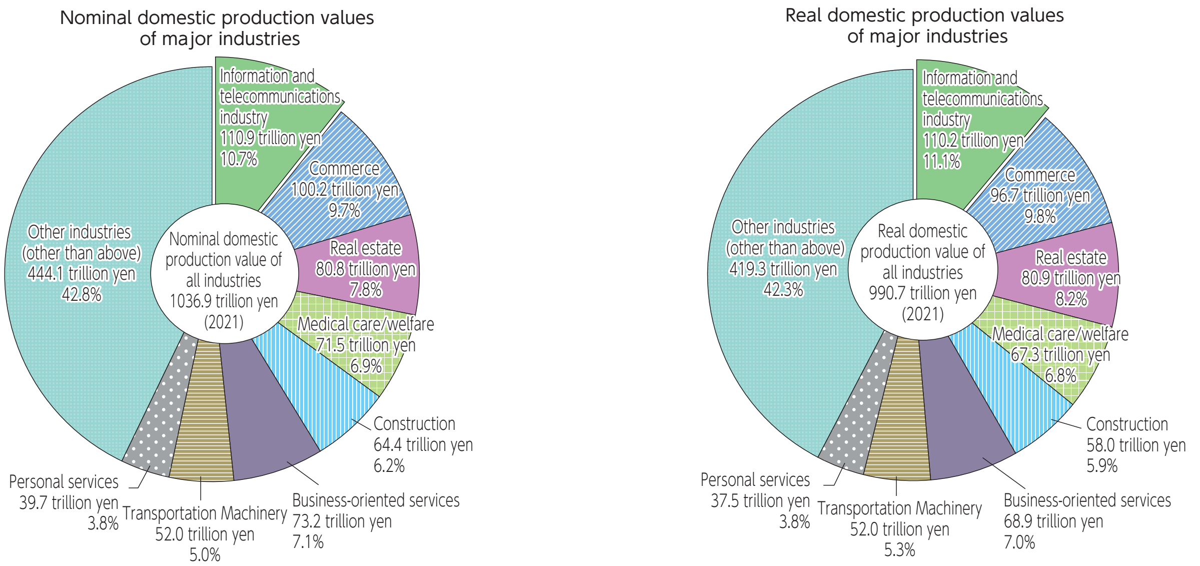
(Source) Created by MIC

2. Changes in global ICT market size (in terms of expenditure) (Figure4-1-1-2 in White Paper)



(Source) Statista (Gartner)

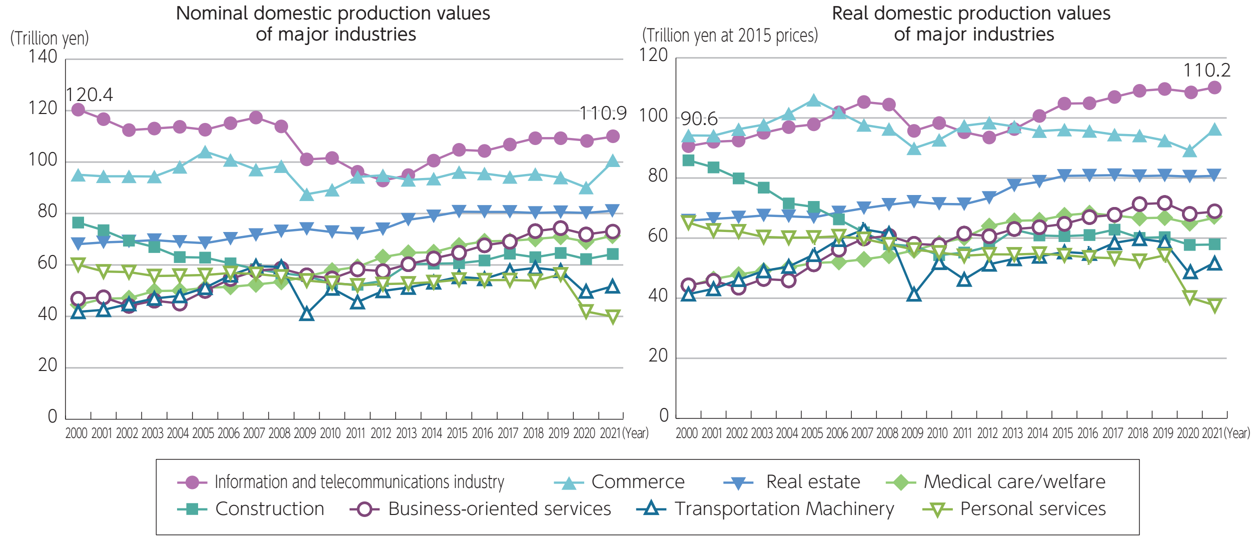
3. Nominal and real domestic production values of major industries (breakdown of 2021)



* 1 Real domestic production value is calculated using the 2015 prices.
* 2 For scope of the information and communications industry, see Annotation 3 of the Appendix.

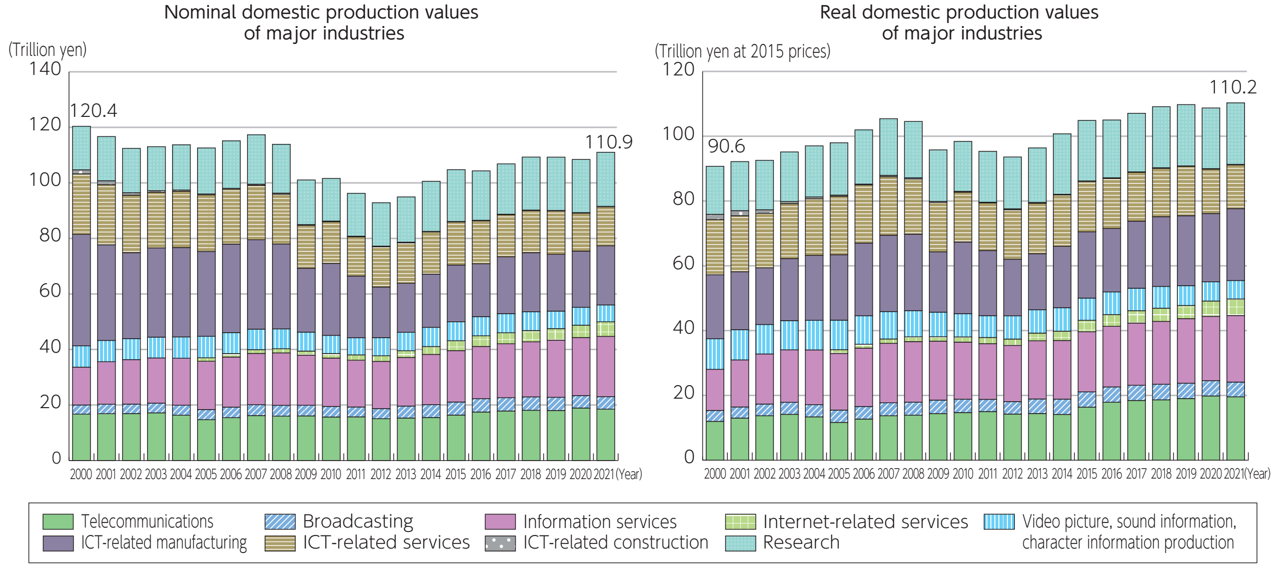
(Source) MIC (2023), "Fiscal 2022 Survey on economic analysis of ICT"

4. Changes in domestic production value of major industries (nominal and real)



(Source) MIC (2023), "Fiscal 2022 Survey on economic analysis of ICT"

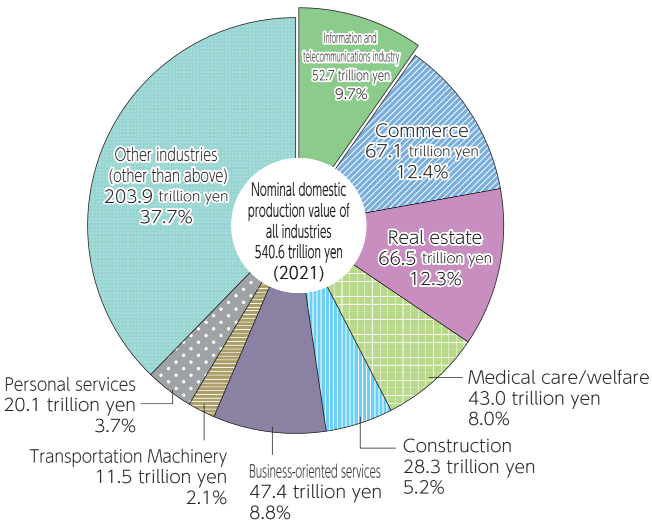
5. Changes in domestic production value of the information and communication industry (nominal and real)*



* For the details of the values, see Data 2 and Data 3 of the Appendix.

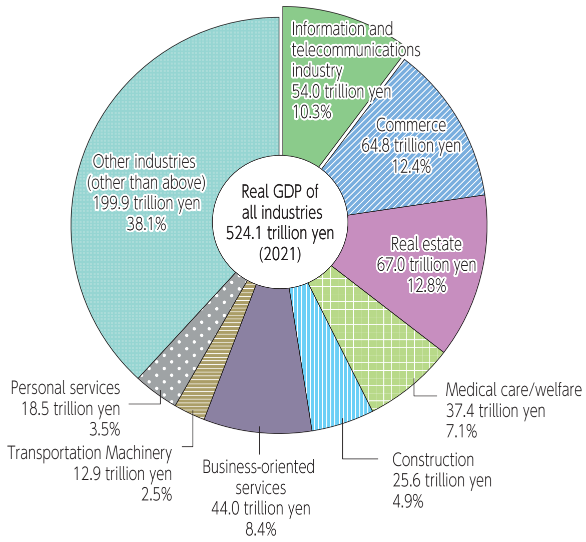
(Source) MIC (2023), "Fiscal 2022 Survey on economic analysis of ICT"

6. GDP of major industries (nominal) (Figure4-1-2-1 in White Paper)



(Source) MIC (2023) "Survey on Economic Analysis of ICT in Fiscal 2022"

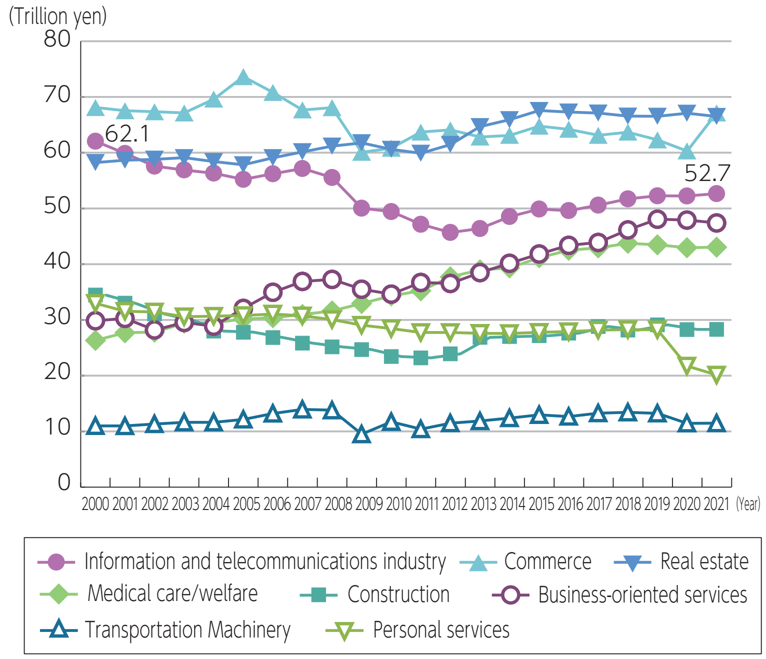
7. GDP of major industries (real)



* Real GDP converted at 2015 prices.

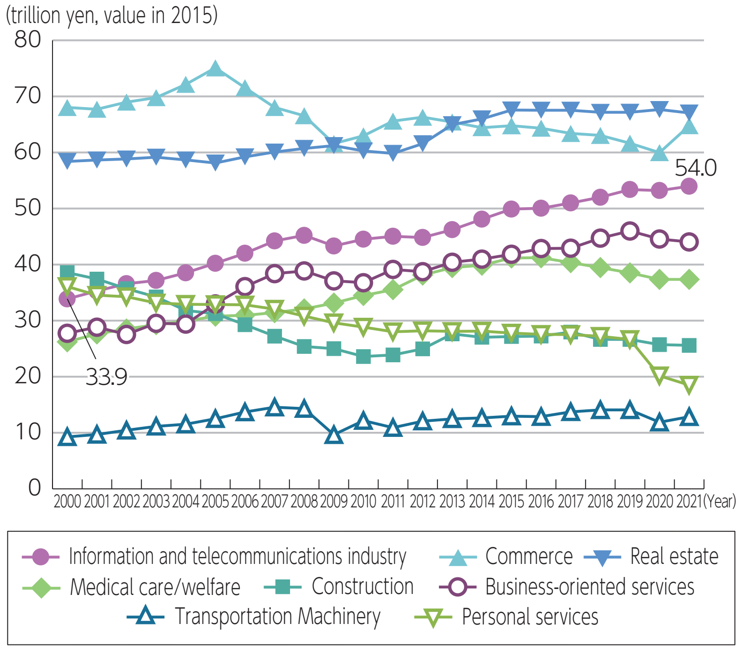
(Source) MIC (2023), "2022 Survey on economic analysis of ICT"

8. Changes in nominal GDP of major industries (Figure4-1-2-2 in White Paper)



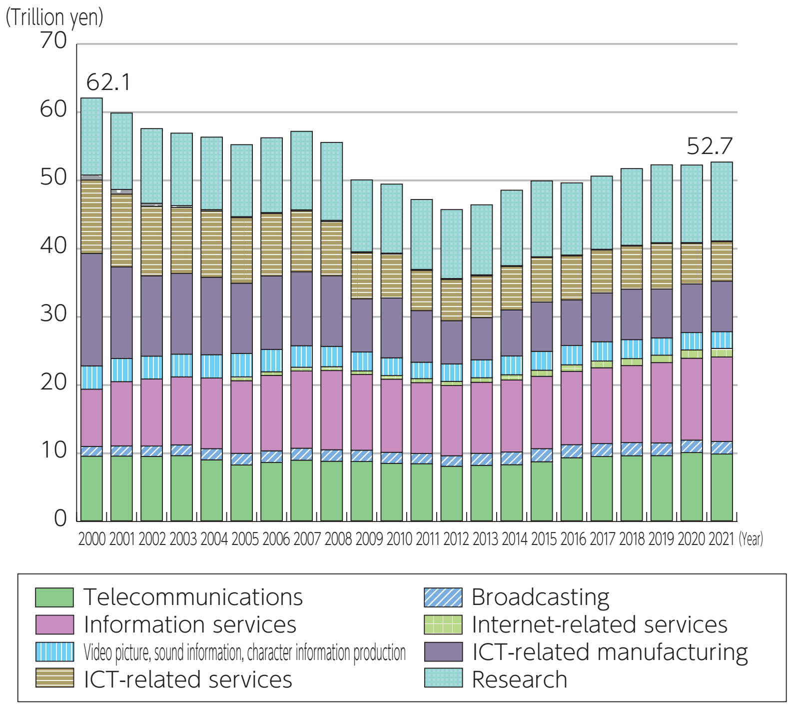
(Source) MIC (2023) "Survey on Economic Analysis of ICT in Fiscal 2022"

9. Changes in GDP of major industries (real)



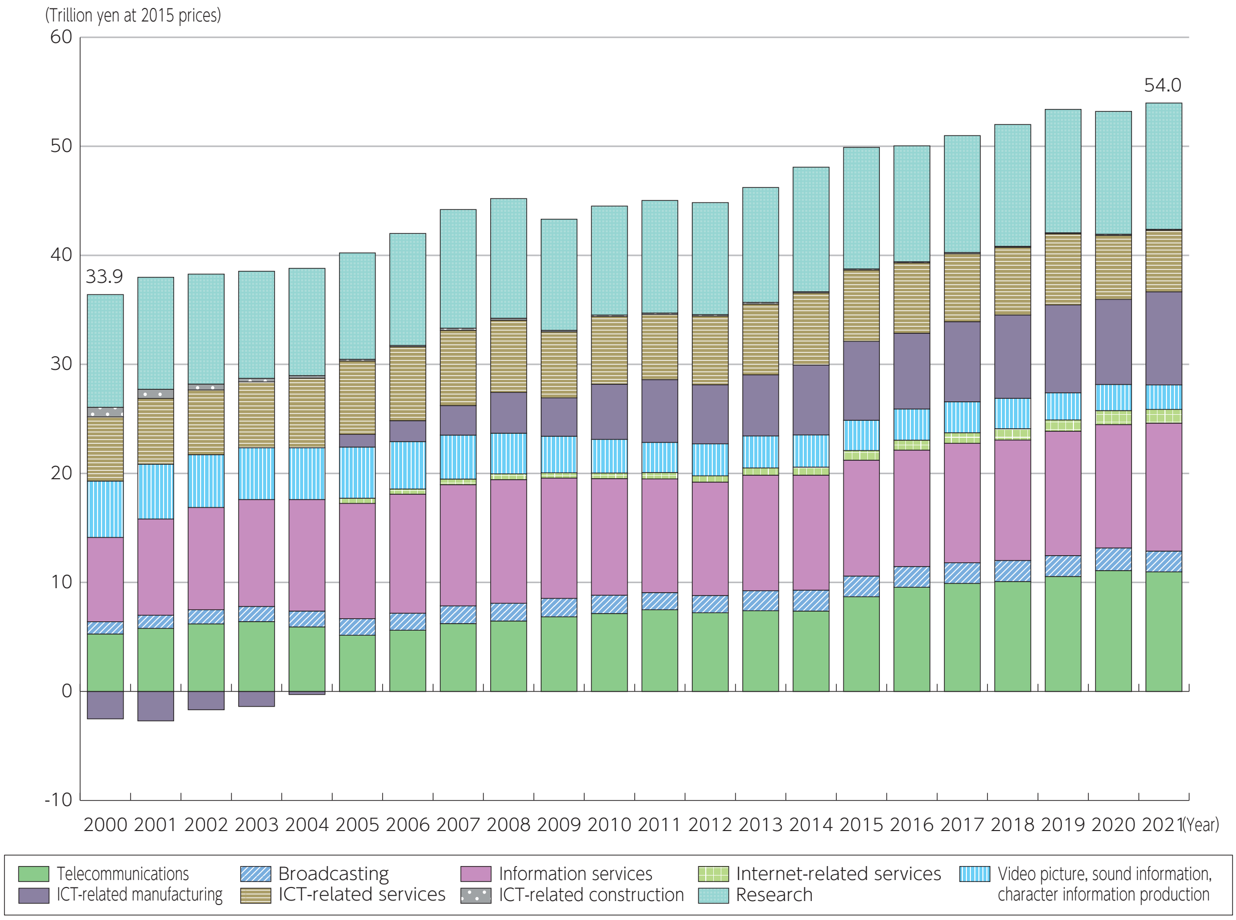
(Source) MIC (2023), "2022 Survey on economic analysis of ICT"

10. Changes in nominal GDP of the ICT industry (Figure4-1-2-3 in White Paper)



(Source) MIC (2023) "Survey on Economic Analysis of ICT in Fiscal 2022"

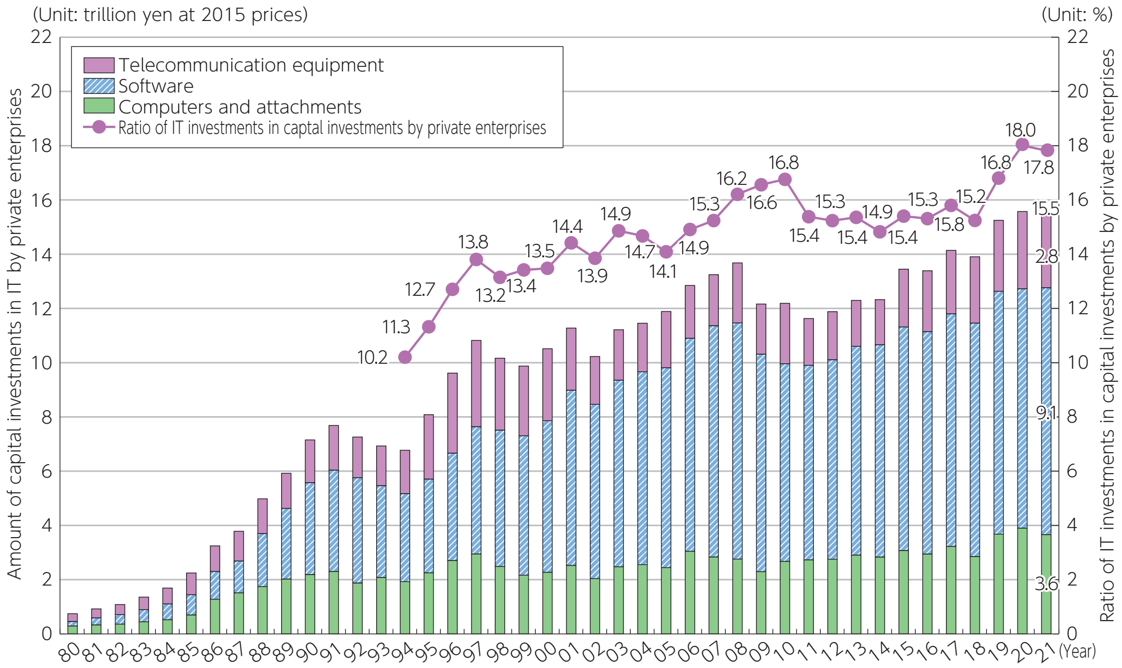
11. Changes in GDP of the information and communication industry (real)



* For the details of the values, see Data 5 of the Appendix.

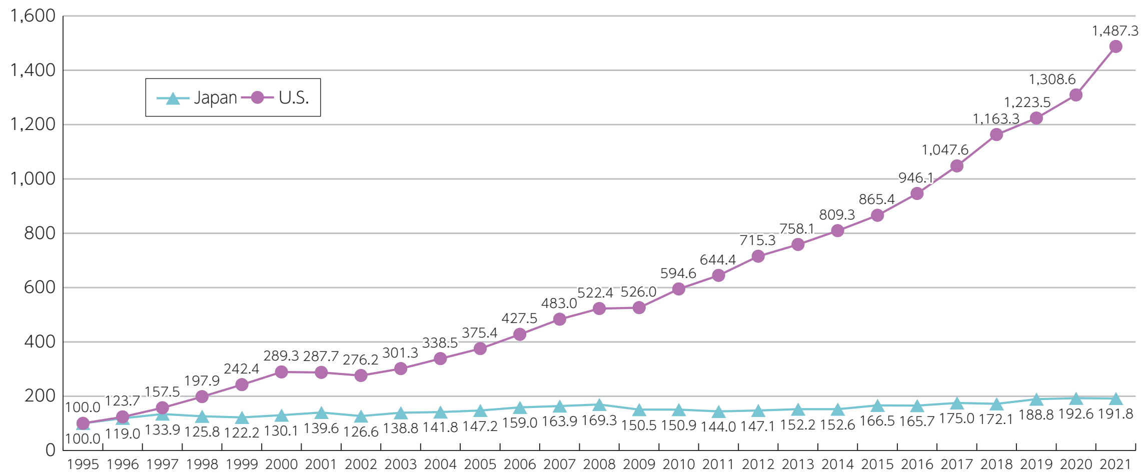
(Source) MIC (2023), "Fiscal 2022 Survey on economic analysis of ICT"

12. Changes in IT investment in Japan (Figure4-1-3-1 in White Paper)



(Source) MIC (2023) "Survey on Economic Analysis of ICT in Fiscal 2022"

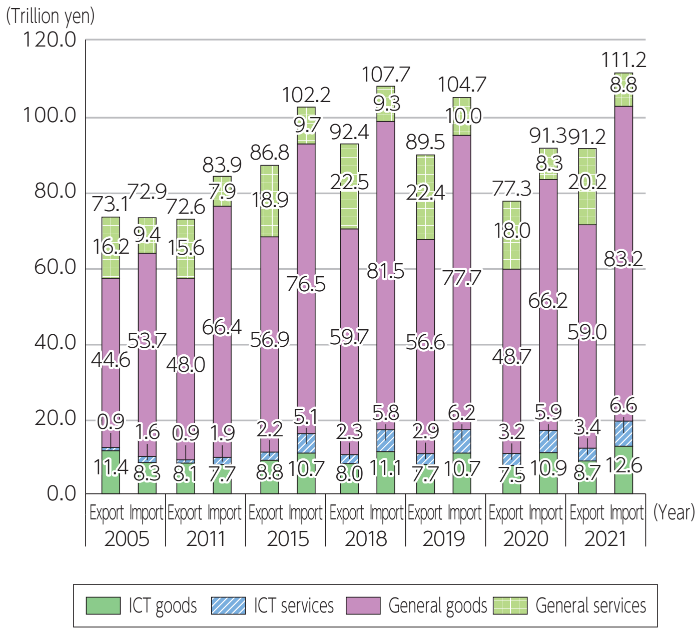
13. Comparison of IT investments in the private sector in Japan and the U.S. (Figure4-1-3-2 in White Paper)



* 1995 = indexed as 100 (Japan: 2015 price; U.S.: 2012 price)

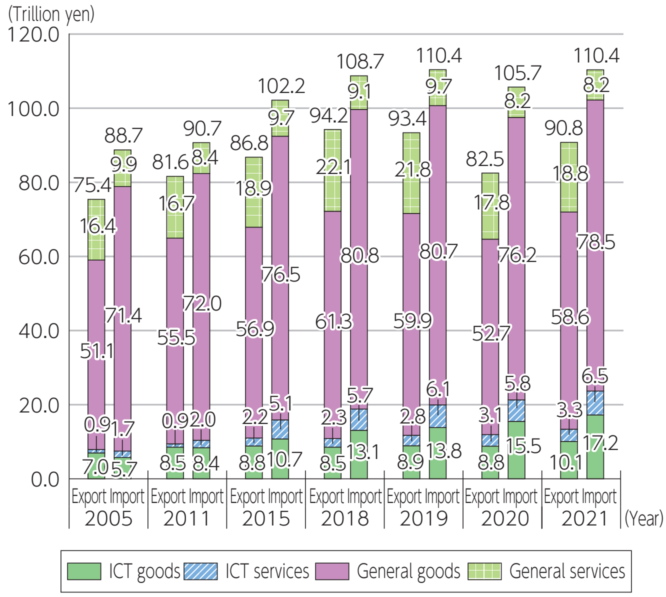
(Source) MIC (2023) "Survey on Economic Analysis of ICT in Fiscal 2022"

14. Changes in the value of imports and exports of goods and services (nominal) (Figure4-1-4-1 in White Paper)



(Source) Prepared based on the MIC "ICT Industry Linkage Table" (for each fiscal year)

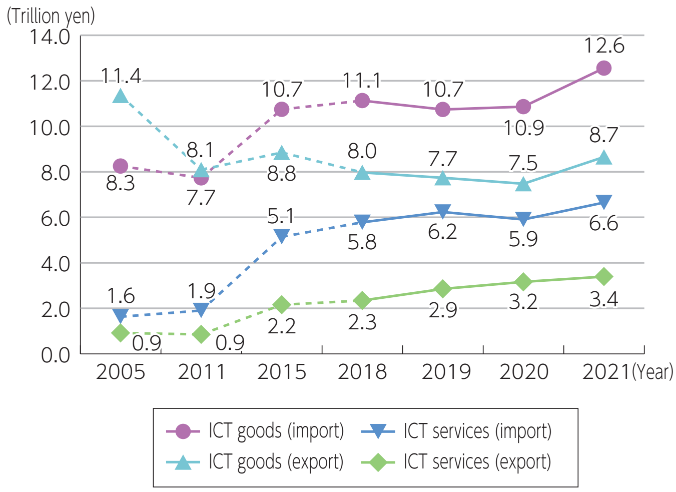
15. Changes in exports/imports of goods/services (real)



* Real value is calculated using the 2015 prices.

(Source) MIC annual "Input-Output Table of the Information Communications Industry"
https://www.soumu.go.jp/johotsusintokei/link/link03_01.html

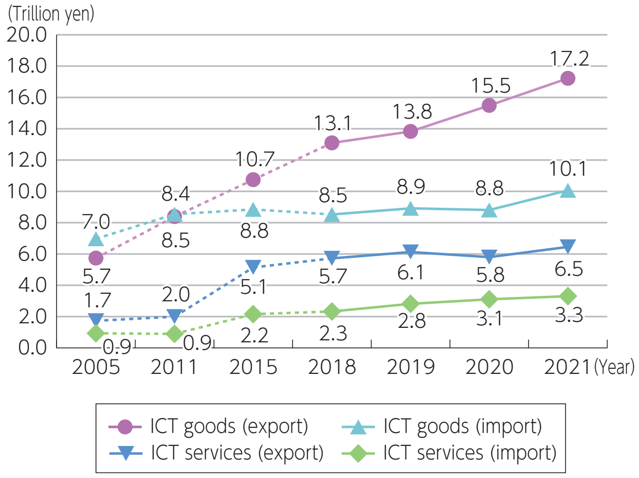
16. Changes in the value of imports and exports of ICT goods and services (nominal) (Figure4-1-4-2 in White Paper)



* There are different blanks in the data from 2005 to 2018 so trends are shown using dashed lines.

(Source) Prepared based on the MIC "ICT Industry Linkage Table" (for each fiscal year)

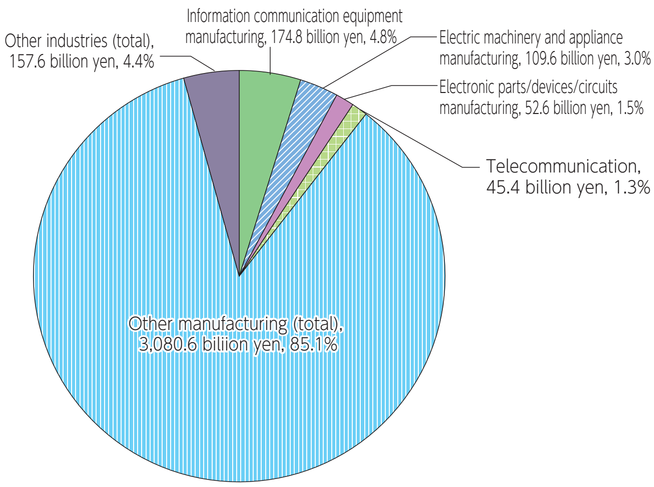
17. Changes in exports and imports of ICT goods/services (Real value)

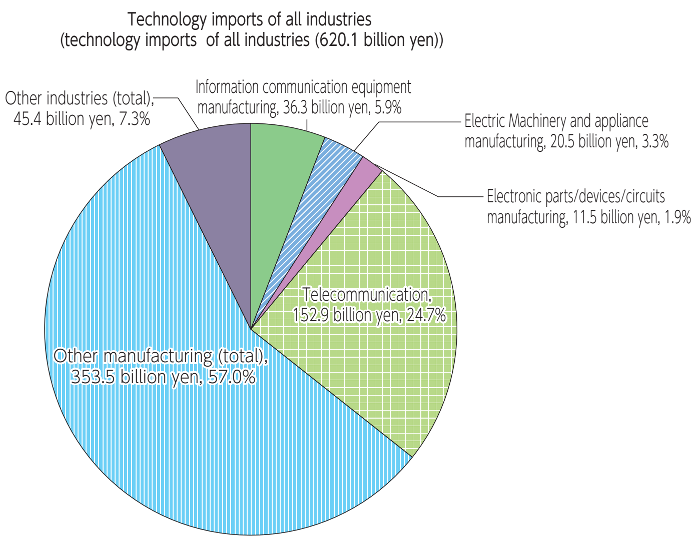


* The transition from 2005 to 2018 is indicated by a dashed line because there is a gap in the period.

(Source) MIC annual "Input-Output Table of the Information Communications Industry"
https://www.soumu.go.jp/johotsusintokei/link/link03_01.html

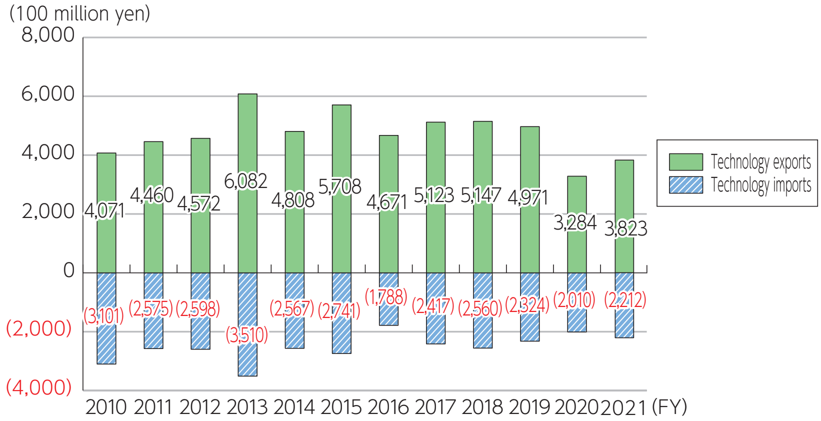
18. Proportion of technology trade values by industry (fiscal 2021)





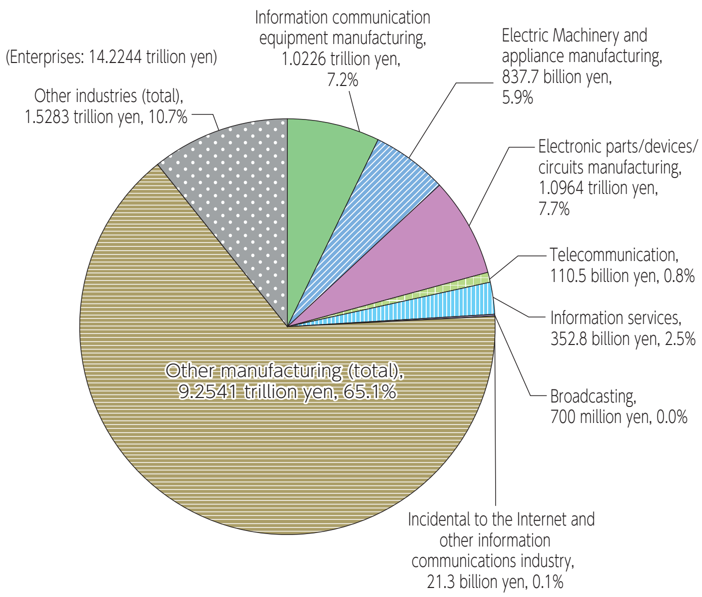
(Source) MIC, annual "Survey of Science and Technology Research"
https://www.stat.go.jp/data/kagaku/index.html

19. Changes in technology trade values of the information and communication industry



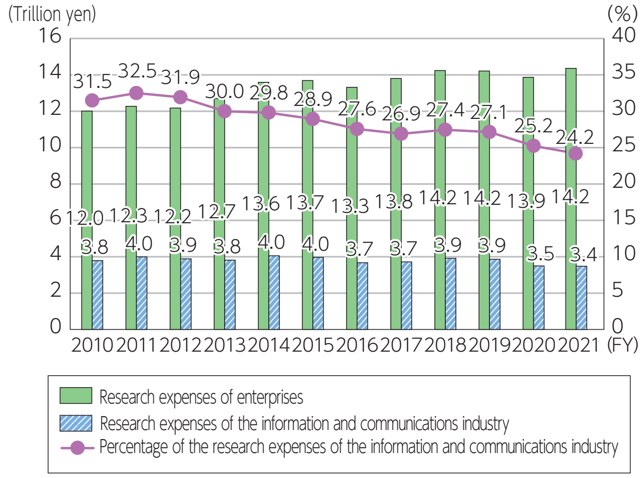
(Source) Prepared from MIC, annual "Survey of Science and Technology Research"
https://www.stat.go.jp/data/kagaku/index.html

20. Percentages of research expenditure by companies (fiscal 2021) (Figure4-1-5-1 in White Paper)



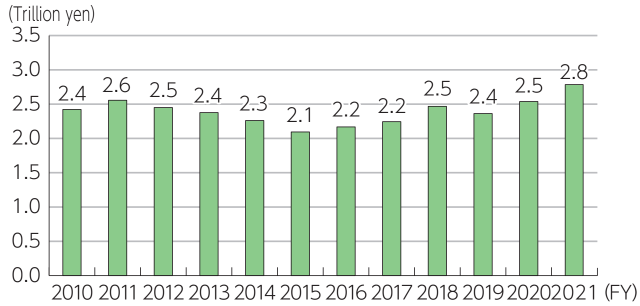
(Source) Prepared based on the MIC "2022 Science and Technology Research Survey"

21. Changes in research expenditure by companies (Figure4-1-5-2 in White Paper)



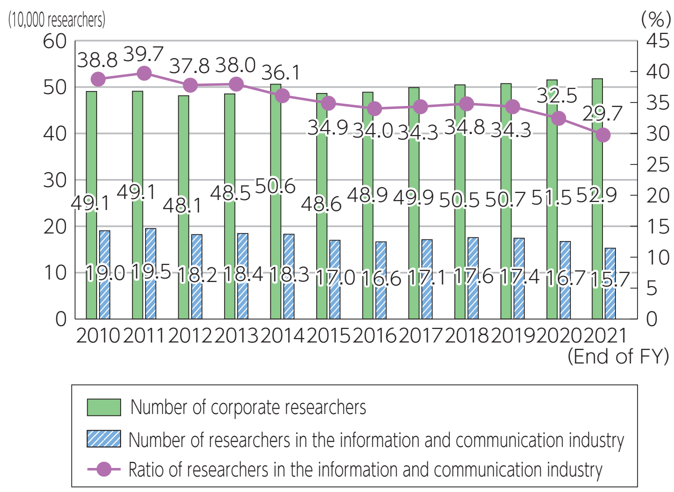
(Source) Prepared based on the MIC "Science and Technology Research Survey" for each fiscal year

22. Changes in research expenses in the information and communications sector



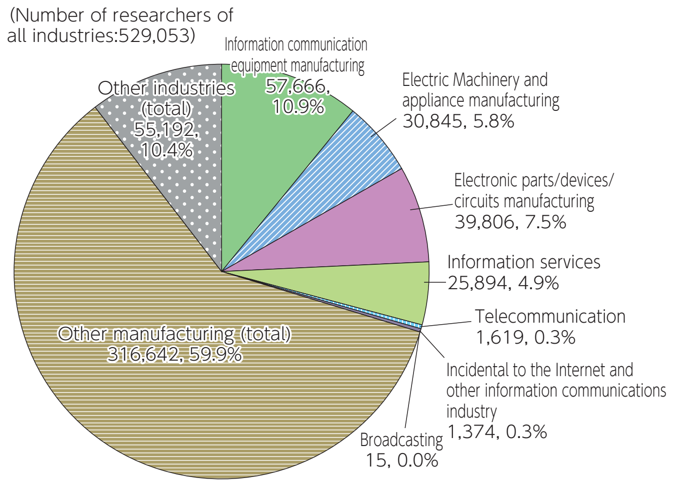
(Source) Prepared from MIC, annual "Survey of Science and Technology Research"
https://www.stat.go.jp/data/kagaku/index.html

23. Changes in the number of researchers at companies (Figure4-1-5-3 in White Paper)



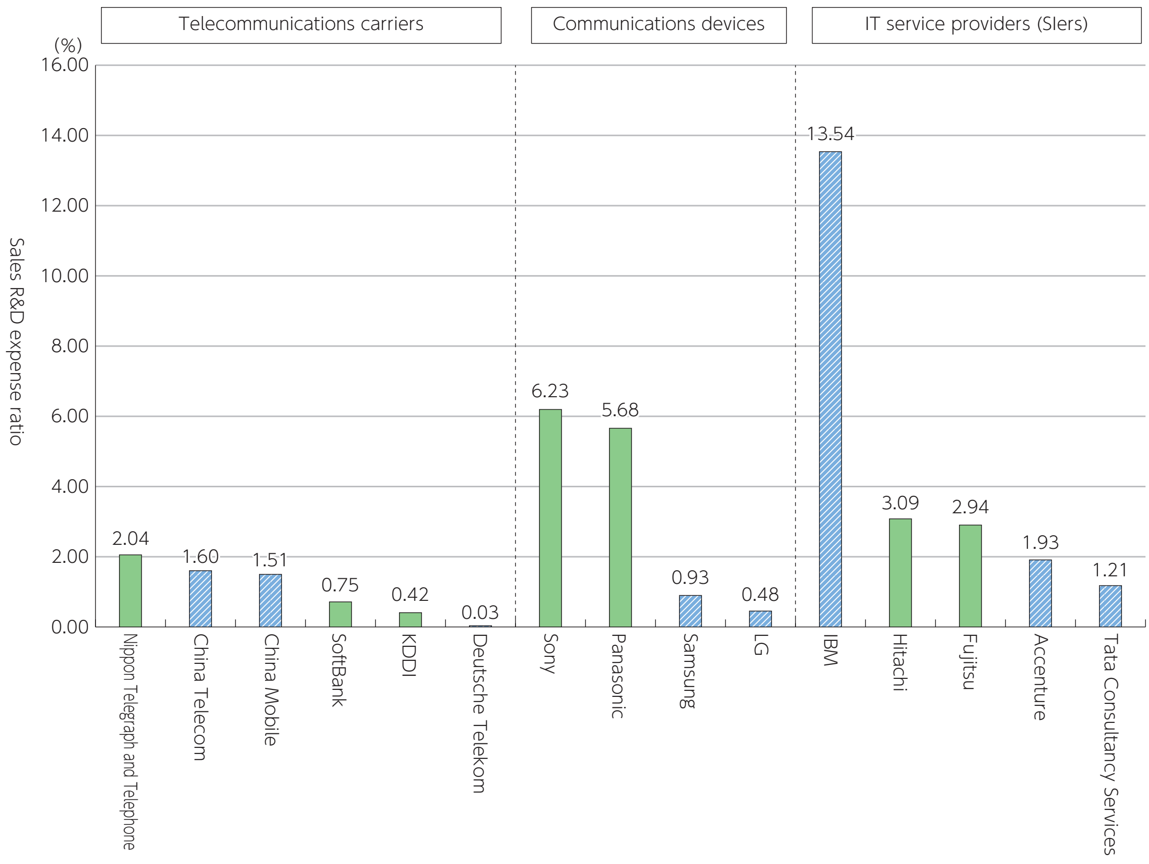
(Source) Prepared based on the MIC "Science and Technology Research Survey" for each fiscal year

24. Percentages of the number of researchers at companies by industry (as of March 31, 2022)



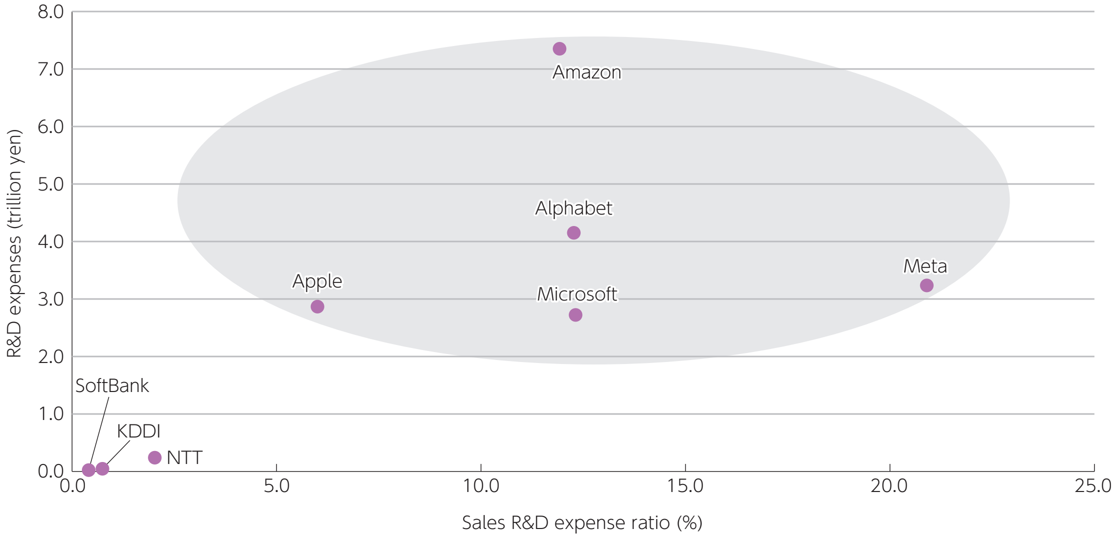
(Source) Prepared based on the MIC "2022 Science and Technology Research Survey"

25. Comparison of research and development expenditures by telecommunications carriers, communications devices and IT service providers (2021) (Figure4-1-5-5 in White Paper)



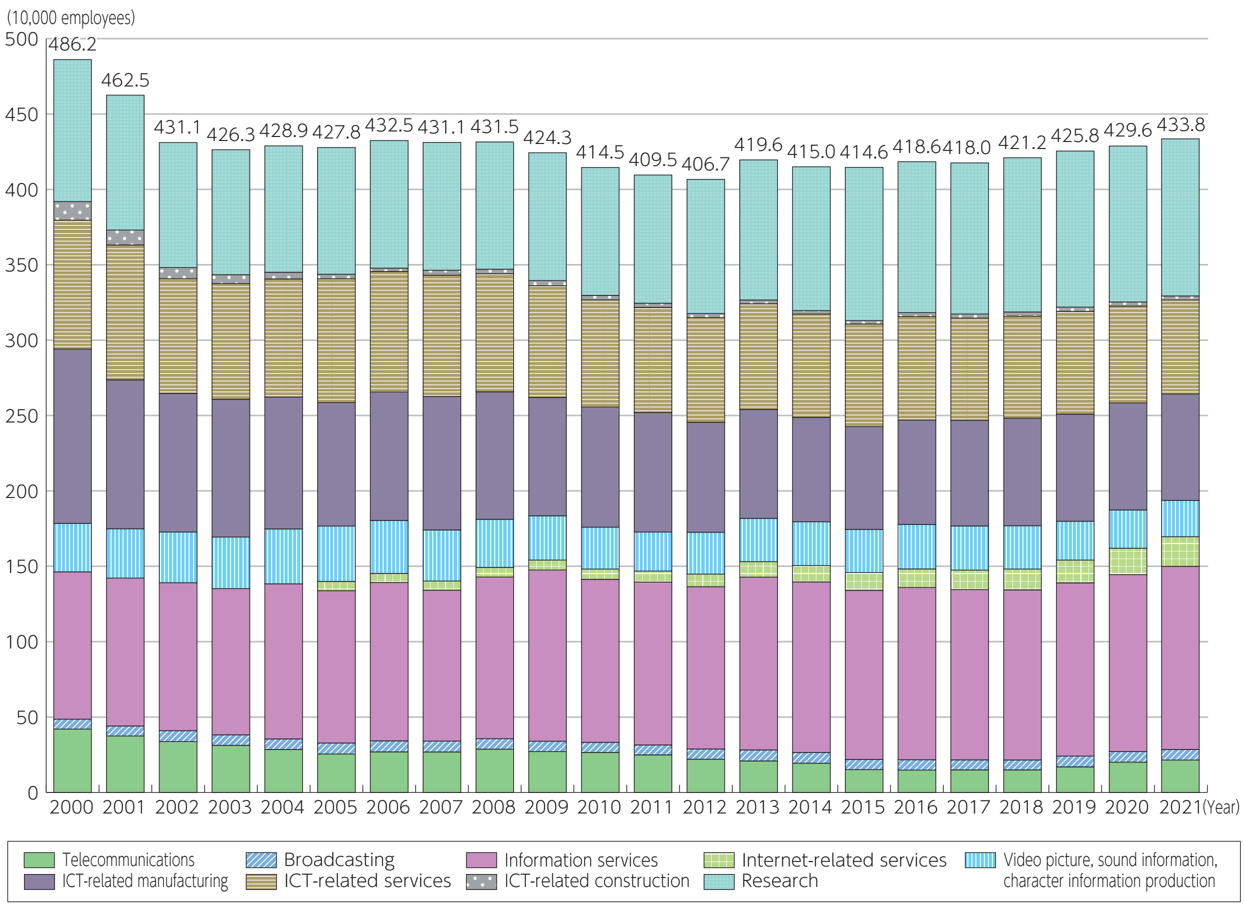
(Source) Prepared based on the annual reports released by companies

26. Comparison of research and development expenditures between major Japanese companies and GAFAM (2021) (Figure4-1-5-6 in White Paper)



(Source) Prepared based on the annual reports released by companies

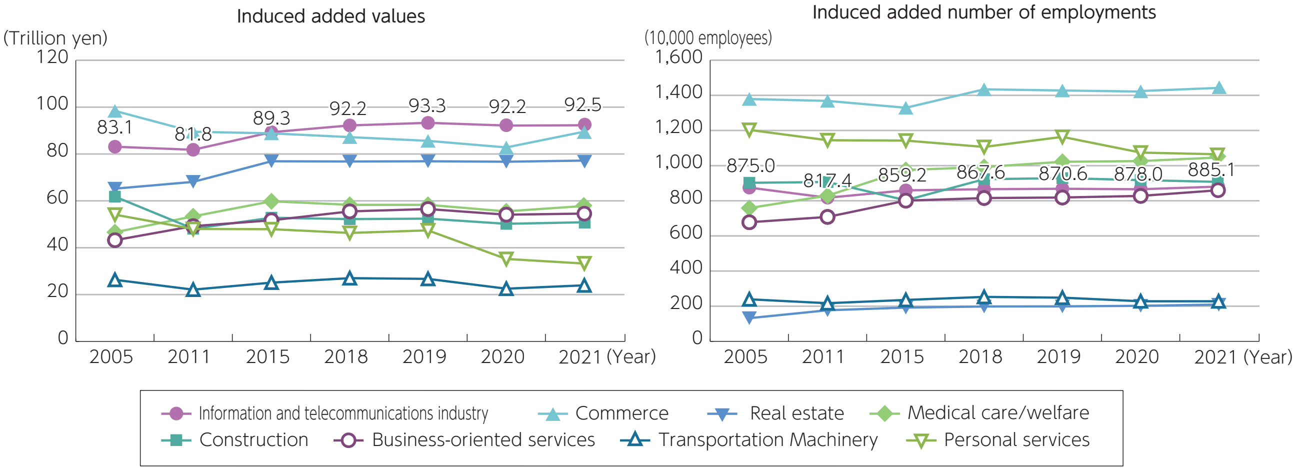
27. Changes in the number of employees of the information and communication industry



* For the details of the values, see Data 6 of the Appendix.

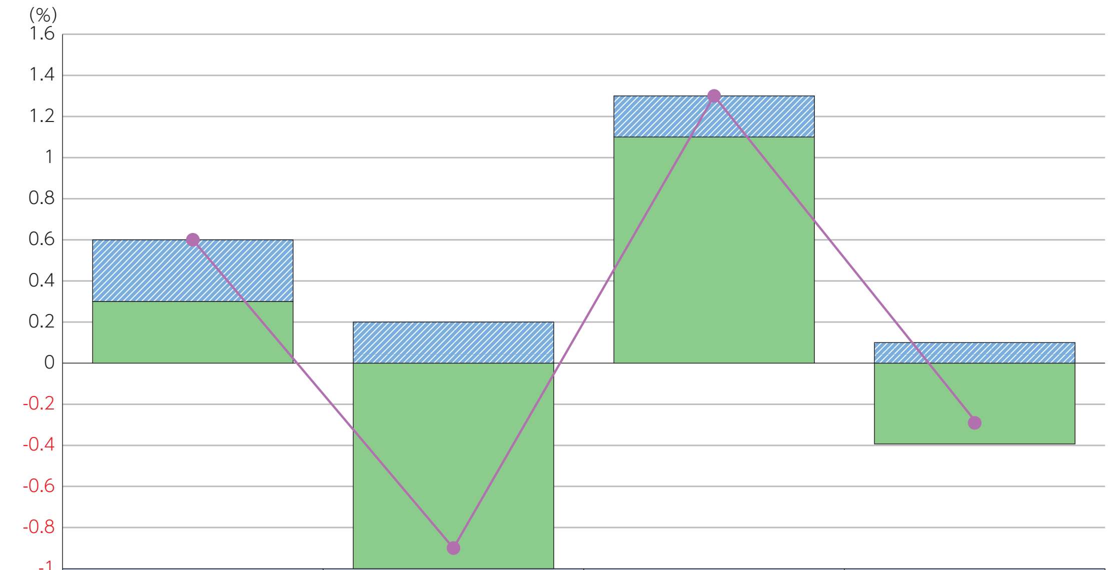
(Source) MIC (2023), "Fiscal 2022 Survey on economic analysis of ICT"

28. Changes in the economic ripple effects (induced added values and number of employments) of production activities of major industry sectors



(Source) MIC (2023), "Fiscal 2022 Survey on economic analysis of ICT"

29. Contribution of the information and communications industry to the real GDP growth rate

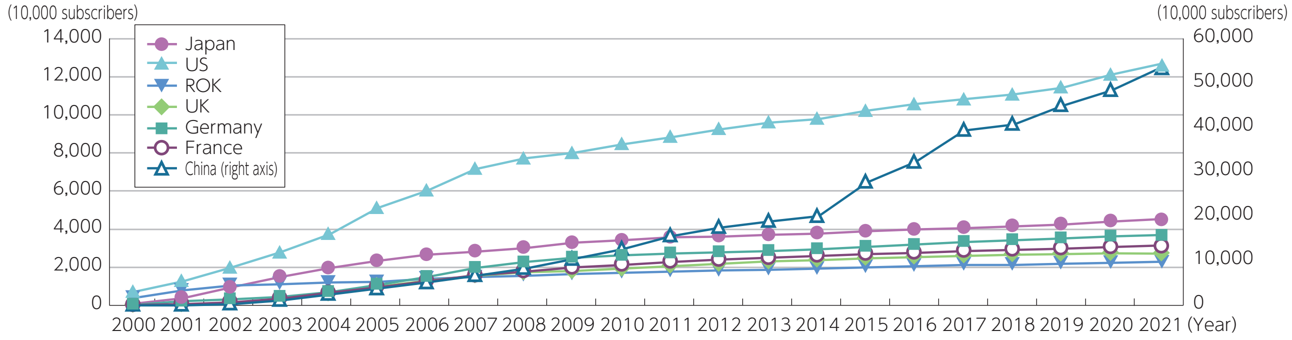


	2000 to 2005 (annual average)	2005 to 2010 (annual average)	2010 to 2015 (annual average)	2015 to 2021 (annual average)
Information and communications industry	0.3	0.2	0.2	0.1
Other industries	0.3	-1.0	1.1	-0.4
All industries	0.6	-0.9	1.3	-0.3

(Source) MIC (2023), "Fiscal 2022 Survey on economic analysis of ICT"

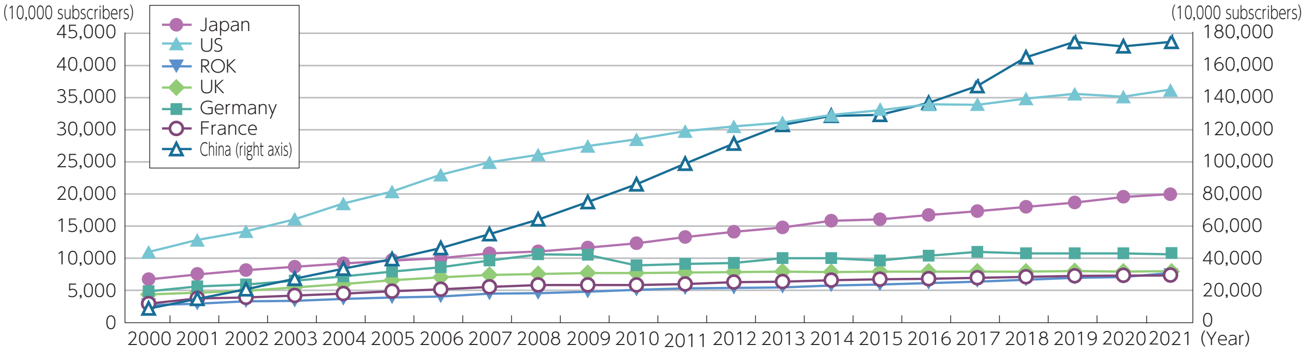
Section 2

1. Changes in fixed broadband service subscriptions in major countries (Figure4-2-1-1 in White Paper)



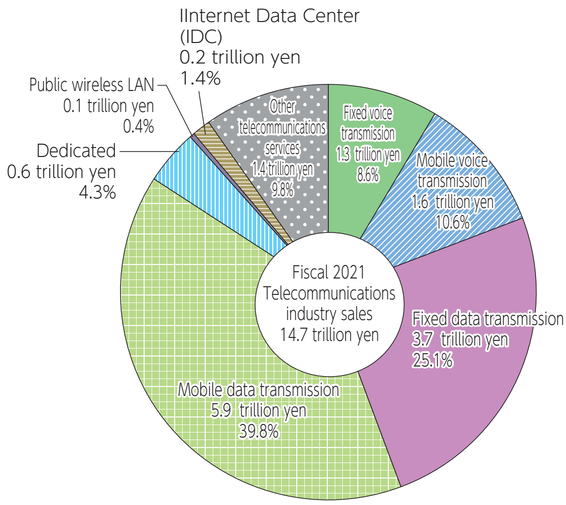
(Source) ITU

2. Changes in the number of mobile phone subscriptions in major countries (Figure4-2-1-2 in White Paper)



(Source) ITU

3. Composition of sales in the telecommunications industry (Figure4-2-2-1 in White Paper)



* 1 Fixed voice transmission is the sum of domestic and international services.
* 2 Fixed data transmission includes sales through Internet access (ISP, FTTH, etc.), IP-VPN, and wide area Ethernet.

(Source) Prepared based on the MIC "Basic Survey on the Information and Communications Industry"

4. Changes in the number of telecommunications carriers (Figure4-2-2-2 in White Paper)

End of FY	2015	2016	2017	2018	2019	2020	2021	2022
Number of telecommunication carriers	17,519	18,177	19,079	19,818	20,947	21,913	23,111	24,272

(Source) Information and Communications Statistics Database

5. State of preparation of optical fiber as of March 31, 2022 (estimated) (Figure4-2-2-3 in White Paper)

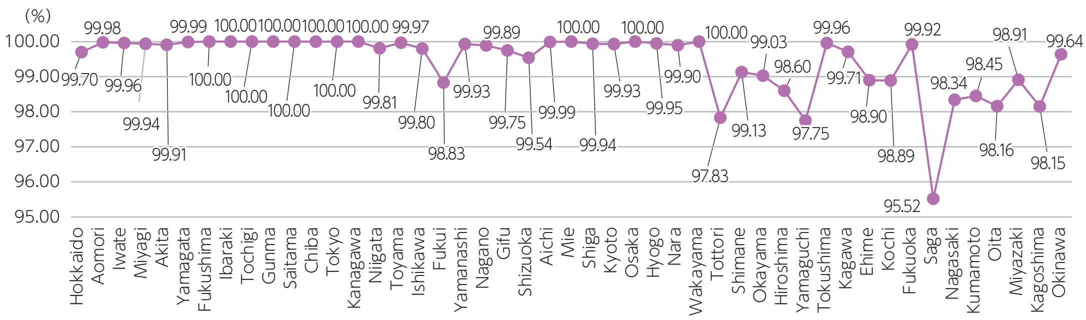
Nationwide development rate of optical fiber

End of March 2022 **99.72%**

(160,000 households are in undeveloped areas)

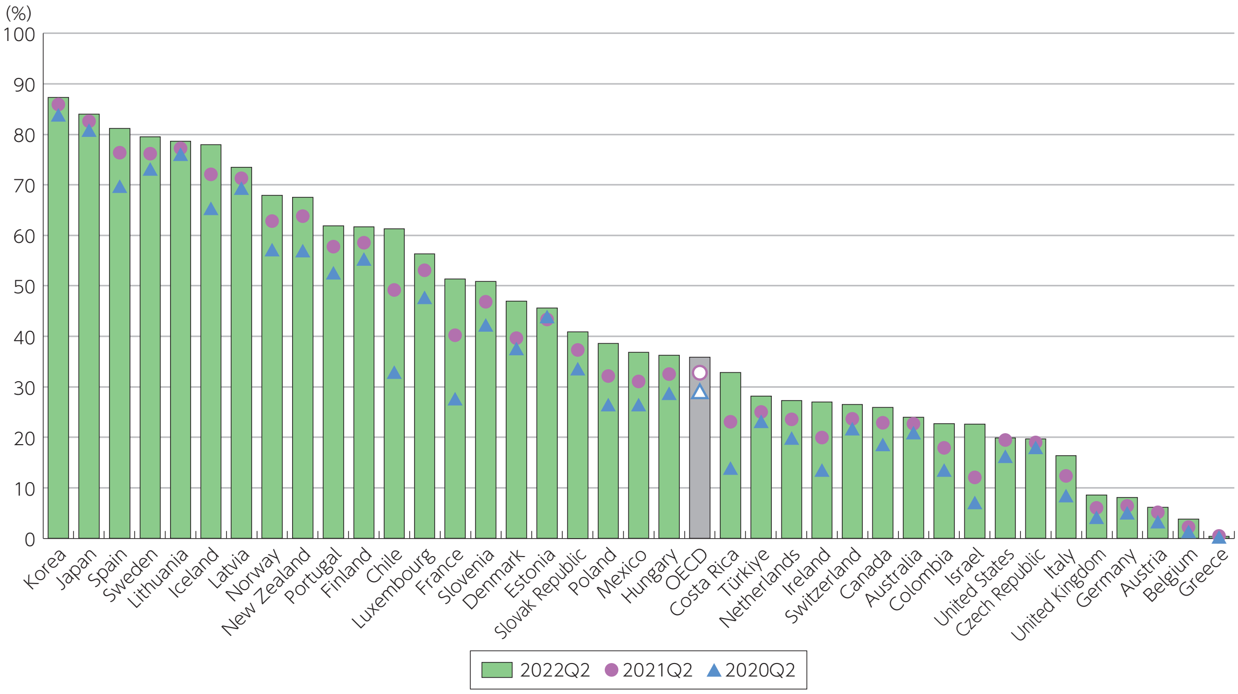
*Based on the basic resident register, etc., the number of the households that can use optical fiber in the areas as estimated based on carrier information on a certain assumption was divided by the number of total households (rounded off to two decimal places).

Development rate of optical fiber by prefecture



(Source) MIC "Survey on Broadband Infrastructure Coverage Rate at End of Fiscal 2021"

6. Percentage of optical fiber in fixed broadband in OECD member countries



(Source) OECD Broadband statistics. 1.10. Percentage of fiber connections in total fixed broadband, June 2022

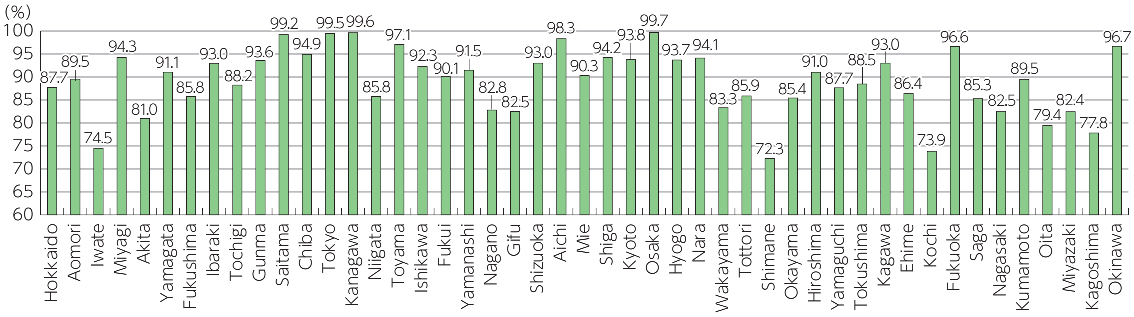
7. Japan's 5G coverage as percentage of population (as of end of March 2022) (Figure4-2-2-4 in White Paper)

National 5G population coverage (end of March 2022)

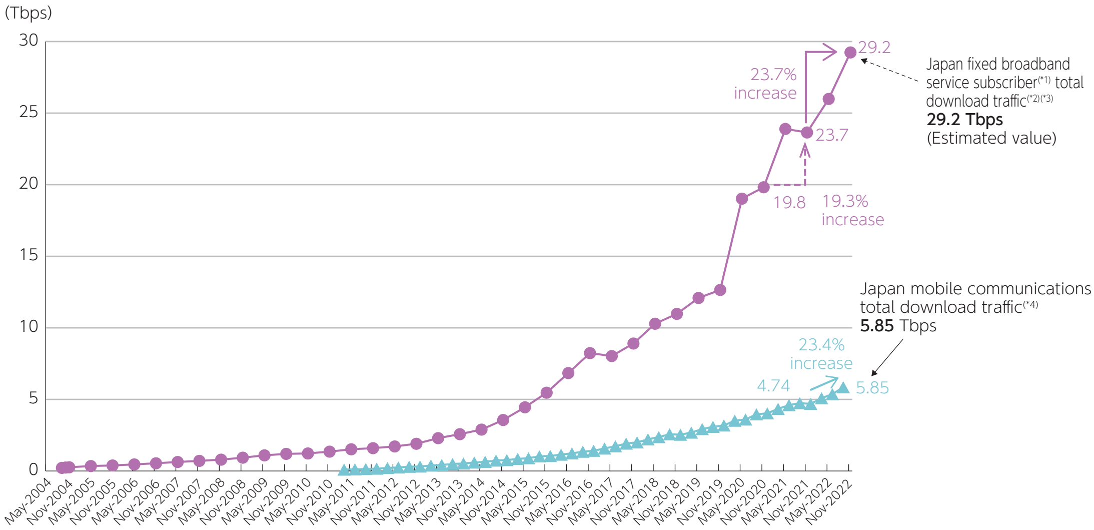
93.2%

* Combined figures of area coverage of four mobile carriers
Rounded to two decimal places

5G population coverage by prefecture (end of March 2022)



8. Changes in Internet traffic (fixed systems, mobile systems, download traffic) (Figure4-2-2-5 in White Paper)



* 1 Services for individuals (FTTH, DSL, CATV, FWA) (including some corporations)
* 2 Prior to May 2011, this also includes some mobile communications traffic to and from mobile phone networks.
* 3 Since May 2017, the number of cooperating ISPs increased from five to nine, resulting in discontinuities due to aggregated and estimated values based on information from the nine ISPs.
* 4 From "MIC Current State of Mobile Communications Traffic in Japan (Sept. 2022)" (measured in March, June, Sept., and Dec.)

(Source) MIC (2023) "Results of Aggregating Internet Traffic in Japan (for November 2022)"

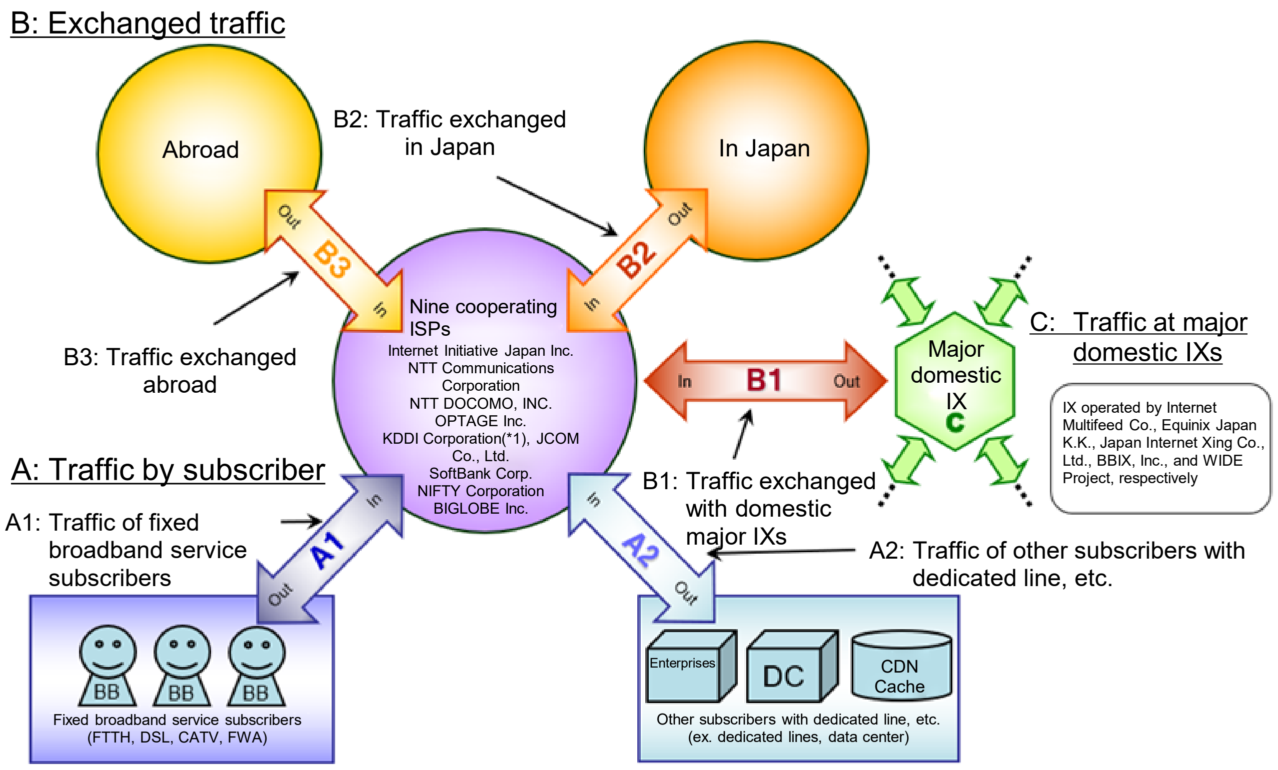
9. Totalization and trial calculation of internet traffic in Japan*1*2

Totalization and estimates of traffic

Year	Month	Total traffic of broadband service subscribers in Japan (estimates) [Gbps] *3		Traffic per broadband service subscriber (estimates) [kbps]		(A1) Traffic of broadband service subscribers (FTTH, DSL, CATV, FWA) [Gbps]		(A2) Traffic of other subscribers (ex. dedicated line, data center) [Gbps]		(B1) Traffic exchanged among major domestic IX and cooperating nine ISPs [Gbps]		(B2) Traffic exchanged between domestic ISPs and nine cooperating ISPs without mediation of IX [Gbps]		(B3) Traffic exchanged between domestic ISPs and nine cooperating ISPs [Gbps]		(X) Share of nine cooperating ISPs (calculated based on the number of contracts) *4
		In	out	in	out	in	out	in	out	in	out	in	out	in	out	
2020	May	2,321	19,025	56.1	460.2	1,534.3	12,575.6	2,968.1	2,420.1	1,610.7	328.6	10,065.5	1,353.3	2,945.8	724.5	66.10%
	November	2,373	19,821	56.2	469.4	1,542.7	12,885.5	2,787.3	2,552.4	1,502.0	290.5	9,380.0	1,535.1	2,603.5	593.5	65.01%
2021	May	2,781	23,899	64.8	556.8	1,776.4	15,264.6	3,226.4	3,084.7	1,881.8	584.3	12,454.5	1,651.1	2,946.1	715.6	63.87%
	November	2,816	23,650	64.7	543.2	1,772.3	14,885.5	3,590.7	3,147.5	2,078.7	631.9	12,906.8	1,654.0	2,518.9	820.7	62.94%
2022	May	3,088	25,993	70.8	595.7	1,922.1	16,180.7	3,850.4	3,530.7	2,299.0	677.7	14,178.9	1,687.8	2,492.9	914.1	62.25%
	November	3,251	29,241	73.2	658.2	1,973.2	17,749.1	4,039.4	3,827.9	2,616.8	707.7	15,662.5	1,952.6	2,687.0	939.1	60.70%

* 1 In "Total traffic of broadband service subscribers in Japan (estimates)", "Traffic per broadband service subscriber (estimates)", A1 and A2, "in" corresponds to "upload" while "out" corresponds to "download".
* 2 Aggregate and estimated values of nine cooperating ISPs (Internet Initiative Japan Inc. (IIJ), NTT Communications Corporation, NTT DOCOMO, INC. (formerly NTT Plala), OPTAGE Inc., KDDI Corporation, JCOM Co., Ltd., SoftBank Corp., NIFTY Corporation, and BIGLOBE Inc.).
* 3 Total traffic of broadband service subscribers in Japan (estimates) is calculated based on the traffic of broadband subscribers of nine cooperating ISPs (A1) and their share of subscribers (X).
* 4 Estimation by linear interpolation based on the "publication of quarterly data on the number and share of telecommunication service contracts"

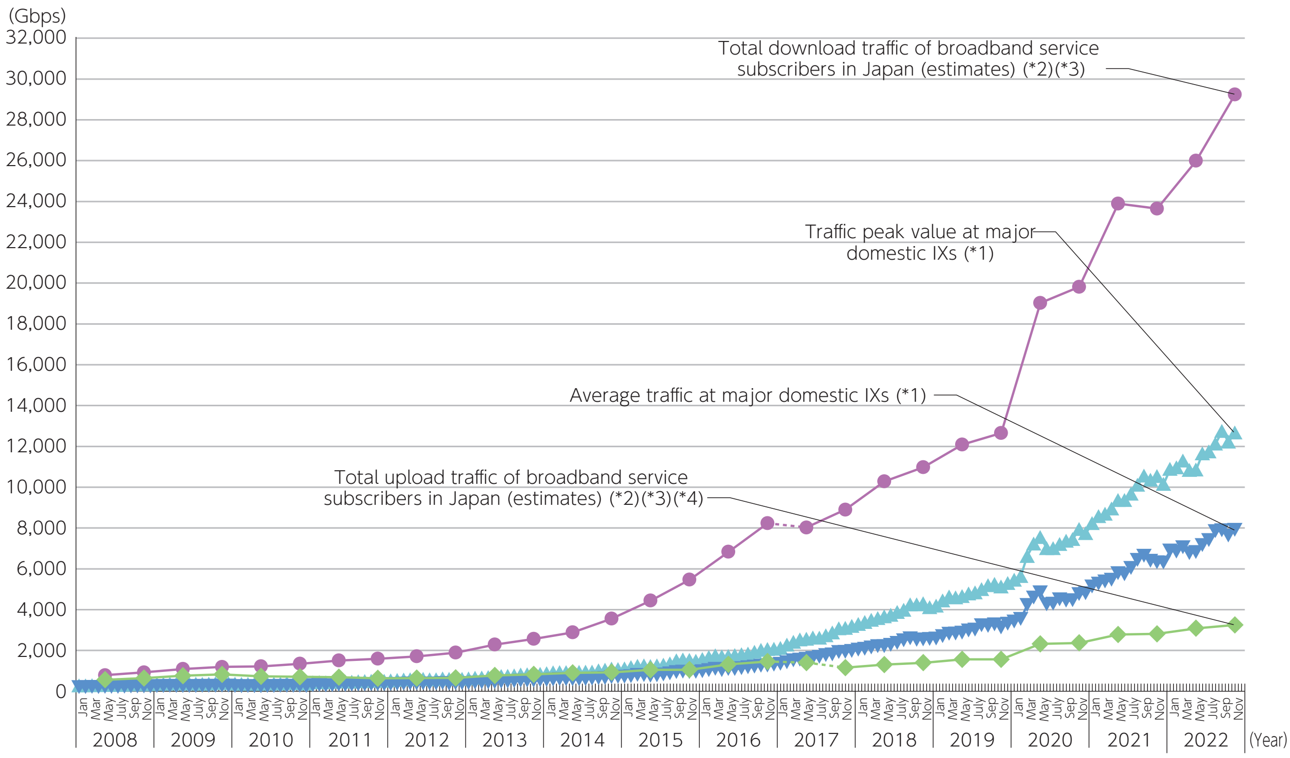
Type of aggregated traffic (Related to fixed broadband services)



(*1) Traffic and contract count data of former NTT Plala from NTT DOCOMO, INC.

(Source) Prepared from MIC, "Aggregation result of Internet Traffic in Japan - release of the aggregation result in November 2022"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000210.html

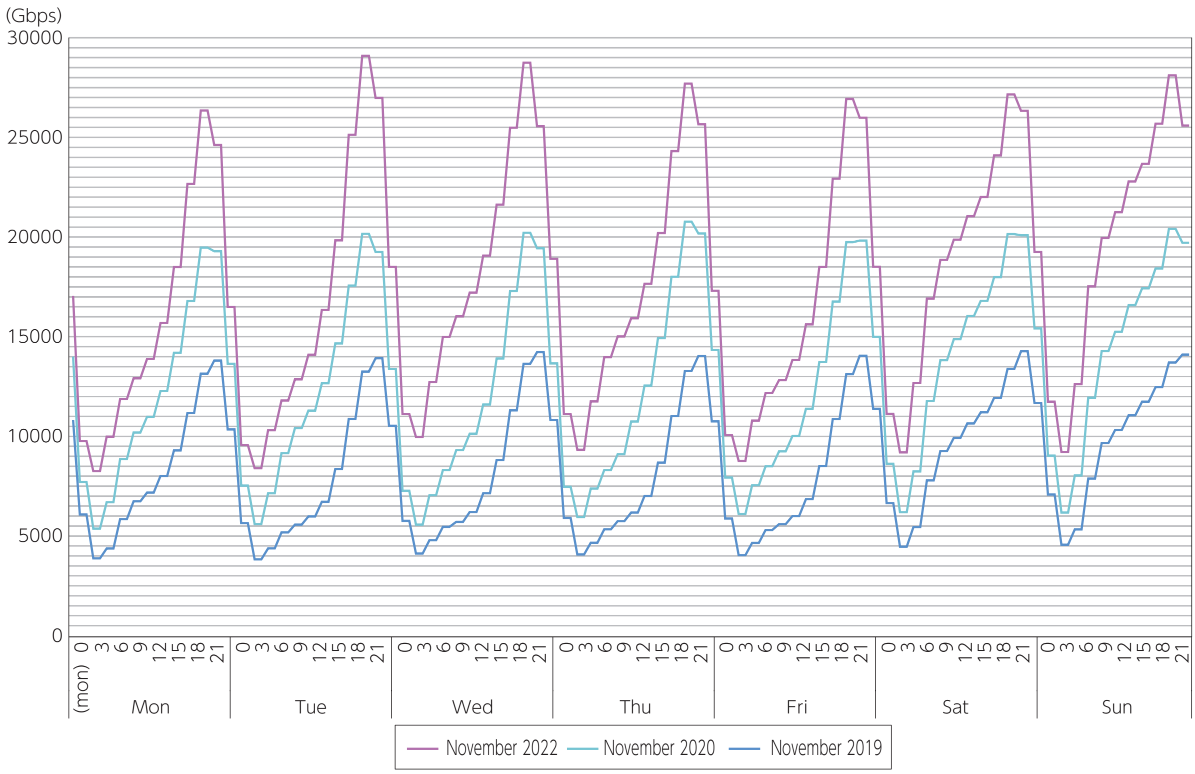
10. Changes in the internet traffic in Japan



* 1 Before December 2010: traffic at three major IXs (WIDE Project (NSPIXP),) Japan Internet Exchange Co. (JPIX) and Internet Multifeed Co. (JPNAP)); In January 2011 and after: traffic at three IXs above plus additional two IXs (BBIX Inc. and Equinix Japan K.K.)
* 2 Before May 2011, a part of mobile communication traffic with mobile telephone network was included in the traffic between some cooperating ISPs and broadband service subscribers. Because exclusion of the traffic concerned from calculation became possible, traffic has been aggregated and calculated without the traffic concerned since November 2011.
* 3 Data is discontinuous because number of cooperating ISPs increased from 5 to 9 in May 2017 and total values and estimates have been based on the nine ISPs since then.
* 4 Data is discontinuous due to a review of measurement method by some of the cooperating business operators during the period from May to November 2017.

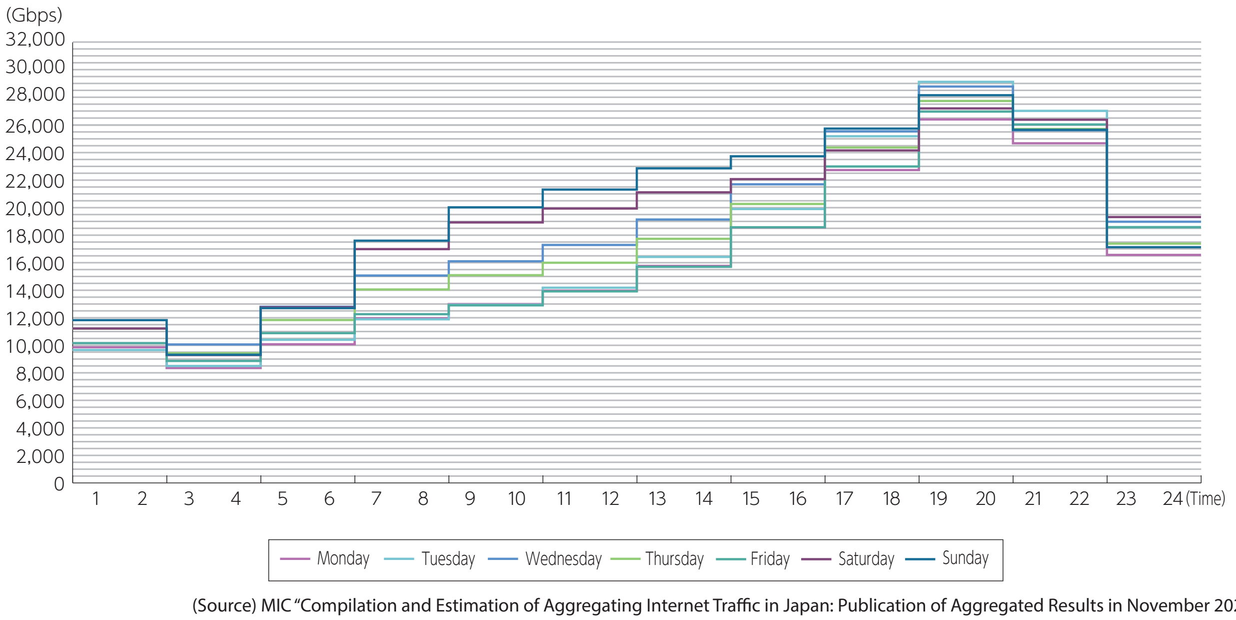
(Source) Prepared from MIC, "Aggregation result of Internet Traffic in Japan (release of the aggregation result in November 2021)"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000210.html

11. Changes in download traffic of broadband subscribers with nine ISPs



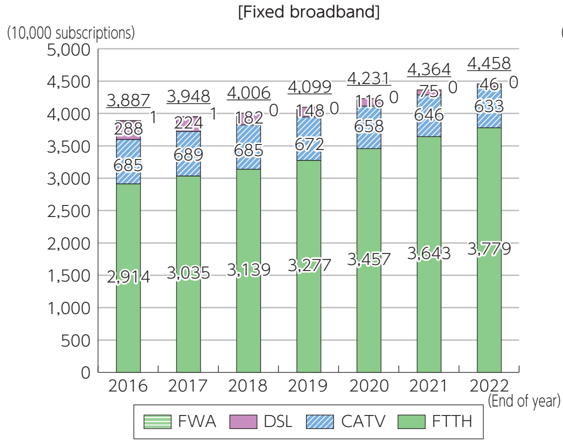
(Source) Prepared from MIC, "Aggregation result of Internet Traffic in Japan (release of the aggregation result in November 2022)"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000210.html

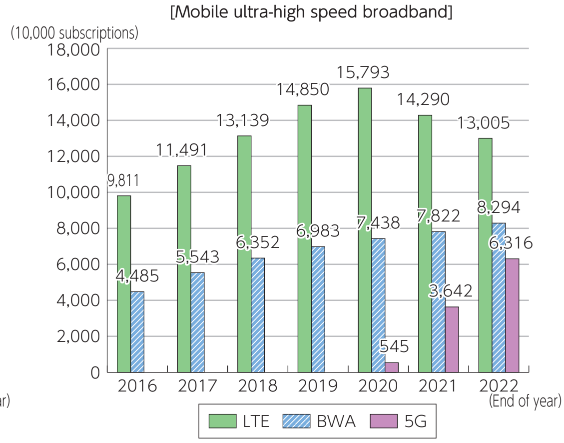
12. Changes in traffic of broadband subscribers with nine ISPs by day of week



(Source) MIC "Compilation and Estimation of Aggregating Internet Traffic in Japan: Publication of Aggregated Results in November 2022"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000210.html

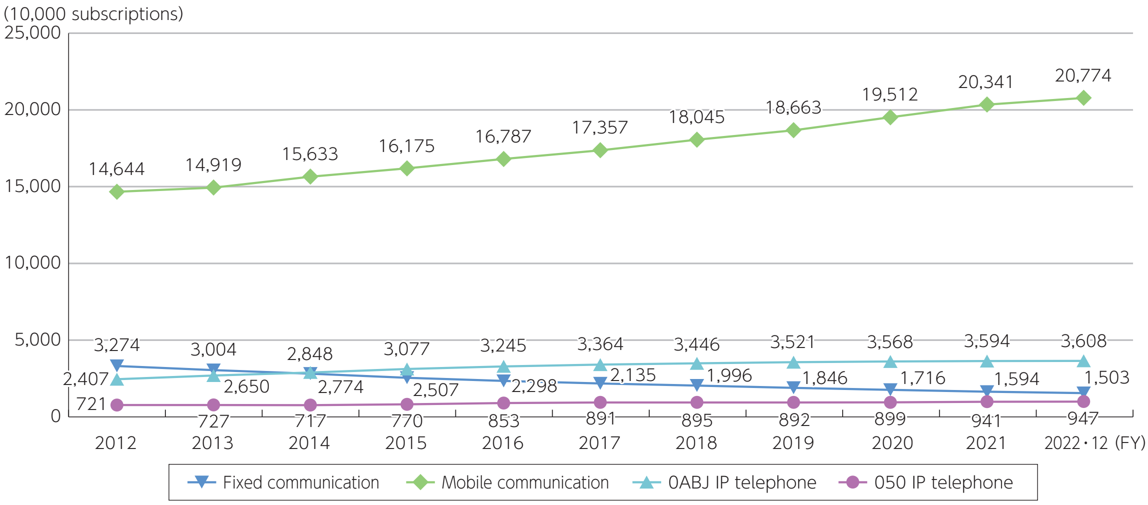
13. Changes in the number of broadband subscriptions (Figure4-2-2-6 in White Paper)





* The figures for the past differ from those published last year due to revisions in business operator reports.
(Source) Prepared based on the MIC "Quarterly data on the number and share of subscriptions to telecommunications services (Fiscal 2022 Q3 (End of December))"

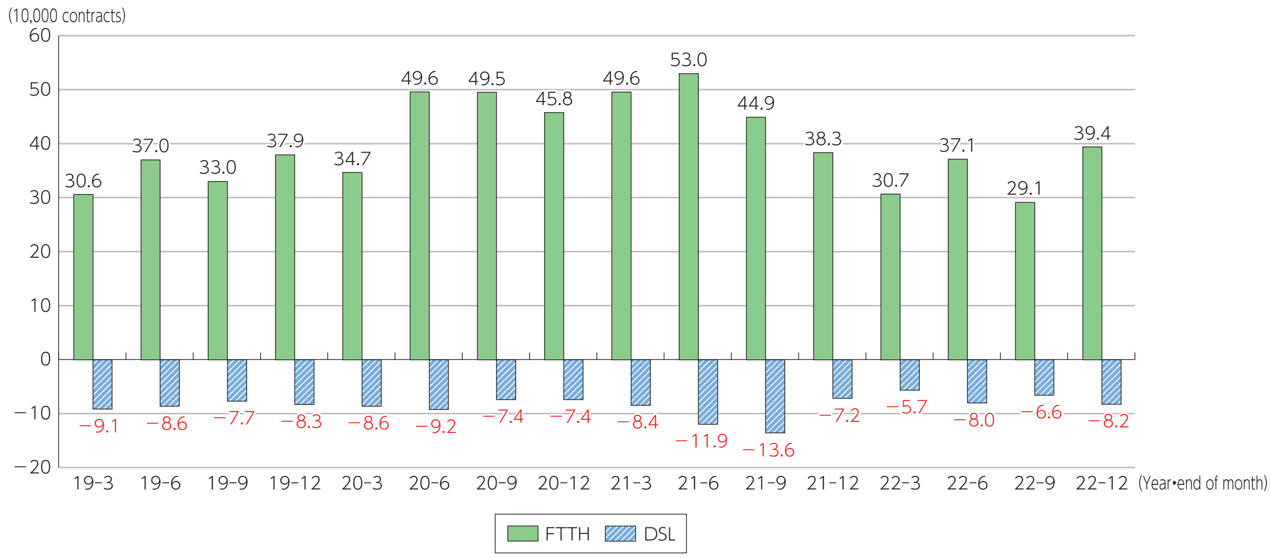
14. Changes in the number of subscriptions to voice communications services (Figure4-2-2-7 in White Paper)



* 1 For fiscal 2022, data up to the end of December was used, so care must be taken when comparing over time.
* 2 Mobile communications is the sum of mobile phones, PHS, and BWA.
* 3 For mobile communications since fiscal 2013, figures are adjusted for intra-group transactions. Adjusted for intragroup transactions means when an MNO receives mobile phone and BWA services as an MVNO from another MNO in the same group and then provides them together with their own services on a single mobile phone, etc., the contracts are counted as one contract instead of two contracts.

(Source) Prepared based on the MIC "Publication of quarterly data on the number and share of subscriptions to telecommunications services (Fiscal 2022 Q3 (End of December))"

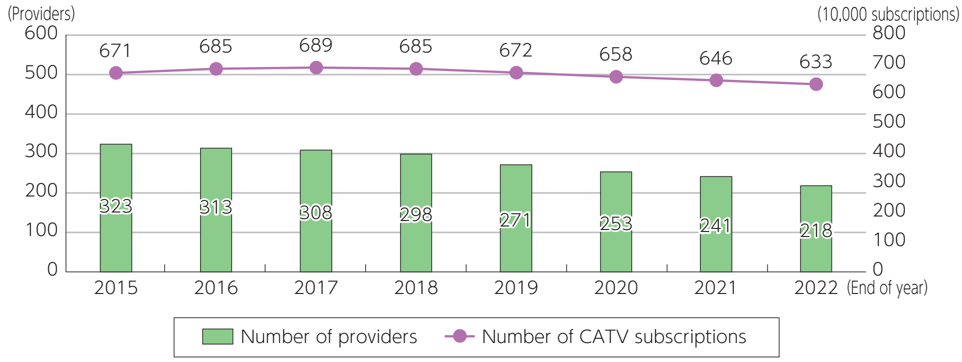
15. Changes in net increase of FTTH and DSL contracts (compared with the end of the previous quarter)



* Past values are different from the past published values due to correction of the report by the business operators.

(Source) Prepared from MIC, "Quarterly data on the number of subscribers and the market share of telecommunications services (the 3rd quarter of fiscal 2022 (at the end of December))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000215.htm

16. Changes in the number of CATV providers and subscriptions



(Source) Prepared from MIC (2022), "Quarterly data on the number of subscribers and the market share of telecommunications services (the 3rd quarter of fiscal 2022 (at the end of December))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000215.html

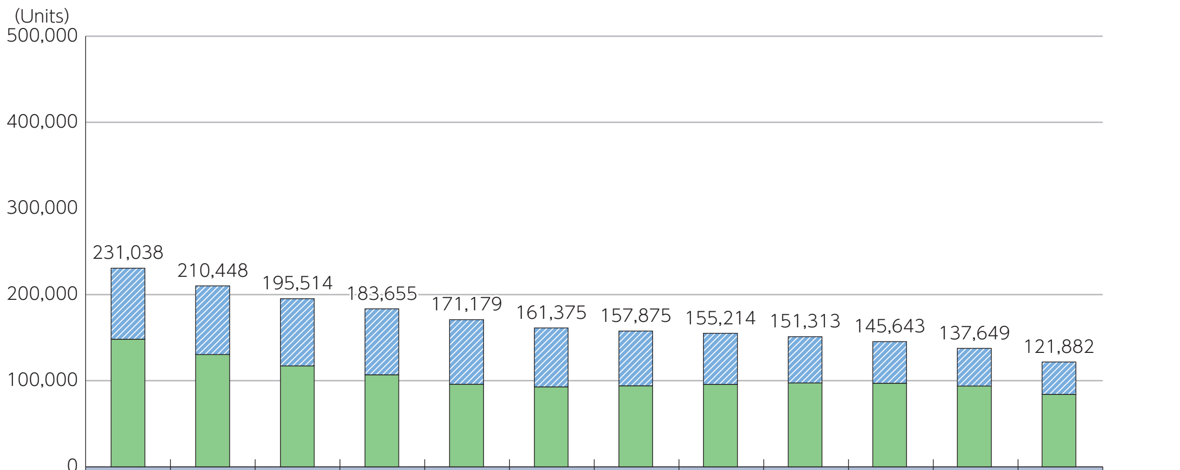
17. Changes in the number of subscribers with fixed telephone

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022・12
NTT East/West subscribed telephone (including ISDN)	3,135	2,847	2,610	2,411	2,250	2,114	1,969	1,834	1,693	1,573	1,460	1,375
0ABJ IP telephone	2,096	2,407	2,650	2,848	3,077	3,245	3,364	3,446	3,521	3,568	3,594	3,608
CATV telephone	75	70	63	55	44	12	0	0	0	0	0	0
Chokushu (dedicated line) telephone	386	357	331	308	214	172	166	162	153	143	134	128
Total	5,691	5,681	5,654	5,621	5,585	5,544	5,500	5,442	5,367	5,284	5,188	5,111

* For fiscal 2022, data up to the end of December was used, so care must be taken when comparing over time.

(Source) Prepared from MIC (2022), "Quarterly data on the number of subscribers and the market share of telecommunications services (the 3rd quarter of fiscal 2022 (at the end of December))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000215.html

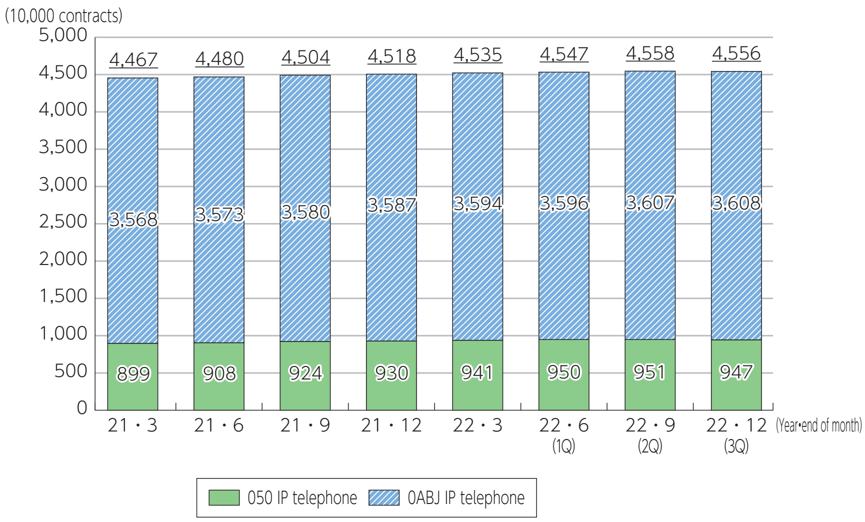
18. Changes in the composition of public telephone facilities of NTT East/West



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Digital	82,678	79,919	78,179	76,755	75,149	68,546	63,751	59,437	53,831	48,574	43,710	37,683
Analog	148,360	130,529	117,335	106,900	96,030	92,829	94,124	95,777	97,482	97,069	93,939	84,199
Total	231,038	210,448	195,514	183,655	171,179	161,375	157,875	155,214	151,313	145,643	137,649	121,882

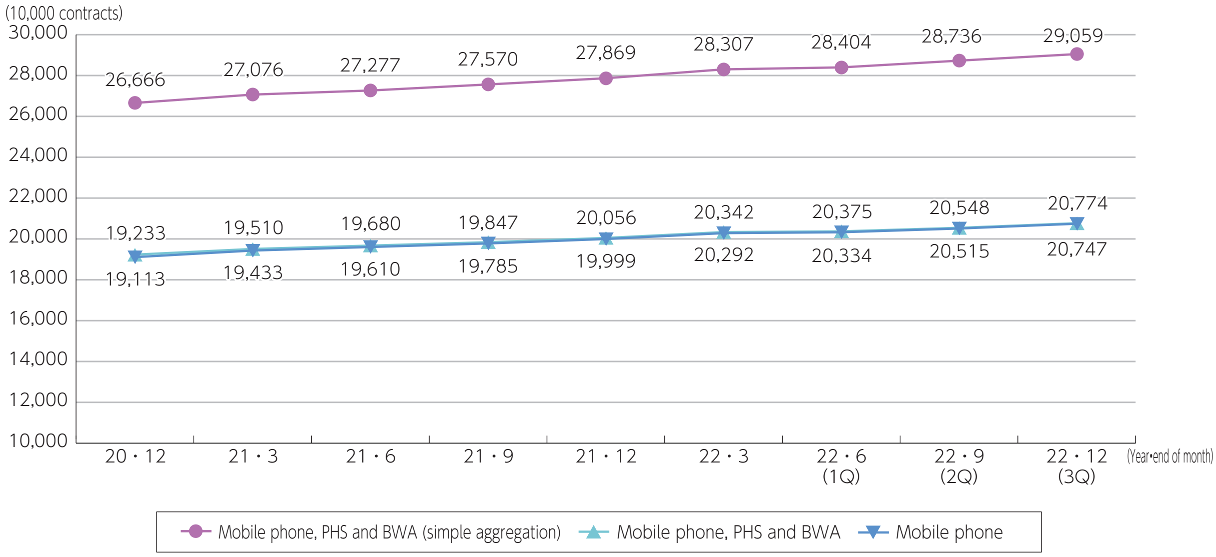
(Source) Prepared from materials of NTT East/West

19. Usage status of IP telephone



(Source) Prepared from MIC (2023), "Quarterly data on the number of subscribers and the market share of telecommunications services (the 3rd quarter of fiscal 2022 (at the end of December))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000215.html

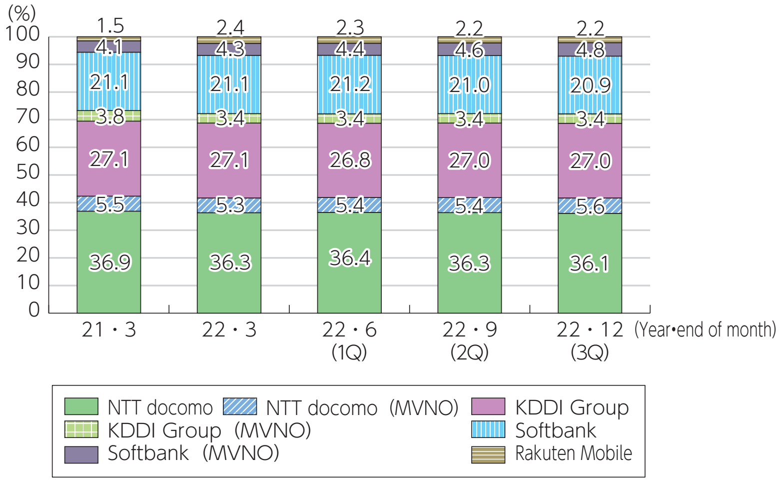
20. Changes in the number of mobile communication contracts



* Unless otherwise stated, the figures for the number of contracts have been adjusted for intra-group transactions. Items indicated as "simple aggregation" are figures that have not been adjusted for intra-group transactions.
"Adjusted for intragroup transactions" means when an MNO receives mobile phone and BWA services as an MVNO from another MNO in the same group and then provides them together with their own services on a single mobile phone, etc., the contracts are counted as one contract instead of two contracts. Counted as one contract.
Past values are different from the values published last year due to correction of the report by the business operators.

(Source) Prepared from MIC (2023), "Quarterly data on the number of subscribers and the market share of telecommunications services (the 3rd quarter of fiscal 2022 (at the end of December))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000215.html

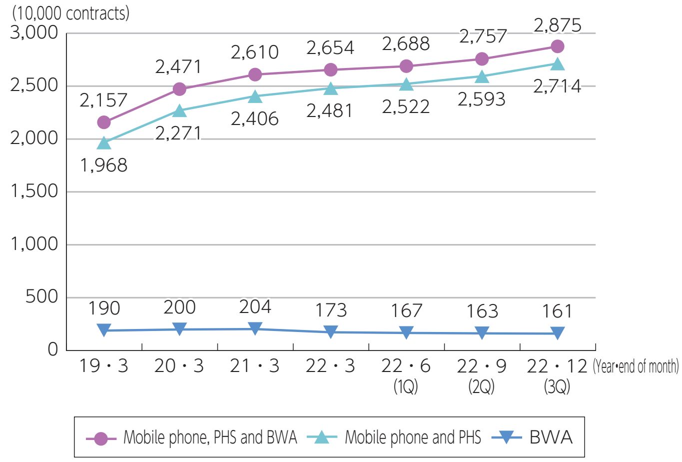
21. Changes in share of mobile communications subscriptions (adjusted for intra-group transactions) by business operator (Figure4-2-2-8 in White Paper)



* 1 Adjusted for intragroup transactions means when an MNO receives mobile phone and BWA services as an MVNO from another MNO in the same group and then provides them together with their own services on a single mobile phone, etc., the contracts are counted as one contract instead of two contracts.
* 2 The share of the KDDI Group includes KDDI, Okinawa Cellular and UQ Communications.
* 3 The share of MVNOs is calculated by MNO group that provides services and is indicated by the supplementary note (MVNO) after the name of the MNO group.
* 4 Rakuten Mobile's share as an MNO. MVNO services provided by Rakuten Mobile are included in NTT DOCOMO (MVNOs) and KDDI Group (MVNOs).

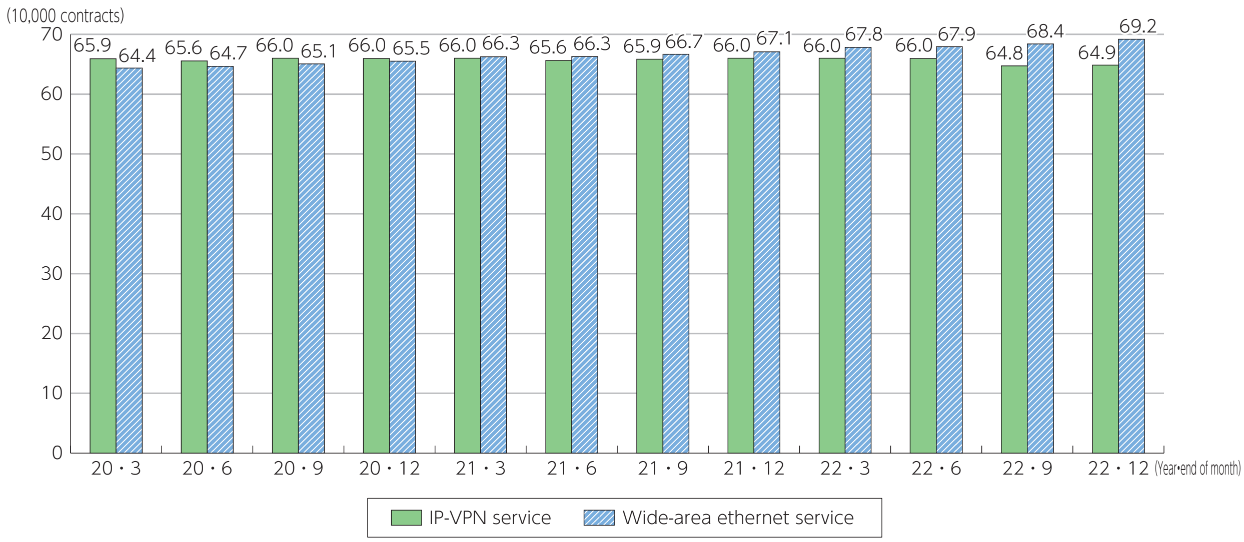
(Source) Prepared based on the MIC "Publication of quarterly data on the number and share of subscriptions to telecommunications services (Fiscal 2022 Q3 (End of December))"

22. Changes in number of MVNO contracts (excluding MVNOs that are MNOs)



(Source) Prepared from MIC (2023), "Quarterly data on the number of subscribers and the market share of telecommunications services (the 3rd quarter of fiscal 2022 (at the end of December))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000215.html

23. Changes in the number of IP-VPN service and wide-area ethernet service contracts

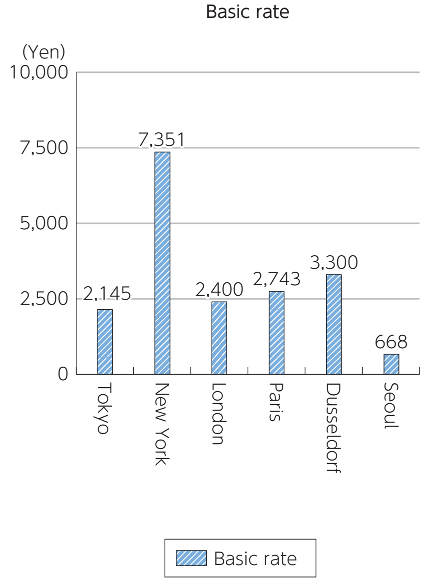


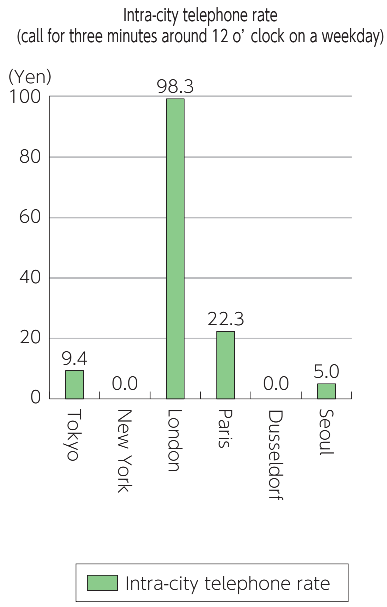
(Source) Past values are different from the values published last year due to correction of the report by the business operators.

24. International comparison of mobile phone charges by model (fiscal 2022)

(Source) MIC "FY2022 Survey on Domestic-Overseas Price Difference of Telecommunication Service"

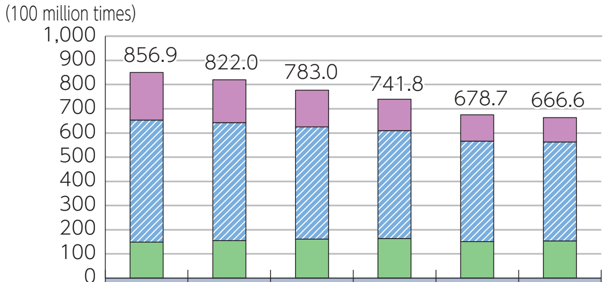
25. International comparison of fixed telephone charges based on individual charges (fiscal 2022)





(Source) MIC "FY2022 Survey on Domestic-Overseas Price Difference of Telecommunication Service"

26. Changes in communication frequency (by calling terminal)



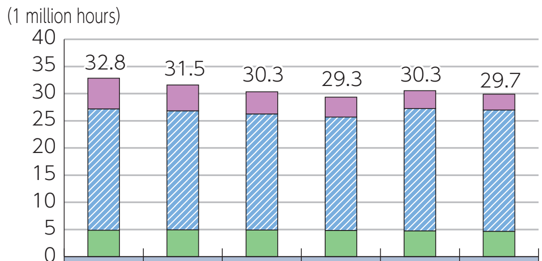
	2016	2017	2018	2019	2020	2021
Fixed	198.1	174.9	152.7	132.2	108.6	97.2
Mobile	503.9	486.1	466.3	445.3	416.5	412.4
IP telephone	154.9	160.9	164.0	164.3	153.5	157.0
Total frequency	856.9	822.0	783.0	741.8	678.7	666.6

(FY)

* Mobile communication: from mobile phone/PHS; Fixed communication: from subscribed telephone, ISDN and public telephone

(Source) MIC, "Voice communication usage status in Japan based on the communication traffic volume (fiscal 2021)"
https://www.soumu.go.jp/menu_news/s-news/01kiban03_02000838.html

27. Changes in communication time (by calling terminal)



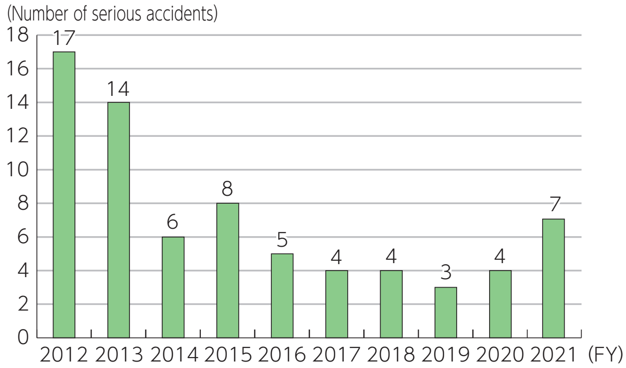
	2016	2017	2018	2019	2020	2021
Fixed	5.6	4.8	4.2	3.6	3.1	2.7
Mobile	22.3	21.8	21.3	20.9	22.5	22.4
IP telephone	4.9	4.9	4.8	4.7	4.7	4.6
Total communication time	32.8	31.5	30.3	29.3	30.3	29.7

(FY)

* 1 Mobile communication: from mobile phone/PHS; Fixed communication: from subscribed telephone, ISDN and public telephone
* 2 Unit is changed from "million hours" to "100 million hours" and values are rounded to the first decimal place. See the source for the values before rounding.

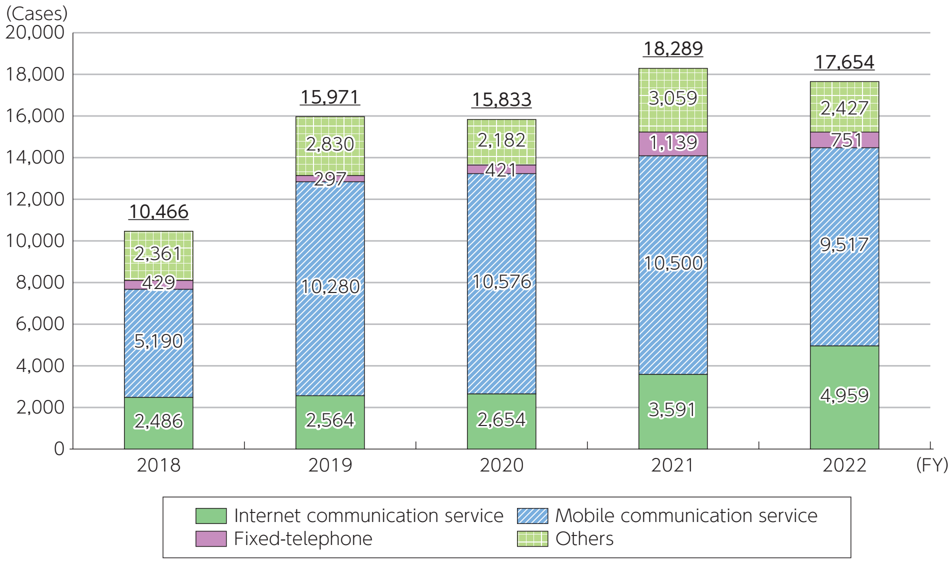
(Source) MIC, "Voice communication usage status in Japan based on the communication traffic volume (fiscal 2021)"
https://www.soumu.go.jp/menu_news/s-news/01kiban03_02000838.html

28. Changes in the number of serious accidents (Figure4-2-2-9 in White Paper)



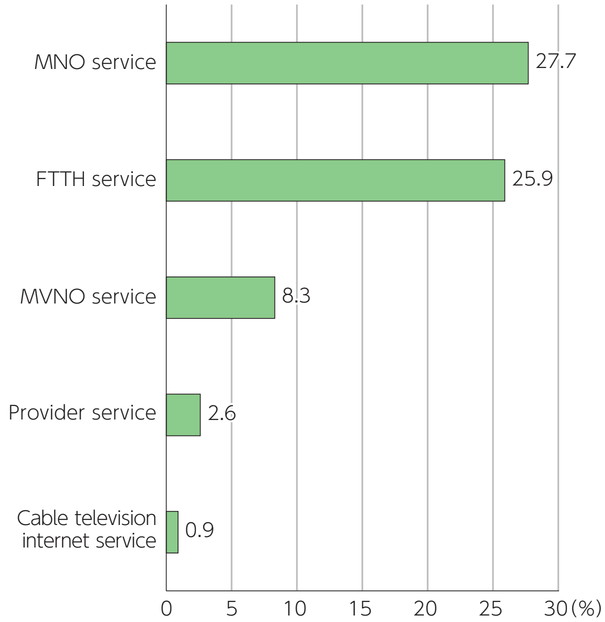
(Source) MIC "Accidents in Telecommunications Services (Fiscal 2021)"

29. Changes in the number of complaints and inquiries received by MIC (Figure4-2-2-10 in White Paper)



(Source) Created by MIC

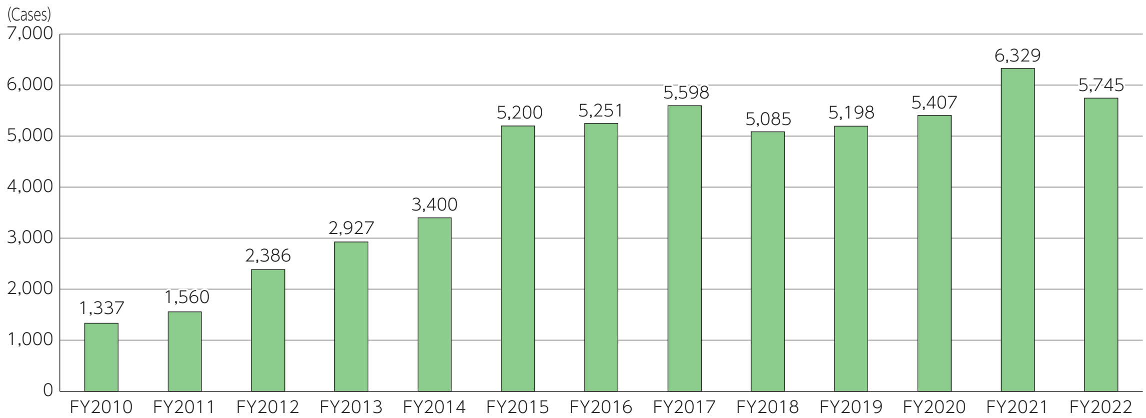
30. Breakdown of complaints and consultations received by consumer centers nationwide and the Ministry of Internal Affairs and Communications (random sample of those received between April 2022 and September 2022) (Figure4-2-2-11 in White Paper)



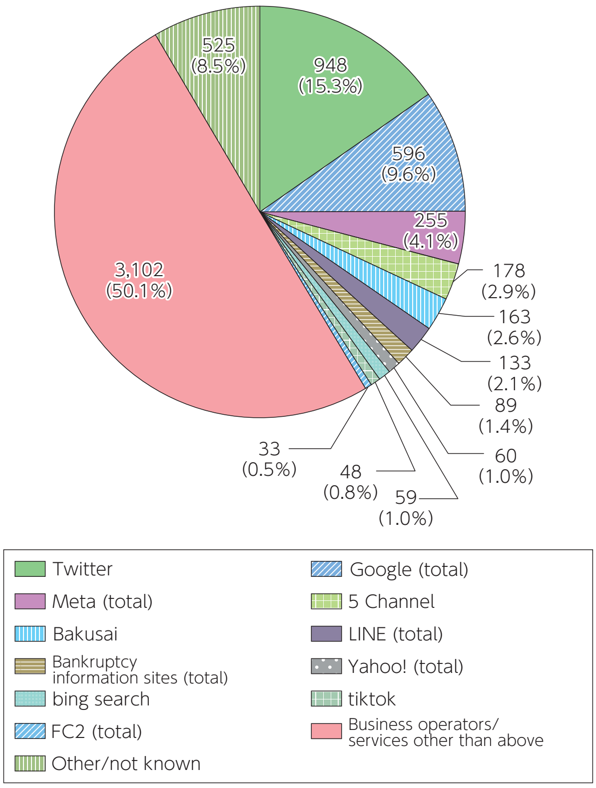
* There is a possibility that ISP services provided together with FTTH lines are only included in provider services.

(Source) MIC "Regular Meeting for Monitoring Consumer Protection Rules and ICT Service Reliability (14th meeting)"

31. Changes in the number of consultations regarding illegal and harmful information (Figure4-2-2-12 in White Paper)



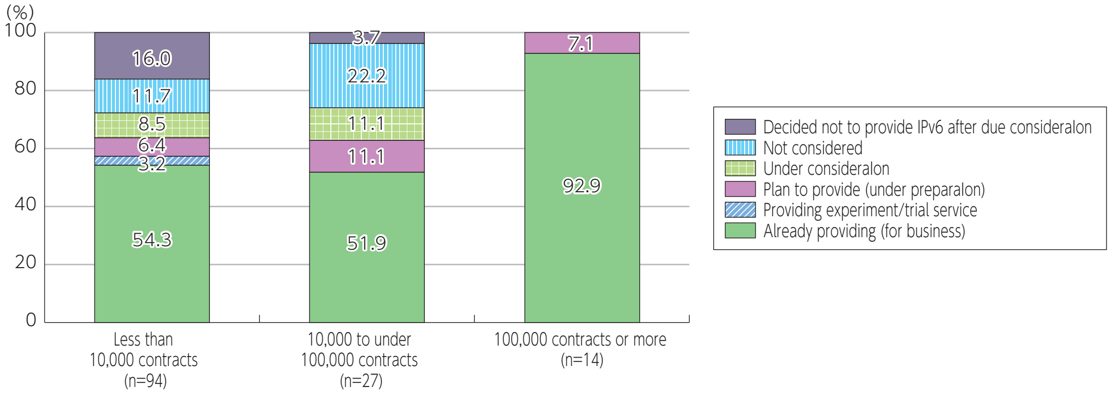
32. Breakdown of the number of consultations provided at the Illegal Harmful Hotline by business operator (Figure4-2-2-13 in White Paper)



Business operator, service, etc.		Number of requests	Percentage
Twitter		948	15.3%
Google (total)		596	9.6%
	Search	229	
	YouTube	158	
	map	180	
	Other	29	
Meta (total)		255	4.1%
	Instagram	199	
	Facebook	55	
	Whatsapp	1	
5 Channel		178	2.9%
Bakusai		163	2.6%
LINE (total)		133	2.1%
	Livedoor services (*2)	61	
	Services in LINE applications	72	
Bankruptcy information sites (total)		89	1.4%
Yahoo! (total)		60	1.0%
	Search	17	
	Auction	14	
	Advice	14	
	News	5	
	Other	10	
bing search		59	1.0%
tiktok		48	0.8%
FC2 (total)		33	0.5%
Business operators/services other than above		3,102	50.1%
Other/not known			8.5%

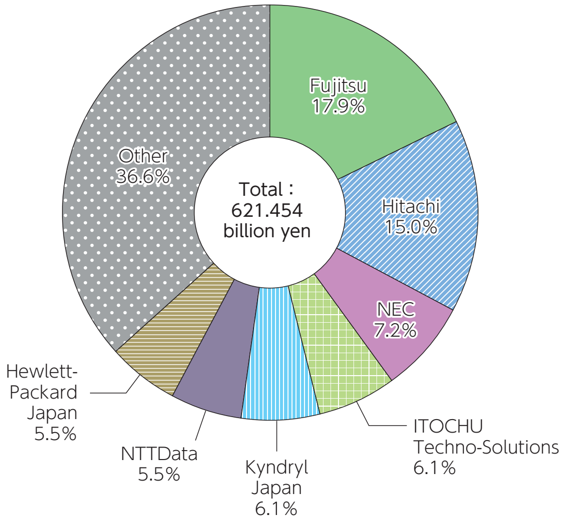
* 1 Breakdown of the number of consultations (work): By business operator/service (n=6,189) <fiscal 2022> *Number of consultations (work): 5,745 cases
* 2 LINE sold the livedoor service on December 27, 2022, so responses from January 2023 are not included.
* 3 Total number of consultations (work), and counseling centers do not determine whether or not individual consultations constitute a violation of rights.
* 4 Since data is compiled by entering a representative domain for each work case, it is not strictly compiled statistical information because there are cases where an applicable domain covers multiple sites.
* 5 Some use their own domains, so the actual domain may not be known.

33. Status of IPv6 service provision (by ISP size) (January 2023)



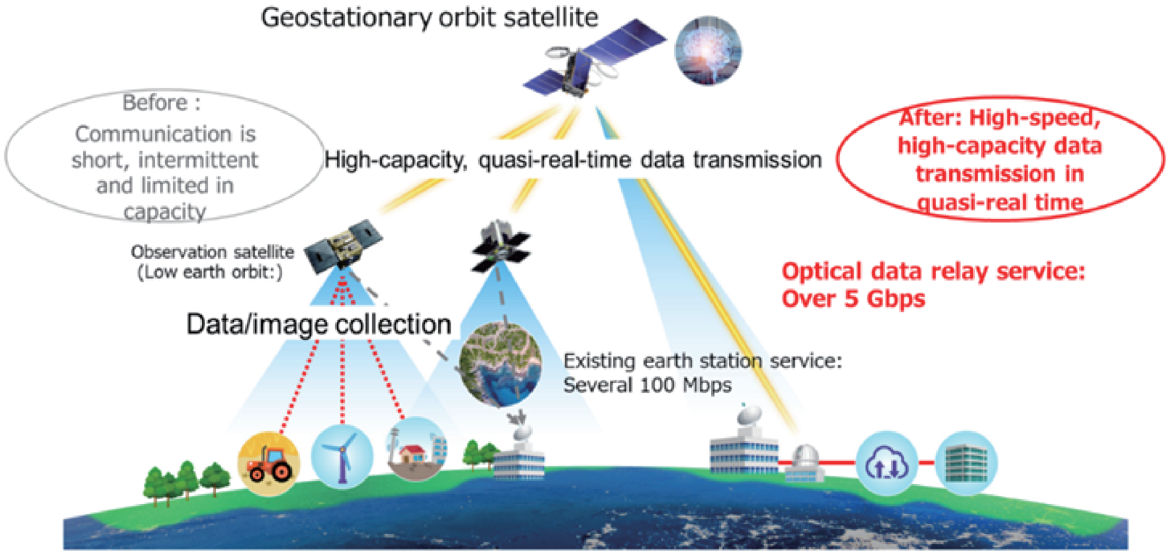
(Source) Prepared from MIC questionnaire survey

34. Market revenue share of domestic client virtualization solutions (on-premises) by vendor sales (2021)



(Source) IDC "Japan Virtual Client Computing Market Share" (July 6, 2022)

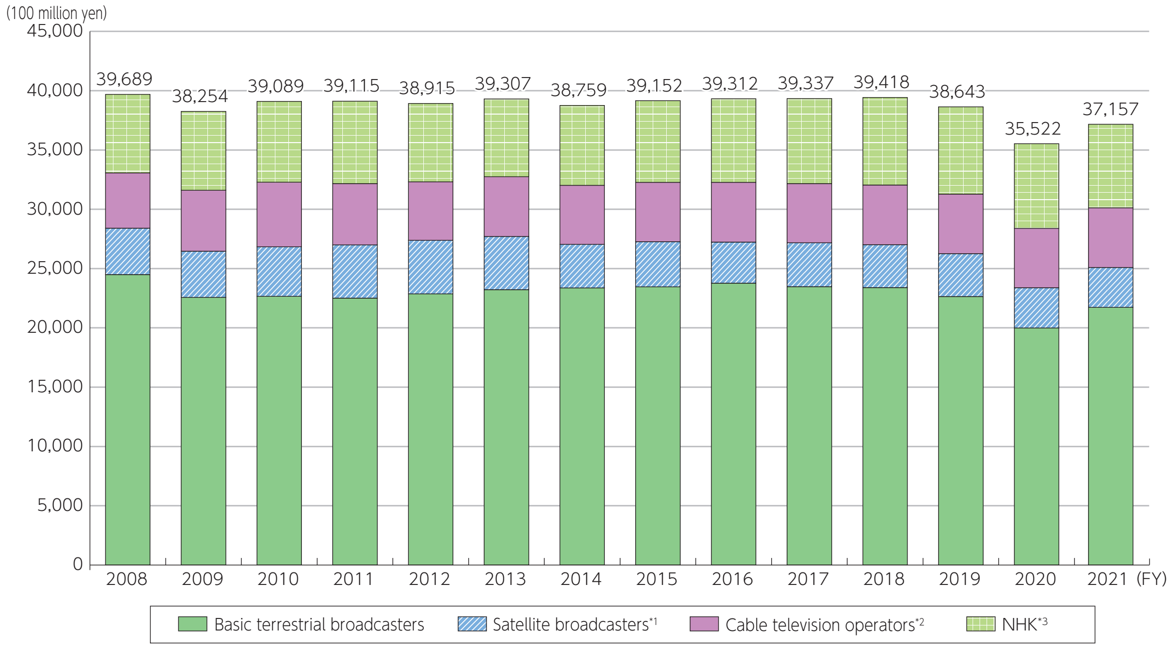
35. Overview of optical data relay service (Figure4-2-3-1 in White Paper)



(Source) Nippon Telegraph and Telephone Corporation "NTT and SKY Perfect JSAT Corporation agree to establish Space Compass, Inc."

Section 3

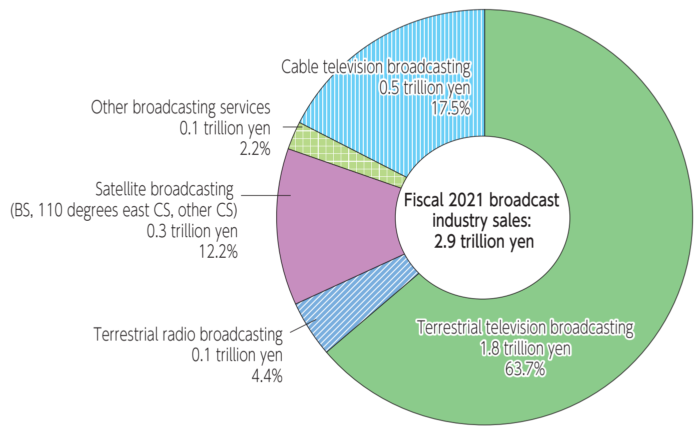
1. Changes in the size of the broadcasting industry market (total sales) and market breakdown (Figure4-3-1-1 in White Paper)



* 1 Calculated based on operating revenues related to the satellite broadcasting business.
* 2 Up to fiscal 2010, cable TV operators were commercial corporations that conducted independent broadcasting using facilities approved under the former Cable Television Broadcasting Act (including facilities registered under the former Broadcast Act for Use of Telecommunications Services that uses a broadcasting system equivalent to the facilities), and from fiscal 2011, cable television operators are registered general broadcasters (limited to commercial corporations) that conduct independent broadcasting using cable telecommunications equipment (with both excluding operators using the IP multicast method).
* 3 NHK's value is ordinary business income.
* 4 Community broadcasters who are also engaged in cable television are excluded.

(Source) Prepared based on the MIC "Income and Expenditures of Private Broadcasters" and NHK "Financial Statements" for each fiscal year

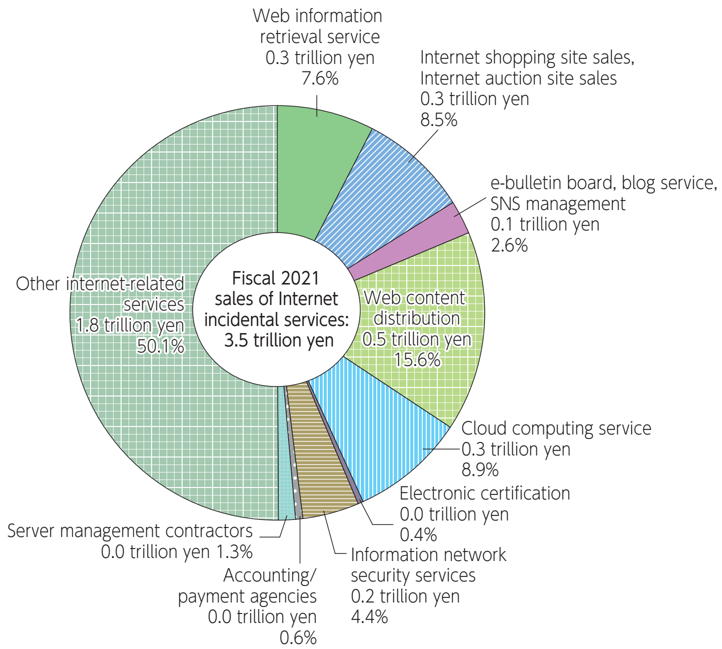
2. Ratio of broadcasting industry sales



* Sales of "cable television broadcasting" include sales of basic services, paid services (paid channels, etc.), and poor reception rebroadcast services.

(Source) Based on MIC "2022 Basic Survey on the Information and Communications Industry"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

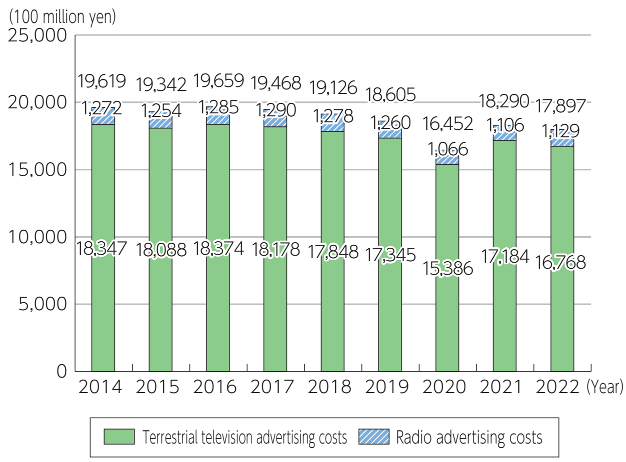
3. Sales ratio of Internet incidental services business



* "Web content streaming business" includes mobile streaming and IPTV services.

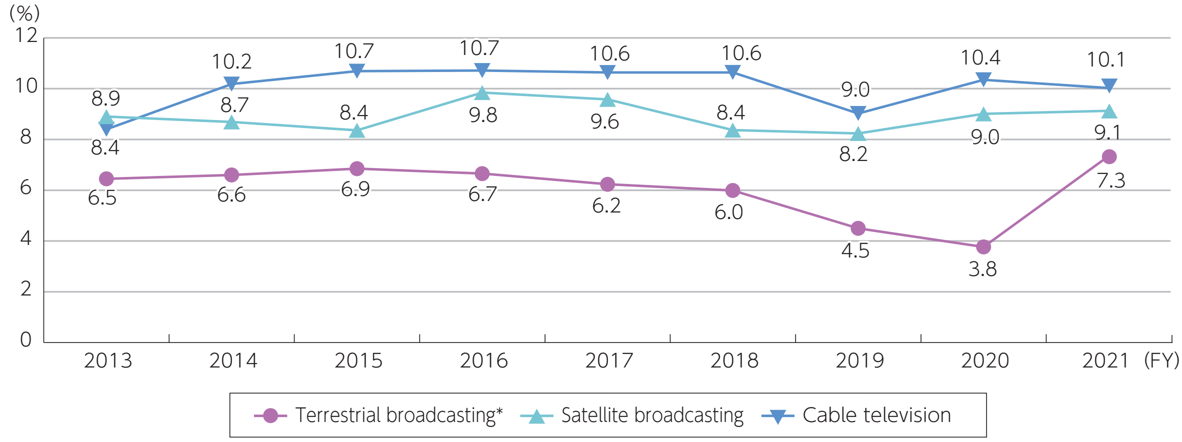
(Source) Based on MIC "2022 Basic Survey on the Information and Communications Industry"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

4. Changes in advertising expenditures of terrestrial private broadcasters



(Source) Prepared based on Dentsu's "Advertising Costs in Japan"

5. Changes in operating profit on sales of private broadcasters (Figure4-3-1-2 in White Paper)



* Basic terrestrial broadcasting excluding community broadcasting

(Source) Prepared based on the MIC "Income and Expenditures of Private Broadcasters" for each fiscal year. etc.

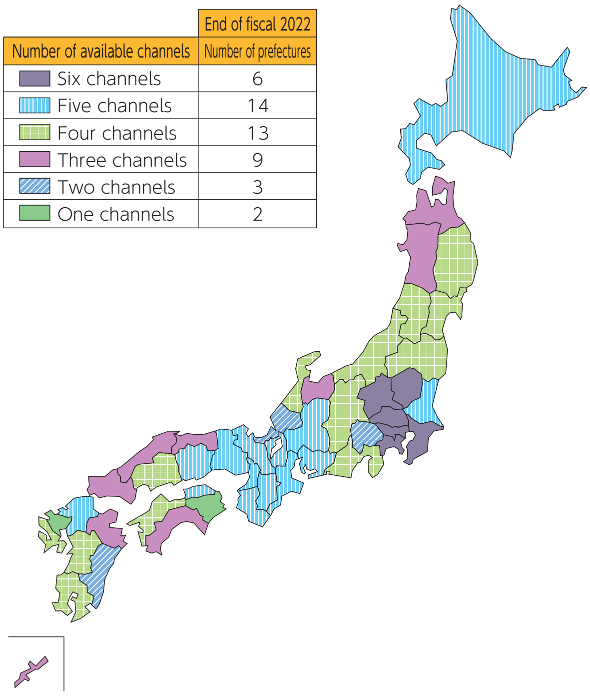
6. Changes in the number of private broadcasters (Figure4-3-1-3 in White Paper)

<table>
<tr><th colspan="3">At the end of fiscal year</th><th>2010</th><th>2011</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th><th>2016</th><th>2017</th><th>2018</th><th>2019</th><th>2020</th><th>2021</th><th>2022</th></tr>
<tr><td rowspan="10">Terrestrial</td><td rowspan="2">Television broadcast (Single operation)</td><td>VHF</td><td>16</td><td rowspan="2">93</td><td rowspan="2">93</td><td rowspan="2">94</td><td rowspan="2">94</td><td rowspan="2">98</td><td rowspan="2">94</td><td rowspan="2">94</td><td rowspan="2">95</td><td rowspan="2">95</td><td rowspan="2">95</td><td rowspan="2">96</td><td rowspan="2">96</td></tr>
<tr><td>UHF</td><td>77</td></tr>
<tr><td rowspan="4">Basic satellite broadcasting</td><td>Medium-wave (AM) broadcasting</td><td>13</td><td>13</td><td>13</td><td>14</td><td>14</td><td>14</td><td>14</td><td>14</td><td>15</td><td>15</td><td>15</td><td>16</td><td>16</td></tr>
<tr><td>Ultrashort wave (FM) broadcasting</td><td>298</td><td>307</td><td>319</td><td>332</td><td>338</td><td>350</td><td>356</td><td>369</td><td>377</td><td>384</td><td>384</td><td>388</td><td>390</td></tr>
<tr><td>Community broadcasting of the above</td><td>246</td><td>255</td><td>268</td><td>281</td><td>287</td><td>299</td><td>304</td><td>317</td><td>325</td><td>332</td><td>334</td><td>338</td><td>339</td></tr>
<tr><td>Short wave</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td colspan="2">Television/radio broadcasting (combined operation)</td><td>34</td><td>34</td><td>34</td><td>33</td><td>33</td><td>33</td><td>33</td><td>33</td><td>32</td><td>32</td><td>32</td><td>31</td><td>31</td></tr>
<tr><td colspan="2">Text broadcasting (single operation)</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="2">Multimedia broadcasting</td><td></td><td></td><td>1</td><td>1</td><td>1</td><td>4</td><td>4</td><td>4</td><td>6</td><td>6</td><td>2</td><td>2</td><td>0</td></tr>
<tr><td colspan="2">Subtotal</td><td>440</td><td>449</td><td>461</td><td>475</td><td>481</td><td>500</td><td>502</td><td>515</td><td>526</td><td>533</td><td>529</td><td>534</td><td>534</td></tr>
<tr><td rowspan="4">Satellite</td><td rowspan="2">Basic satellite broadcasting</td><td>BS broadcasting</td><td>20</td><td>20</td><td>20</td><td>20</td><td>20</td><td>20</td><td>19</td><td>19</td><td>22</td><td>22</td><td>20</td><td>22</td><td>21</td></tr>
<tr><td>110 degrees east longitude CS broadcasting</td><td>13</td><td>13</td><td>22</td><td>23</td><td>23</td><td>23</td><td>23</td><td>20</td><td>20</td><td>20</td><td>20</td><td>20</td><td>20</td></tr>
<tr><td colspan="2">General satellite broadcasting</td><td>91</td><td>82</td><td>65</td><td>45</td><td>7</td><td>5</td><td>4</td><td>4</td><td>4</td><td>4</td><td>4</td><td>4</td><td>4</td></tr>
<tr><td colspan="2">Subtotal</td><td>113</td><td>108</td><td>92</td><td>72</td><td>46</td><td>44</td><td>41</td><td>39</td><td>41</td><td>41</td><td>39</td><td>42</td><td>42</td></tr>
<tr><td rowspan="4">Cable television</td><td rowspan="3">General cable broadcasting pertaining to registration (limited to operators of voluntary broadcasting)</td><td>Broadcasting using former authorized facilities (limited to operators of voluntary broadcasting)</td><td>502</td><td rowspan="2">556</td><td rowspan="2">545</td><td rowspan="2">539</td><td rowspan="2">520</td><td rowspan="2">510</td><td rowspan="2">508</td><td rowspan="2">504</td><td rowspan="2">492</td><td rowspan="2">471</td><td rowspan="2">464</td><td rowspan="2">464</td><td rowspan="2">–</td></tr>
<tr><td>Broadcasting using former cable services</td><td>26</td></tr>
<tr><td>IP multicast broadcasting of the above</td><td>5</td><td>5</td><td>4</td><td>3</td><td>3</td><td>3</td><td>5</td><td>5</td><td>5</td><td>5</td><td>5</td><td>4</td><td>–</td></tr>
<tr><td colspan="2">Subtotal</td><td>528</td><td>556</td><td>545</td><td>539</td><td>520</td><td>510</td><td>508</td><td>504</td><td>492</td><td>471</td><td>464</td><td>464</td><td>–</td></tr>
</table>

* 1 The number of television broadcasters (single operation) at the end of fiscal 2015 included five operators (including one which also operates basic terrestrial broadcasting) conducting basic terrestrial broadcasting for mobile reception.
* 2 Regarding satellite broadcasters, based on the amended Broadcast Act that came into force in June 2011, BS broadcasting and 110 degrees east longitude CS broadcasting are counted as basic satellite broadcasting while other satellite broadcasting is counted as general satellite broadcasting.
* 3 Some satellite broadcasters operate two or more types of broadcasting (BS broadcasting, 110 degrees east longitude CS broadcasting, and general satellite broadcasting) so the totals of each column do not match the values in the subtotal column. Furthermore, from fiscal 2011, only operating broadcasters are included.
* 4 Regarding cable television operators, up to fiscal 2010, former approved facilities operators under the former Cable Television Broadcasting Act and registered operators under the former Act on Broadcast on Telecommunications Services were included, and from fiscal 2011, registered general broadcasters conducting independent broadcasting using cable telecommunication facilities under the Broadcast Act are included (regarding IP multicast broadcasting, up to fiscal 2010, it is included in former broadcasting using cable services, and from fiscal 2011 it is included in registered general broadcasters conducting independent broadcasting using cable telecommunications equipment).

(Source) Prepared based on the MIC "Current State of Cable Television" (only the values for cable TV operators)

7. Number of available private terrestrial television broadcasting channels (fiscal 2022)

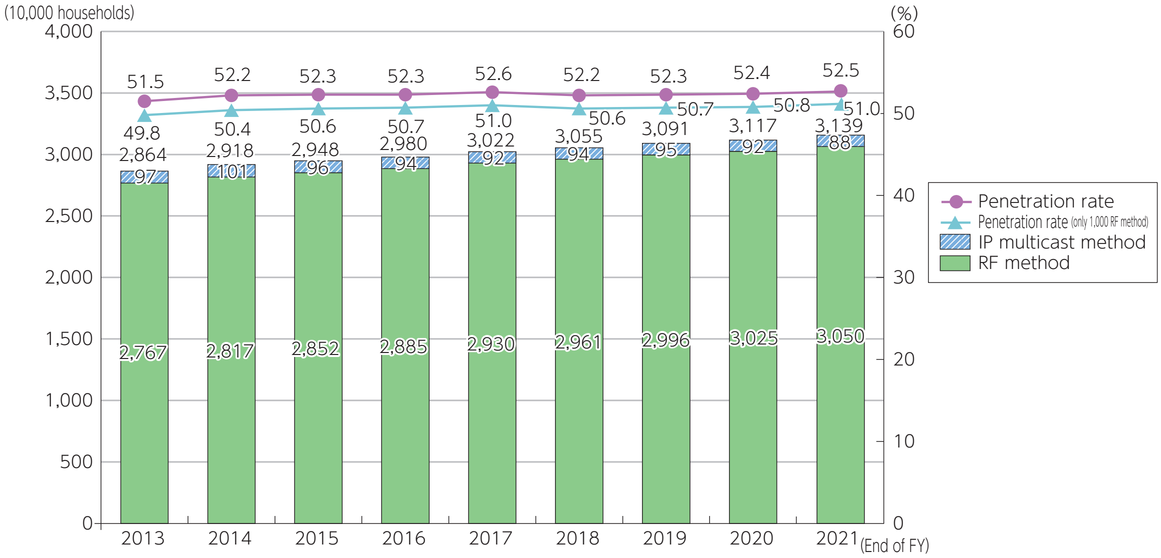


Number of available channels	End of fiscal 2022 Number of prefectures
Six channels	6
Five channels	14
Four channels	13
Three channels	9
Two channels	3
One channels	2

8. Major satellites used for satellite broadcasting in Japan (at the end of fiscal 2022)

Broadcasting type	Satellites	Orbit (east longitude)	Start of operation
Basic satellite broadcasting	BSAT-3a	110 degrees	Oct. 2007
	BSAT-3b	110 degrees	Jul. 2011
	BSAT-3c/JCSAT-110R	110 degrees	Sep. 2011
	JCSAT-110A	110 degrees	Apr. 2017
	BSAT-4a	110 degrees	Dec. 2018
	BSAT-4b	110 degrees	Sep. 2020
General satellite broadcasting	JCSAT-4B	124 degrees	Aug. 2012
	JCSAT-3A	128 degrees	Mar. 2007

9. Changes in the number of subscribed households and penetration rate for receiving services from cable telecommunications equipment that provide independent broadcasting as per their registration (Figure4-3-1-4 in White Paper)



* 1 The penetration rate is calculated from the number of households in the Basic Resident Register.
* 2 The number of subscribed households with the RF method means the total number households (including the number of households with radio interference) connected to the cable telecommunications equipment as per their registration.

(Source) Prepared based on the MIC "Current State of Cable Television"

10. NHK domestic broadcasting (end of fiscal 2022) (Figure4-3-1-5 in White Paper)

Category			Number of channels
Terrestrial broadcasting	Television broadcasting		2
	Radio broadcasting	Medium-wave (AM) broadcasting	2
		Ultrashort wave (FM) broadcasting	1
Satellite broadcasting (BS broadcasting)	Television broadcasting		4

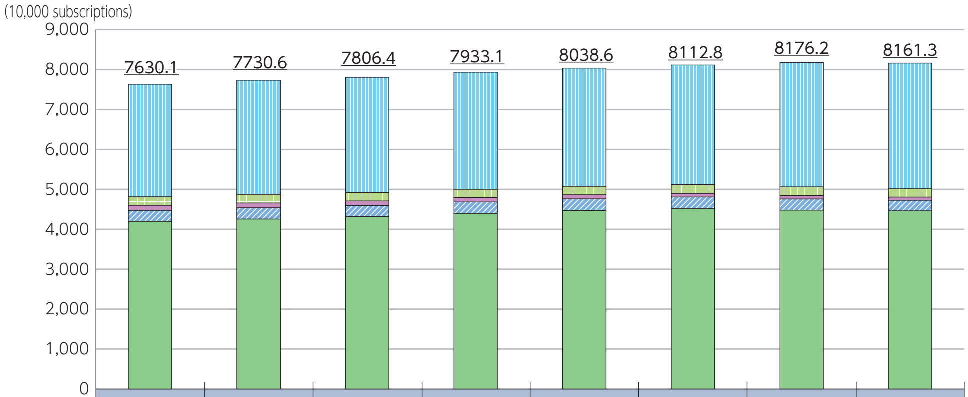
* 1 The radio broadcasting frequency is also indicated by the channel.
* 2 With regard to television broadcasting, analog television broadcasting ended on March 31, 2021, and all broadcasting has been shifted to digital broadcasting.

11. NHK's international television and radio broadcasting (plan as of April 2023) (Figure4-3-1-6 in White Paper)

	Television		Radio
	For overseas Japanese	For foreigners	For overseas Japanese and foreigners
Broadcasting hours	Around 5 hours a day	24 hours a day	75 hours 7 minutes in total per day
Budget	19..8 billion yen (FY2023 NHK budget)		4.9 billion yen (same as on the left)
Language	Japanese	English	18 languages
Service area	Almost all over the world		Almost all over the world
Satellites used / Transmission facilities	Foreign satellites, CATV, etc.		Domestic transmitting stations, overseas relay stations, etc.

* The number of broadcasting hours of international TV broadcasting for foreigners includes the broadcasting hours of Japan International Broadcasting (JIB).

12. Number of subscribers to broadcasting services (Figure4-3-1-7 in White Paper)

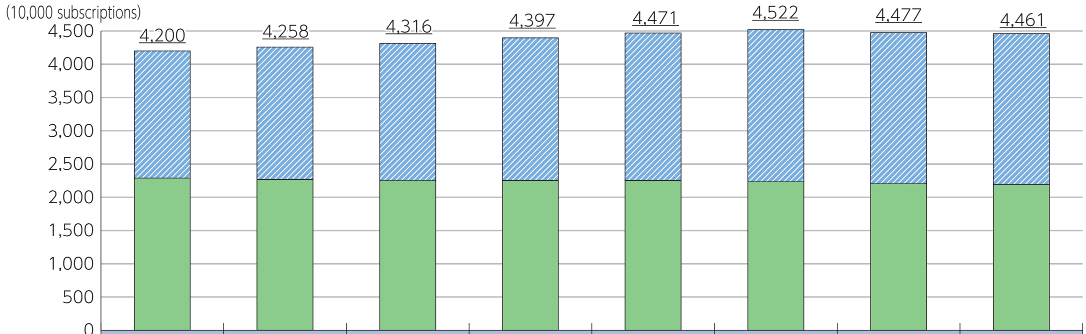


	2014	2015	2016	2017	2018	2019	2020	2021
Cable television	2,817.0	2,852.0	2,885.0	2,930.3	2960.7	2,995.9	3,117.1	3,138.5
110 degrees east longitude CS	212.0	219.5	209.3	208.4	213.7	215.8	218.3	217.1
124/128 degrees east longitude CS	125.4	120.3	114.4	109.4	102.7	93.1	84.4	76.6
WOWOW	275.6	280.5	282.3	287.6	290.1	285.5	279.1	268.0
NHK	4,200.1	4,258.3	4,315.4	4397.4	4,471.4	4,522.5	4,477.3	4,461.1
Satellite contract, etc.	1,911.3	1,993.3	2,066.7	2147.6	2,221.5	2,289.1	2,274.2	2,271.5

* 1 The number of subscribers to terrestrial broadcasting (NHK) is the number of NHK subscriptions of all subscription types.
* 2 The number of subscribers to satellite contracts, etc. is the number of NHK satellite contracts and special contracts.
* 3 The number of WOWOW subscribers is the number of WOWOW subscriptions.
* 4 The number of subscribers of 124/128 degrees east CS is the number of Sky Perfect! premium service subscriptions.
* 5 The number of subscribers of 110 degrees east CS is the number of Sky Perfect! subscriptions.
* 6 The number of households subscribed to cable television is the number of households subscribed to cable telecommunications equipment that carry out independent broadcasting as per their registration.

(Source) Prepared based on material from the Japan Electronics and Information Technology Industries Association, Japan Cable Laboratories, and NHK, and the MIC "Current State of Satellite Broadcasting" and "Current State of Cable Television"

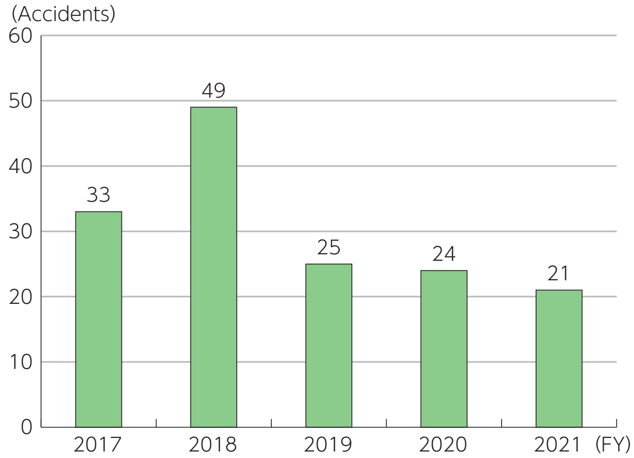
13. Changes in the number of NHK broadcast subscriptions (Figure4-3-1-8 in White Paper)



	2014	2015	2016	2017	2018	2019	2020	2021
Special contract	1	1	1	1	1	1	1	1
Satellite contract	1,910	1,992	2,066	2,146	2,220	2,288	2,273	2,270
Terrestrial contract	2,289	2,265	2,249	2,250	2,250	2,233	2,203	2,190
Total	4,200	4,258	4,316	4,397	4,471	4,522	4,477	4,461

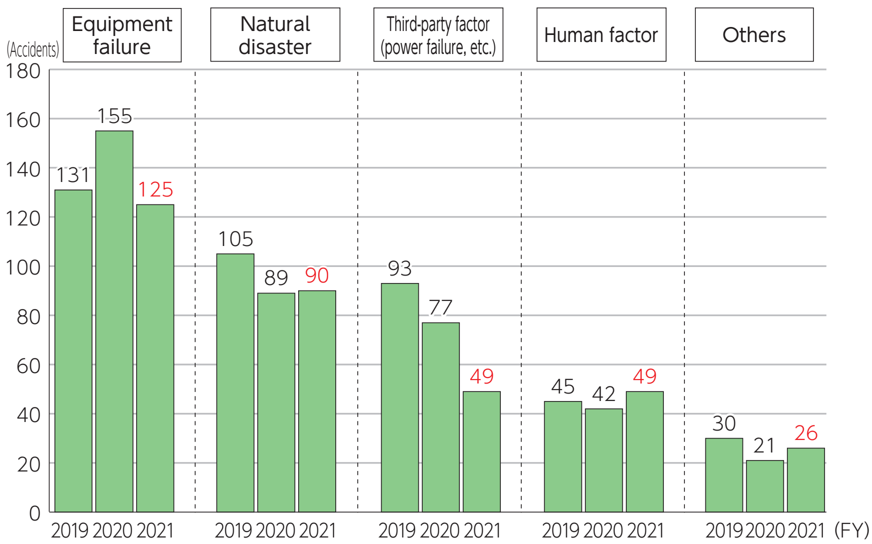
(Source) Prepared based on material from NHK

14. Changes in the number of serious accidents (Figure4-3-1-9 in White Paper)



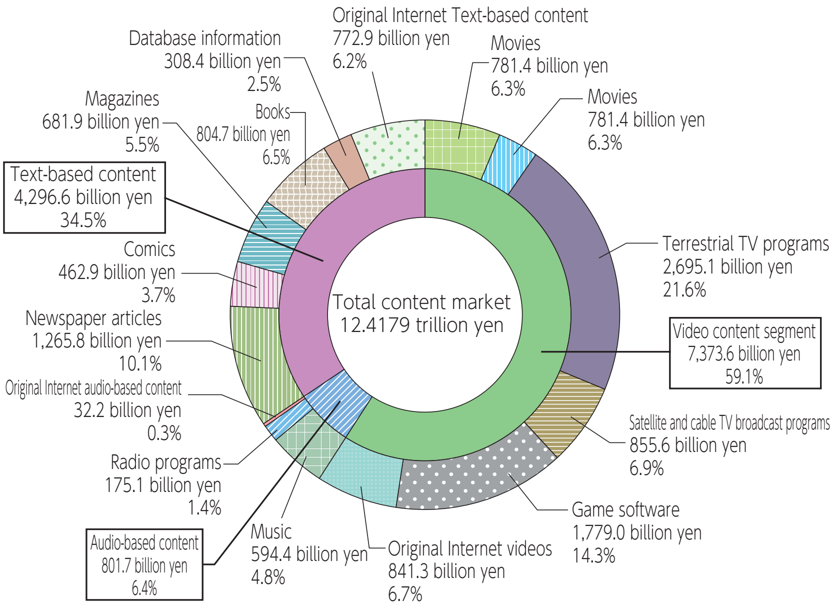
(Source) Prepared based on the MIC "State of the Occurrence of Broadcasting Suspension Accidents" (fiscal 2021)

15. Changes in the number of broadcasting suspension accidents by cause (Figure4-3-1-10 in White Paper)



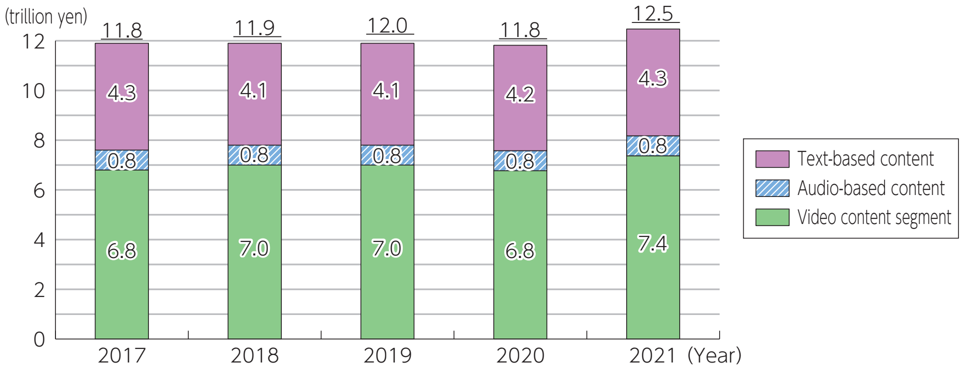
(Source) Prepared based on the MIC "State of the Occurrence of Broadcasting Suspension Accidents (fiscal 2021)"

16. Breakdown of the Japanese content market (2021) (Figure4-3-2-1 in White Paper)



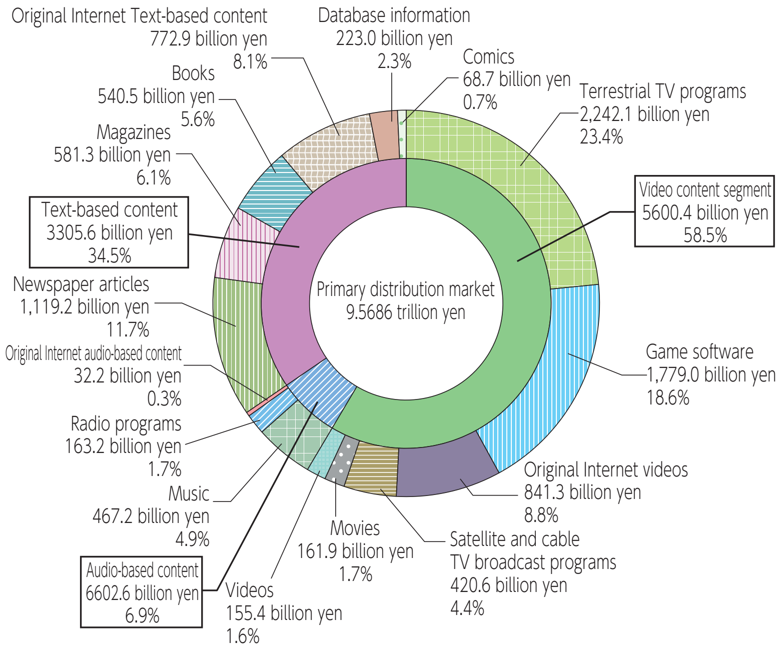
(Source) MIC Institute for Information and Communications Policy "Survey on Media/Software Production and Distribution"

17. Changes in size of the Japanese content market (by content type) (Figure4-3-2-2 in White Paper)



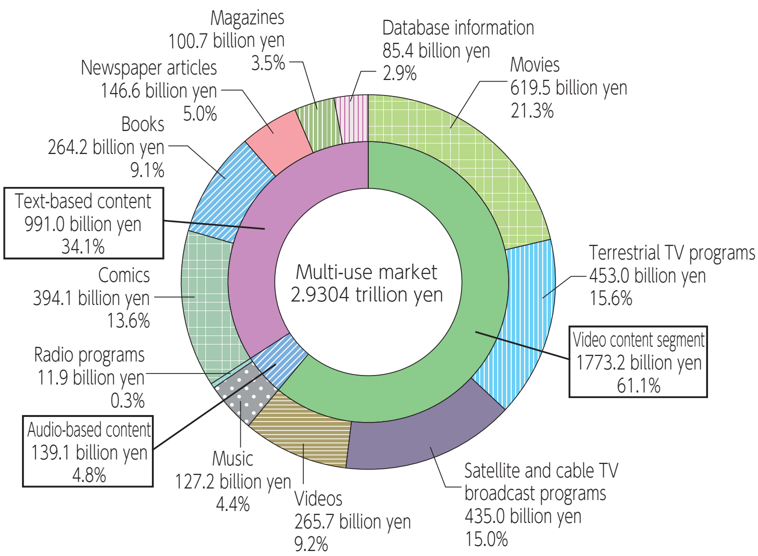
(Source) MIC Institute for Information and Communications Policy "Survey on Media/Software Production and Distribution"

18. Breakdown of primary distribution market (2021)
(Figure4-3-2-3 in White Paper)



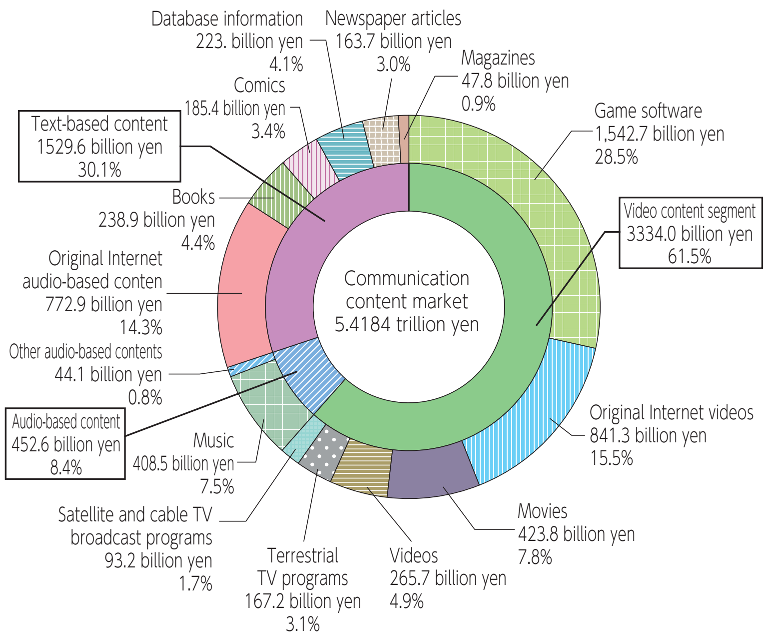
(Source) MIC Institute for Information and Communications Policy "Survey on Media/Software Production and Distribution"

19. Breakdown of multi-use market (2021)
(Figure4-3-2-4 in White Paper)



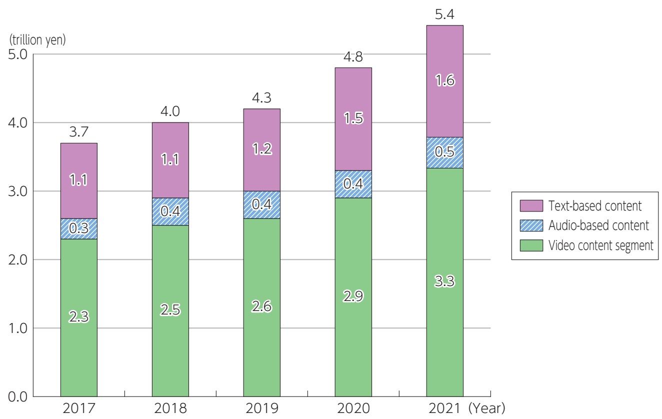
(Source) MIC Institute for Information and Communications Policy "Survey on Media/Software Production and Distribution"

20. Breakdown of the communication content market (2021) (Figure4-3-2-5 in White Paper)



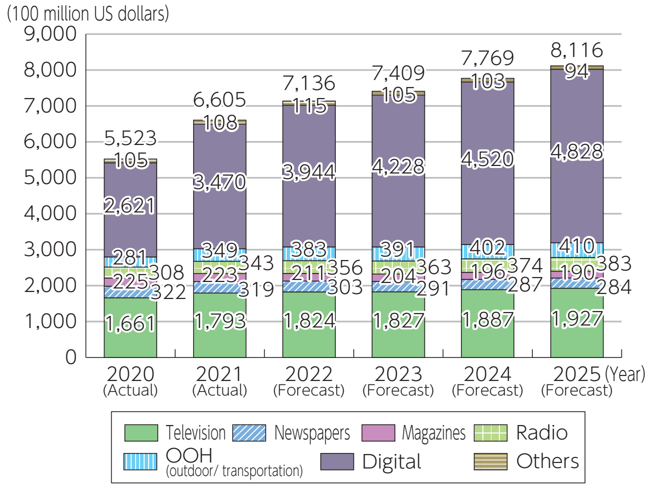
(Source) MIC Institute for Information and Communications Policy "Survey on Media/Software Production and Distribution"

21. Changes in the size of the telecommunications content market (by content type) (Figure4-3-2-6 in White Paper)



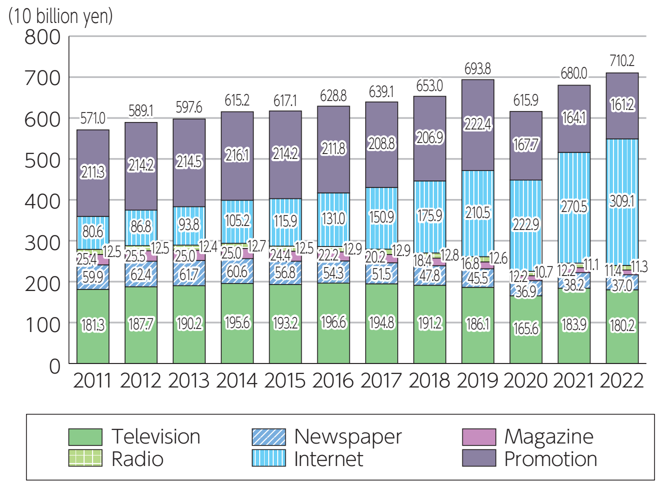
(Source) MIC Institute for Information and Communications Policy "Survey on Media/Software Production and Distribution"

22. Changes and forecast in global advertising expenditures by media type (Figure4-3-2-7 in White Paper)



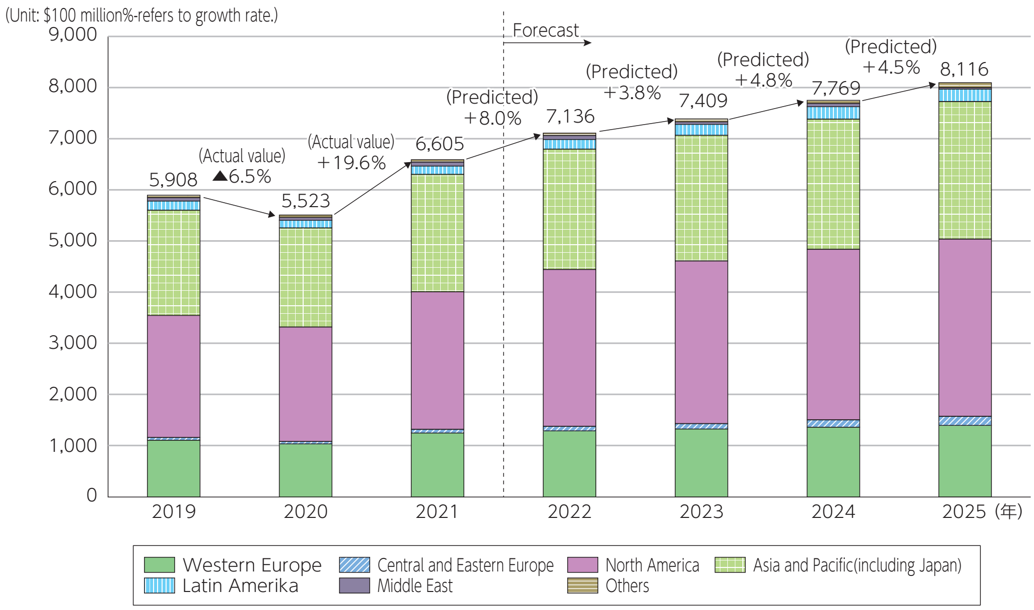
(Source) Prepared based on Dentsu Group's "Global Advertisement Spend Growth Rate Forecast (2022 to 2025)"

23. Changes in advertising expenditure by media in Japan (Figure4-3-2-8 in White Paper)



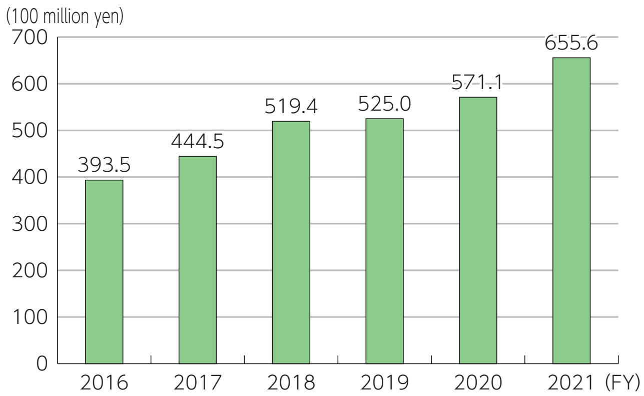
(Source) Prepared based on Dentsu's "Advertising expenditure in Japan (each year)"

24. Changes in global total advertising expenditure



(Source) Dentsu Group "Global Advertisement Spend Growth Rate Forecast (2022 to 2025)"

25. Changes in the value of broadcasting content exports from Japan (Figure4-3-2-9 in White Paper)

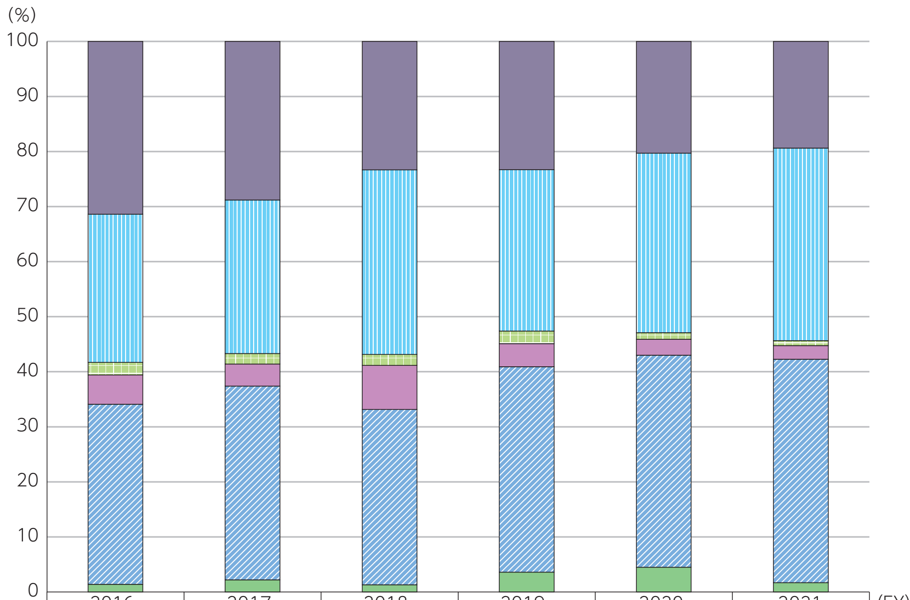


* 1 Value of broadcasting content exports: Total sales to overseas of program broadcasting rights, Internet distribution rights, video/DVD rights, program format remake rights, and merchandising rights, etc.

* 2 Calculated based on questionnaire responses submitted by NHK, key private broadcasting stations, semi-key private broadcasting stations, local stations, satellite broadcasters, CATV operators, and production companies, etc.

(Source) Prepared based on the MIC "Analysis of the Current Status of Overseas Expansion of Broadcasting Content"

26. Changes in the value of Japan's broadcasting content exports by rights

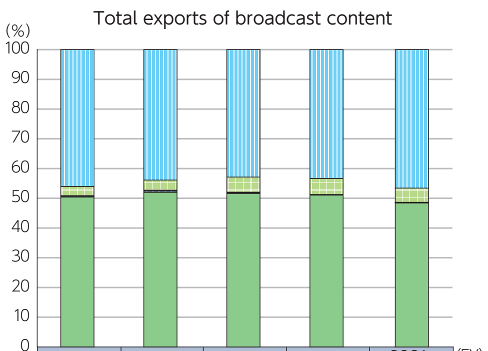


	2016	2017	2018	2019	2020	2021 (FY)
Program broadcasting right	31.4	28.8	23.3	23.3	20.3	19.4
Internet distribution right	26.9	27.9	33.5	29.3	32.6	35.0
Video/DVD release right	2.3	1.9	2.0	2.3	1.2	0.8
TV formatting/remaking right	5.3	4.0	8.1	4.2	2.9	2.5
Merchandizing right	32.7	35.2	31.8	37.3	38.5	40.6
Others	1.4	2.2	1.3	3.6	4.5	1.7

(Source) Prepared based on the MIC "Analysis of the Current Status of Overseas Expansion of Broadcasting Content"

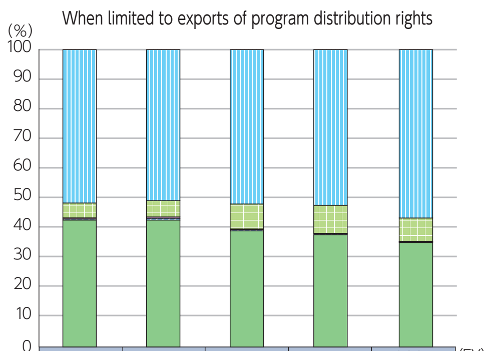
27. Changes in the value of Japan's broadcasting content exports by entity

Total exports of broadcast content



	2017	2018	2019	2020	2021 (FY)
NHK and key private staJons	46.0	43.9	42.9	43.3	46.5
Semi-key private staJons in Osaka	3.1	3.4	5.1	5.4	4.6
Local staJons	0.2	0.3	0.2	0.1	0.1
Satellite broadcaster	0.3	0.4	0.2	0.1	0.2
ProducJons, etc.	50.4	52.1	51.7	51.1	48.7

When limited to exports of program distribution rights

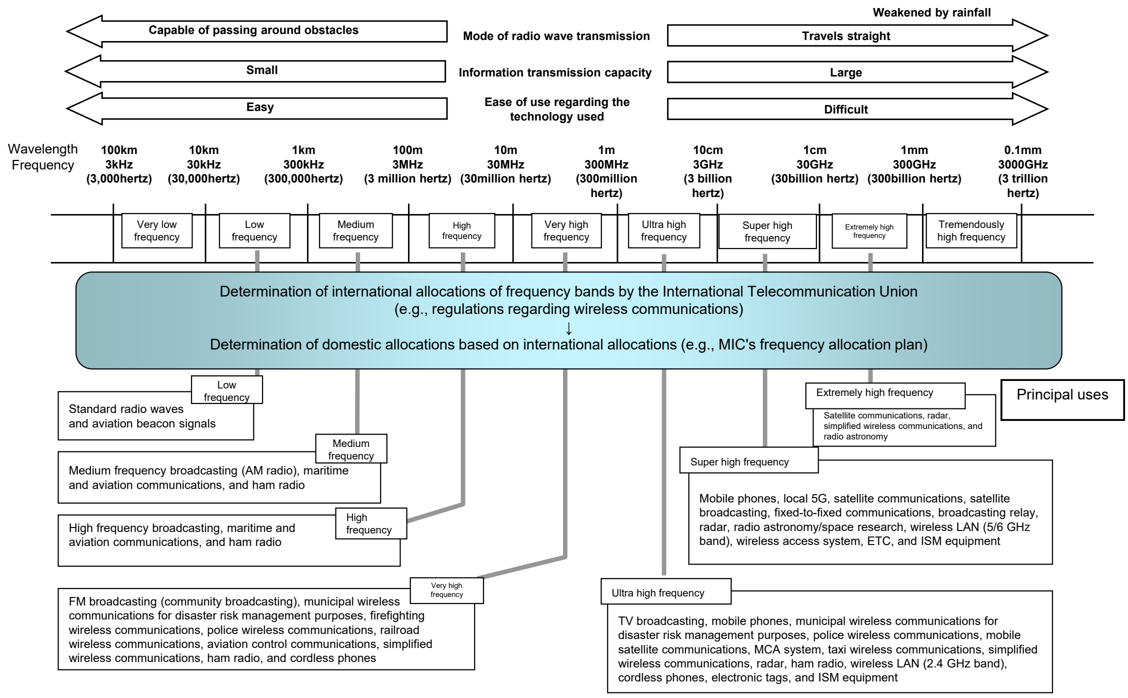


	2017	2018	2019	2020	2021 (FY)
NHK and key private staJons	51.9	51.1	51.9	52.7	56.9
Semi-key private staJons in Osaka	5.0	5.5	8.4	9.5	7.9
Local staJons	0.4	0.5	0.2	0.2	0.1
Satellite broadcaster	0.4	0.6	0.4	0.2	0.3
ProducJons, etc.	42.3	42.3	39.1	37.4	34.7

(Source) Prepared based on the MIC "Analysis of the Current Status of Overseas Expansion of Broadcasting Content"

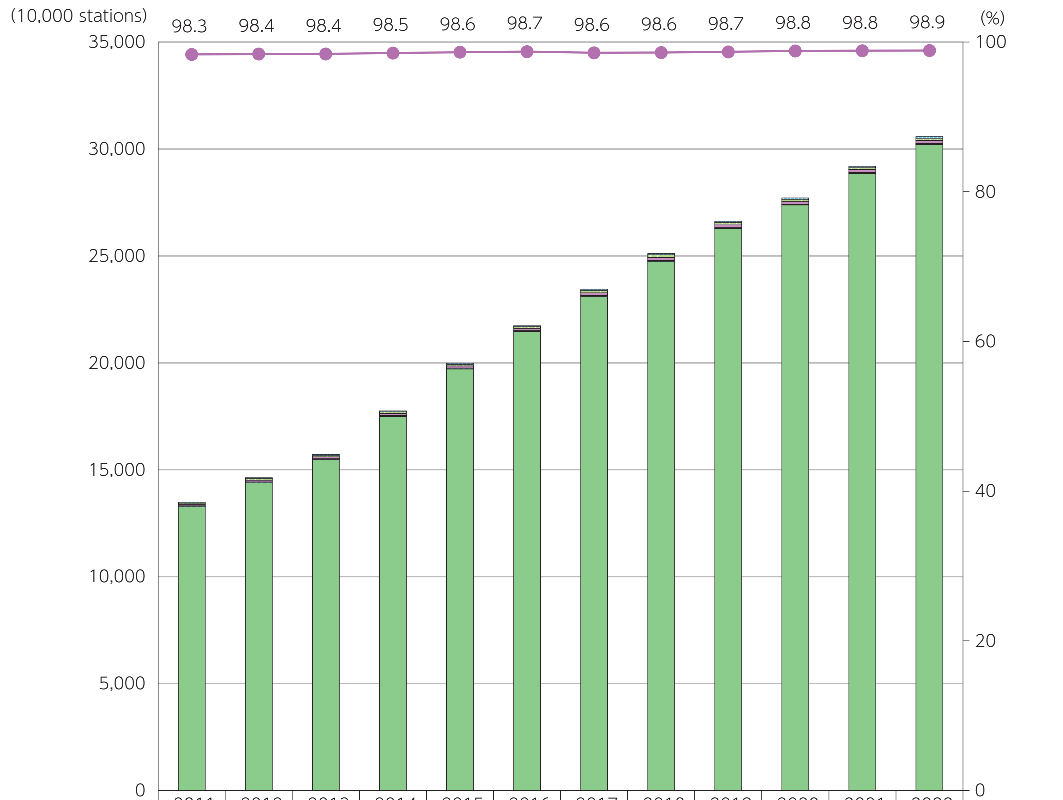
Section 4

1. Main uses and characteristics of each frequency band in Japan (Figure4-4-1-1 in White Paper)



Spectrum	Wave length	Characteristics
Very low frequency	10 to 100km	Propagating along ground surface, waves of this spectrum can go over low hills. Being capable of propagating in water, the spectrum can be used for seabed exploration
Low frequency	1 to 10km	Being capable of propagating to very distant places, the spectrum is used by standard frequency stations to inform radio clock, etc. of time and frequency standard.
Medium frequency	100 to 1000m	Capable of propagating through reflection off the E-layer of the ionosphere that is formed at the height of about 100km, the spectrum is used mainly for radio broadcasting.
High frequency	10 to 100m	Capable of reaching the other side of the globe by being reflected off the F-layer of the ionosphere that is formed at the height of about 200 to 400km and by repeating reflection between F-layer and the ground surface. Widely used for ocean ship and international flight plane communication, international broadcasting and amateur radio.
Very high frequency	1to 10m	Waves of this spectrum propagate rather straight and are not easily reflected off the ionosphere, butare capable of reachingthe other side of mountains and buildings to a certain extent. The spectrum is widely used for a variety of mobile communications including emergency and fire emergency radio.
Ultra high frequency	10cm to 1m	Waves of this spectrum have stronger tendency to propagate straight compared with very high frequency, butare capable of reachingthe other side of mountains and buildings to a certain extent. The spectrum is widely used mostly for a variety of mobile communication systems including mobile phones, and digital television broadcasting and microwave ovens.
Super high frequency	1to 10cm	Due to the strong tendency to propagate straight, this spectrum is suitable for emission to a specific direction. It is mainly used for fixed trunk circuits, satellite communication, satellite broadcasting and wireless LAN.
Extremely high frequency	1mm to 10mm	With strong tendency to propagate straight, waves of the spectrum can transmit very large information quantity, but not very far in bad weather due to rain or fog. For this reason, the spectrum is used for relatively short-distance radio access communication and image transmission systems, simplicity radio, car collision prevention radar and radio telescopes for astronomical observation.
Tremendously high frequency	0.1mm to 1mm	The spectrum has nature similar tolight. It is rarely used for communication but used for radio telescopes for astronomical observation as is the case of Extremely high frequency.

2. Changes in the number of radio stations (Figure4-4-2-1 in White Paper)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Other	43	46	50	50	55	49	49	55	59	61	51	55
Base stations	58	63	68	71	70	73	125	132	117	95	108	112
Convenience stations*2	77	84	90	97	105	112	118	125	132	137	142	143
Amateur stations	44	44	44	44	44	43	43	41	40	39	38	37
Land mobile stations*1	13,266	14,388	15,472	17,493	19,711	21,457	23,109	24,748	26,278	27,379	28,859	30,219
Percentage of land mobile stations	98.3	98.4	98.4	98.5	98.6	98.7	98.6	98.6	98.7	98.8	98.8	98.9

* 1 Land mobile station: A radio station (such as a mobile phone devices) operated while moving on land or stopped at an unspecified point.
* 2 Convenience radio station: A radio station that performs simple radio communication.

3. Major geostationary satellites used for communications services in Japan (at the end of fiscal 2022)

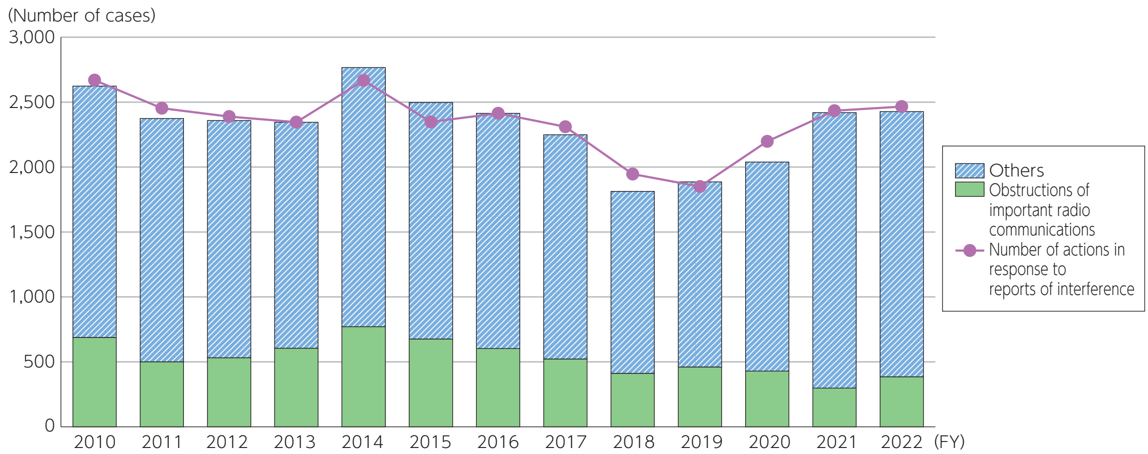
		Satellite name	Orbit (east longitude)	Operating company	Band used
		JCSAT-85	85.15°	Sky Perfect JSAT	Ku
		Intelsat 15		Intelsat	
	●	JCSAT-110A	110°	Sky Perfect JSAT	Ku
	●	JCSAT-4B	124°	Sky Perfect JSAT	Ku
	●	JCSAT-3A	128°	Sky Perfect JSAT	C、Ku
		JCSAT-5A	132°	Sky Perfect JSAT	S、C、Ku
◎		N-STAR d		NTT Docomo	
◎		N-STAR e	136°	NTT Docomo	S、C
	●	SUPERBIRD-C2	144°	Sky Perfect JSAT	Ku
	●	JCSAT-1C	150°	Sky Perfect JSAT	Ku、Ka
	●	JCSAT-2B	154°	Sky Perfect JSAT	C、Ku
	●	SUPERBIRD-B3	162°	Sky Perfect JSAT	Ku、Ka
		Horizons-3e	169°	Sky Perfect JSAT, Intelsat	C、Ku

* 1 Satellites with ¤ are mainly used for mobile communications. Satellites with l are also used for broadcasting.
* 2 JCSAT-85 and Intelsat 15 are the name of the same satellite. Similarly, JCSAT-5A and N-STAR d are the name of the same satellite.

4. Major non-geostationary satellites used for communications services in Japan (at the end of fiscal 2022)

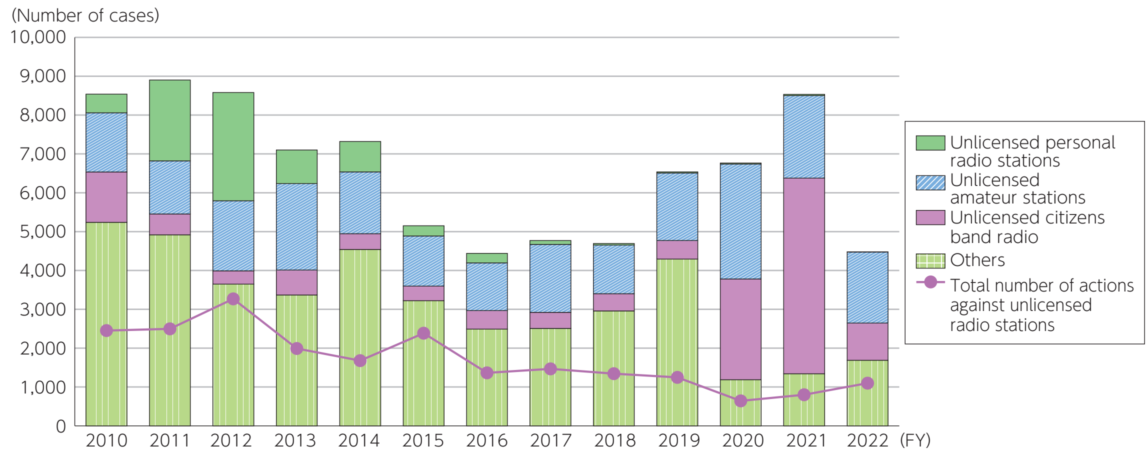
Satellite name	Altitude/number of satellites	Operating business	Agency in Japan	Service area	Service content	Service launch time
ORBCOMM	825km hight/16 satellites	ORBCOMM	ORBCOMM Japan	Global	Data communication and positioning	March, 1999
Iridium	780km hight/66 satellites	Iridium	KDDI Satcom Global Cubic-i Furuno Marlink Overseas Communications ICOM Vavicom Aviation Japan Digital Communications	Global	Voice, data communication, short burst data, open port	June, 2005
Globalstar	1414km hight/24 satellites	Globalstar	IPMotion	Global	Voice, data communication, positioning	July, 2018
Starlink	550km hight/4053 satellites	SpaceX	Starlink Japan	Global	Data communication	October, 2022

5. Changes in the number of reports of jamming and obstruction of radio stations and the number of actions taken (Figure4-4-4-1 in White Paper)



Number of reports of interference or obstruction	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	(FY)
Obstructions of important radio communications	689	501	532	605	771	676	603	522	412	461	429	298	385	
Others	1,934	1,873	1,826	1,740	1,995	1,821	1,811	1,727	1,401	1,425	1,610	2,121	2,047	
Total	2,623	2,374	2,358	2,345	2,766	2,497	2,414	2,249	1,813	1,886	2,039	2,419	2,432	
Number of actions in response to reports of interference or obstructions														
Number of actions in response to reports of interference	2,669	2,453	2,389	2,346	2,667	2,348	2,414	2,310	1,946	1,850	2,198	2,434	2,466	

6. Changes in the number of reports of unlicensed radio stations and the number of actions taken (Figure4-4-4-2 in White Paper)



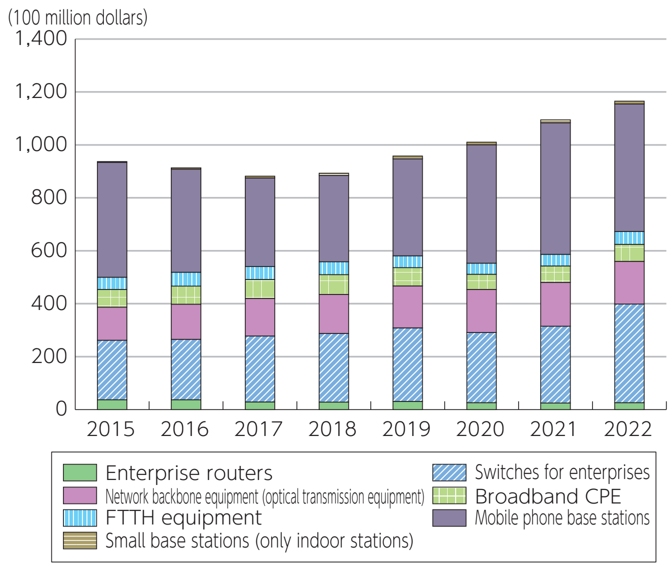
Number of unlicensed radio stations found		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022 (FY)
Stations found	Unlicensed personal radio stations	479	2,081	2,788	865	784	265	245	99	40	28	25	32	3
	Unlicensed amateur stations	1,525	1,367	1,803	2,225	1,592	1,291	1,229	1,749	1,253	1,739	2,959	2,126	1,831
	Unlicensed citizens band radio	1,295	538	342	642	404	375	478	414	443	477	2,594	5,035	958
	Others	5,239	4,917	3,648	3,369	4,541	3,221	2,489	2,508	2,958	4,293	1,187	1,341	1,689
	Total	8,538	8,903	8,581	7,101	7,321	5,152	4,441	4,770	4,694	6,537	6,765	8,534	4,481

Number of actions against unlicensed radio stations

Number of actions	Prosecution	262	249	231	228	215	230	168	168	208	189	62	49	94
	Guidance	2,190	2,247	3,038	1,764	1,465	2,156	1,196	1,300	1,136	1,058	581	752	1,004
	Total	2,452	2,496	3,269	1,992	1,680	2,386	1,364	1,468	1,344	1,247	643	801	1,098

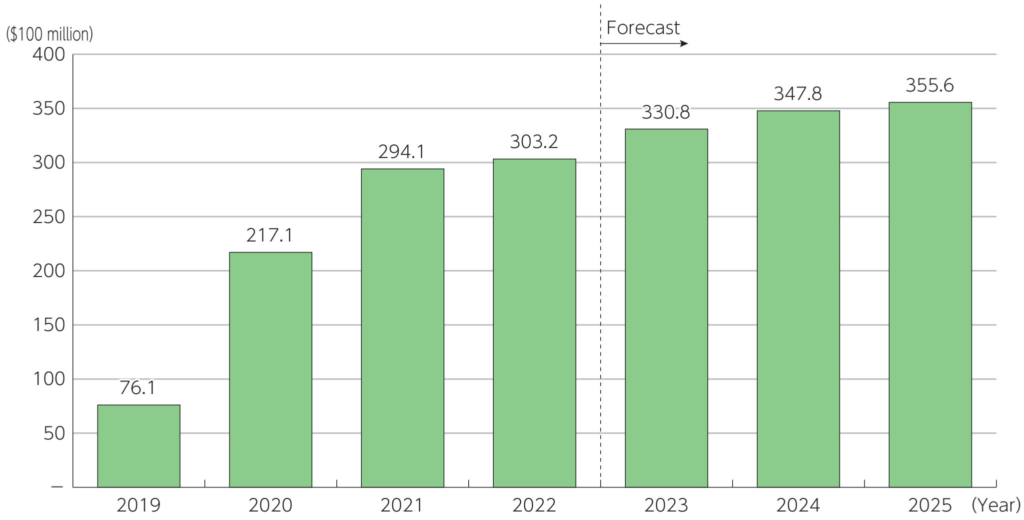
Section 5

1. Changes in the value of global network equipment shipments (Figure4-5-1-1 in White Paper)



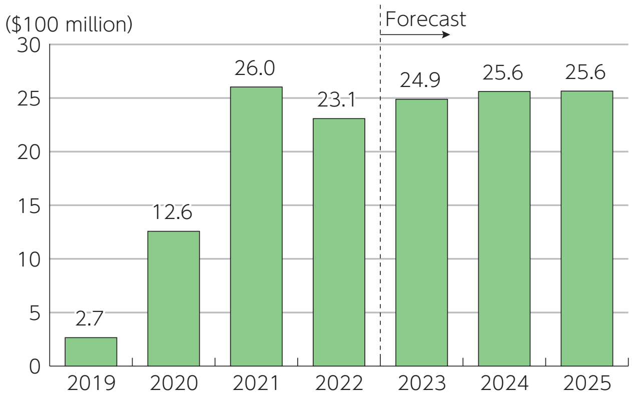
(Source) Omdia

2. Global 5G base stations (macrocells) market size (value of shipments)



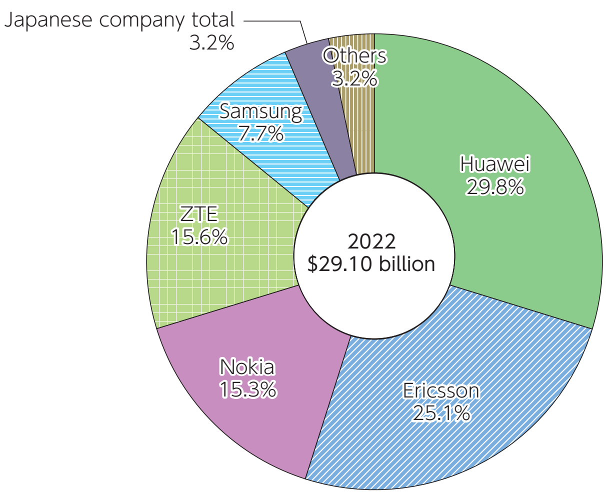
(Source) Omdia

3. Size (value of shipments) of the Japanese 5G base stations (macrocells) market (Figure4-5-1-2 in White Paper)



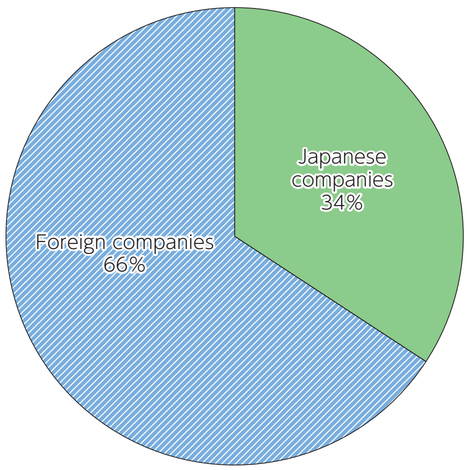
(Source) Omdia

4. Global 5G base stations (macrocells) market share (value of shipments)



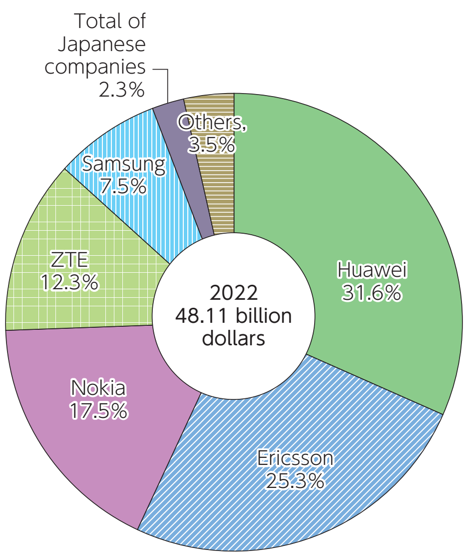
(Source) Omdia

5. Share of global electronic components market (in terms of sales) (2021) (Figure4-5-1-3 in White Paper)



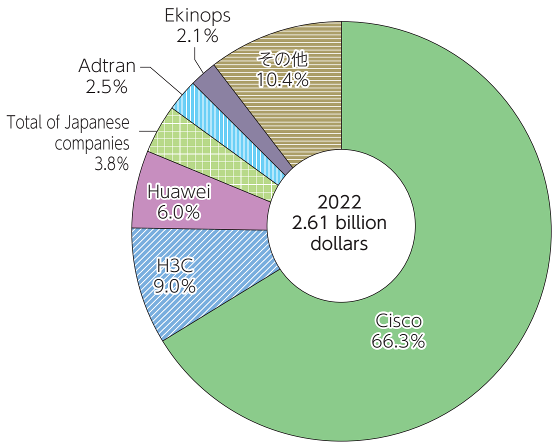
(Source) Omdia

6. Share of the global macrocell base station market (value of shipments in 2022) (Figure4-5-1-4 in White Paper)



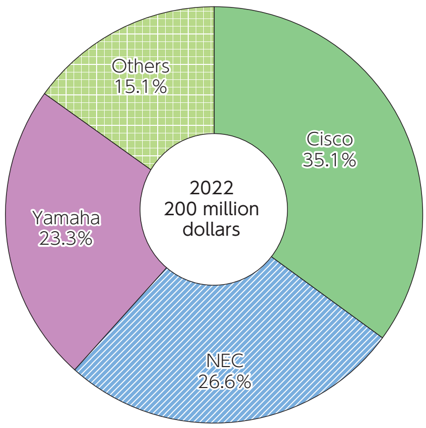
(Source) Omdia

7. Global enterprise router market share



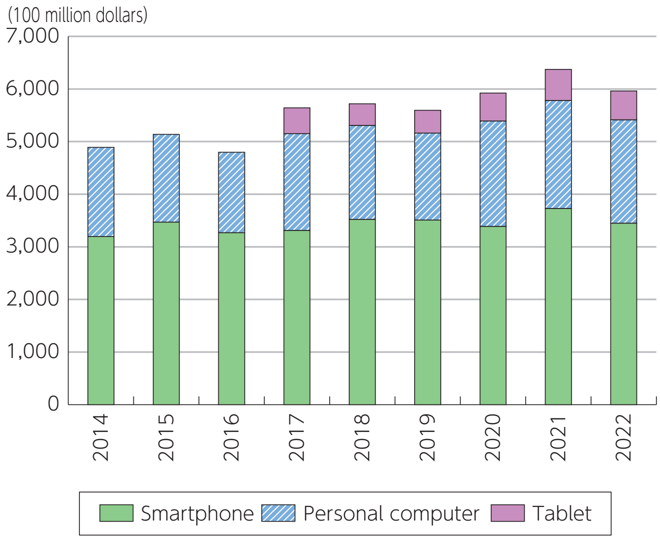
(Source) Omdia

8. Japanese enterprise router market share



(Source) Omdia

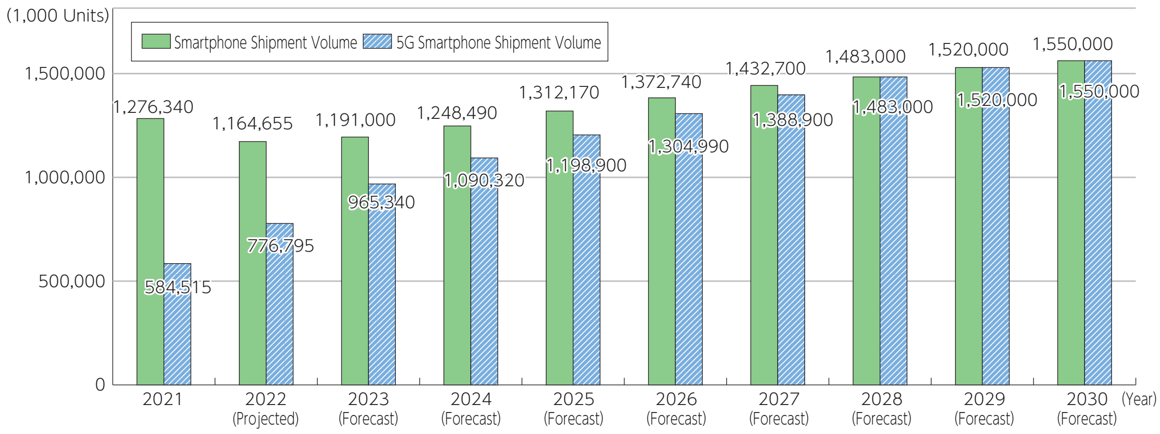
9. Changes in the value of global information device shipments (Figure4-5-2-1 in White Paper)



* Tablets have been counted since 2017

(Source) Omdia

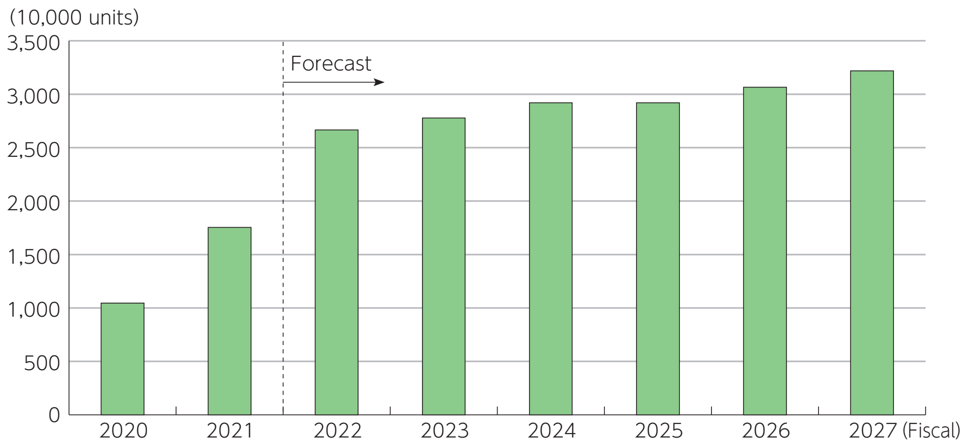
10. Transition and Forecast of Global Shipment Volume of Smartphones & 5G Smartphones (Figure4-5-2-2 in White Paper)



* 1 Based on the shipment volume at manufacturers.
* 2 The values for 2022 are those projected, and the values after 2023 are those forecasted.
* 3 Number of 5G smartphones are included in the number of smartphones.

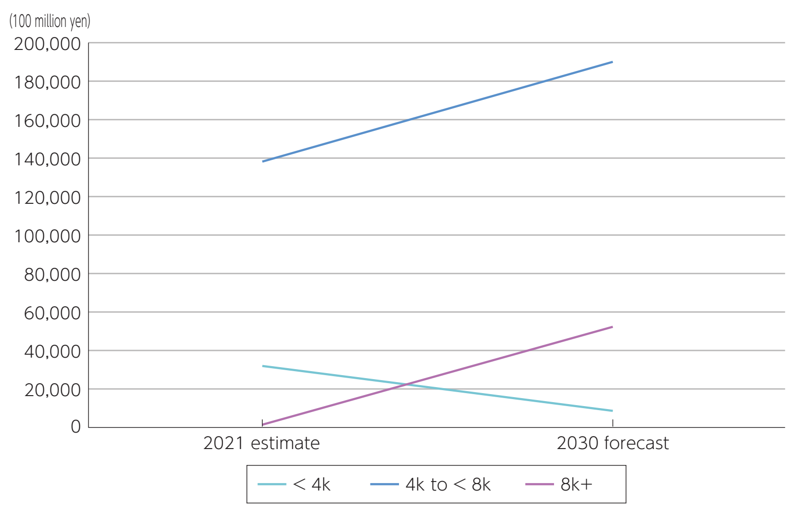
(Source) Yano Research Institute Ltd., "Global Market of Mobile Phone Subscriptions and Shipment Volume: Key Research Findings 2022", February 7, 2023

11. Shipments of 5G smartphones in Japan (Figure4-5-2-3 in White Paper)



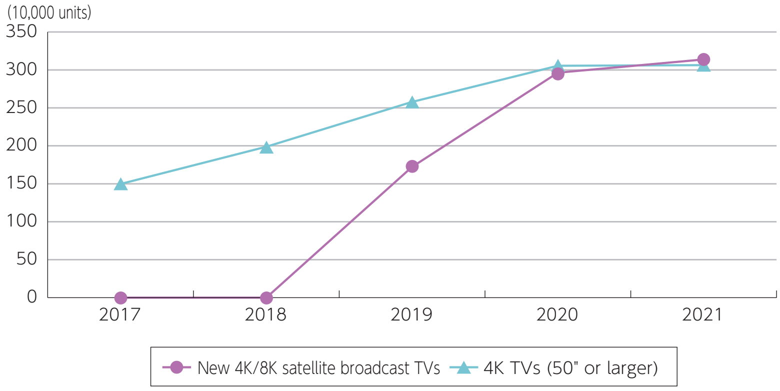
(Source) CIAJ "Medium-Term Demand Forecast for Communications Devices [Fiscal 2022 to Fiscal 2027]"

12. Value of global shipments of 4K and 8K televisions (Figure4-5-2-4 in White Paper)



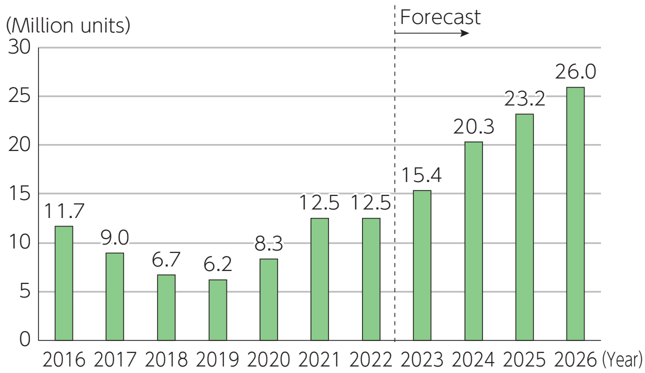
(Source) Fuji Chimera Research Institute, Inc. "5G/8K business future outlook survey 2022"

13. Number of 4K and 8K televisions shipped in Japan (Figure4-5-2-5 in White Paper)



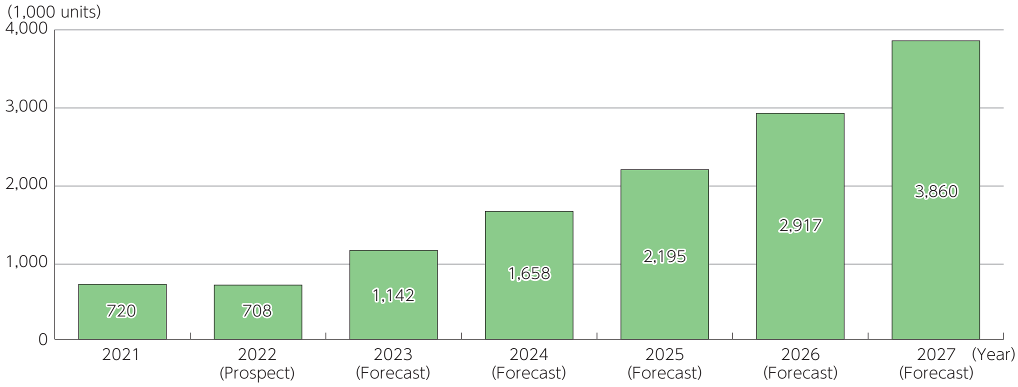
(Source) JEITA "Domestic Shipments of Consumer Electronic Devices"

14. Changes and forecast in global VR headset shipments (Figure4-5-2-6 in White Paper)



(Source) Omdia

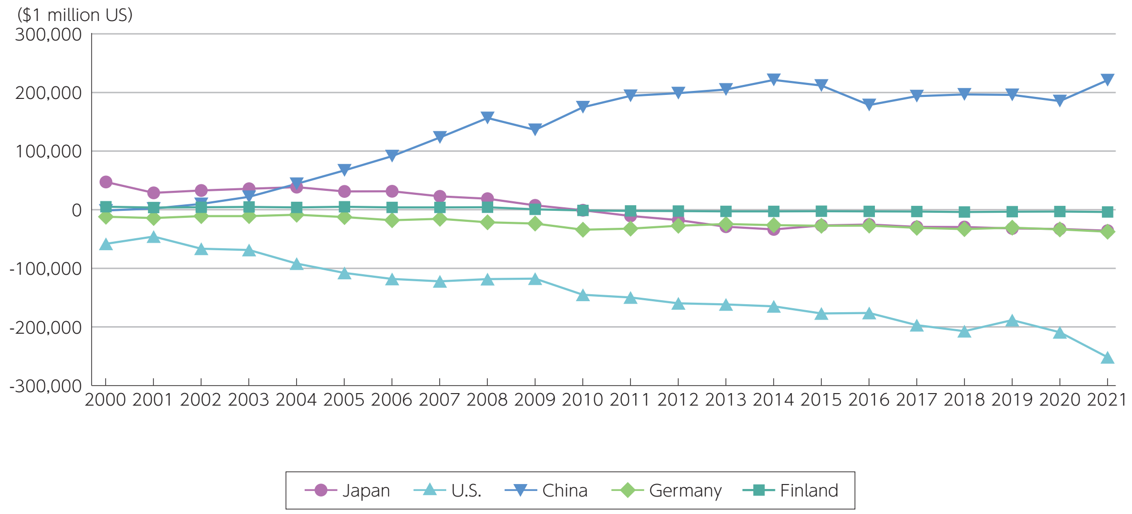
15. Forecast on Domestic Shipment Volume of HMDs for XR (VR/AR/MR) & 360-Degree Videos (Figure4-5-2-7 in White Paper)



* 1 In terms of the number of units shipped by manufacturers.
* 2 The value for 2022 is an estimate, and the values for 2023 and later are forecasts.

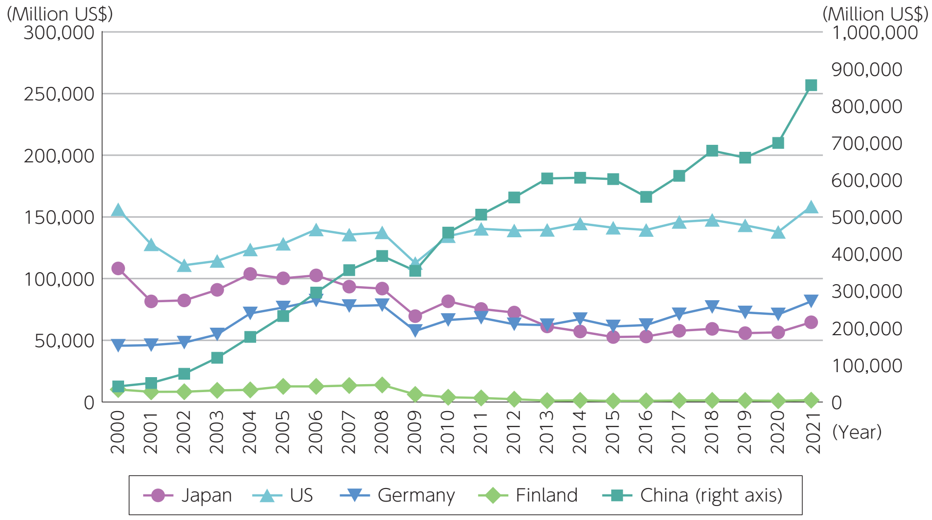
(Source) Yano Research Institute Ltd., "The Market of HMDs (Head Mounted Displays) for XR (VR/AR/MR) and 360-Degree Videos: Key Research Findings 2021", May 11, 2022

16. Changes in the value of the export surplus of ICT equipment and devices by country (Figure4-5-3-1 in White Paper)



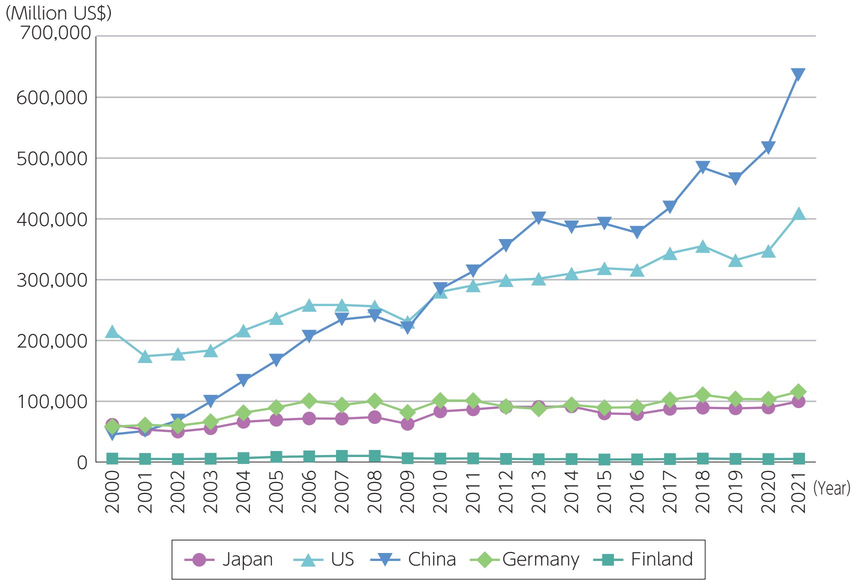
(Source) UNCTAD "UNCTAD STAT"

17. Changes in the value of exports of ICT equipment and devices by country



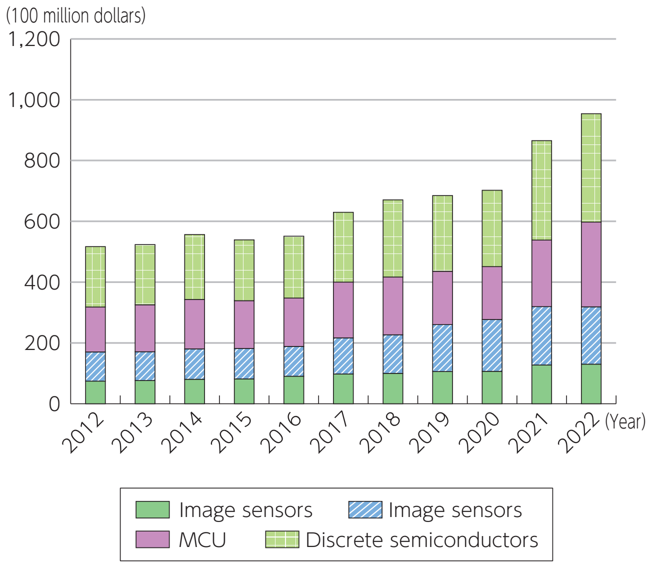
(Source) UNCTAD "UNCTAD STAT"

18. Changes in the value of imports of ICT equipment and devices by country



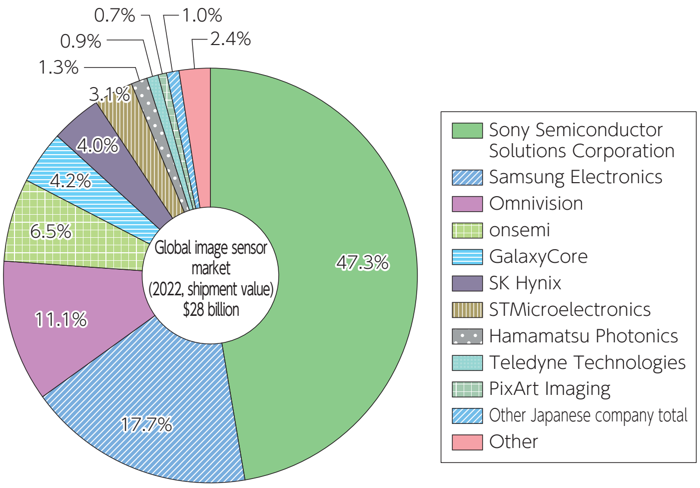
(Source) UNCTAD "UNCTAD STAT"

19. Changes in global semiconductor market (value of shipments)



(Source) Omdia

20. Changes in Global imaging sensor market share (value of shipments in 2022)

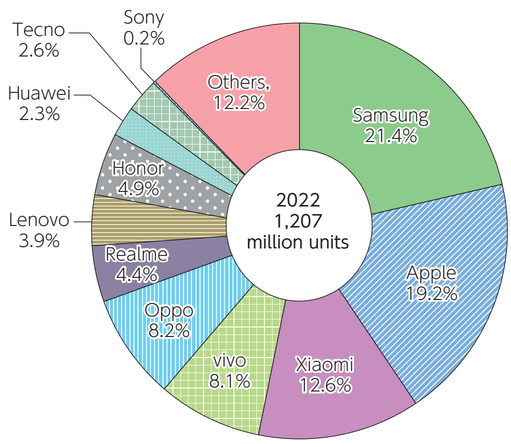


(Source) Omdia

21. Changes in Japan's semiconductor market (value of shipments)

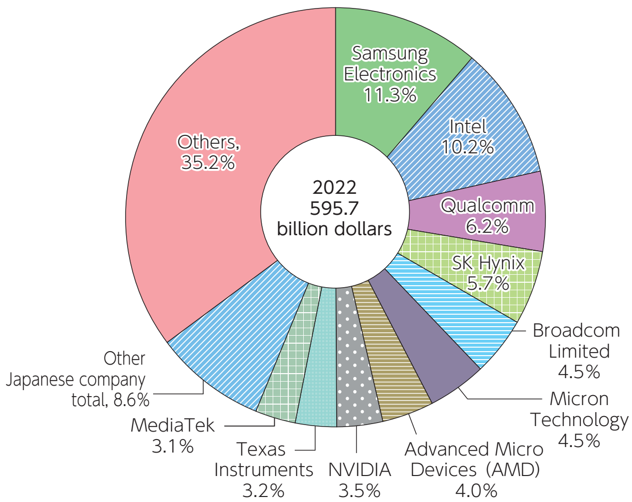
(Source) Omdia

22. Changes in the global smartphone market share



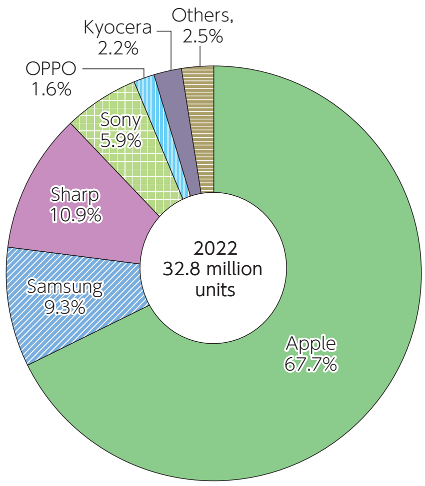
(Source) Omdia

23. Changes in the global semiconductor market share



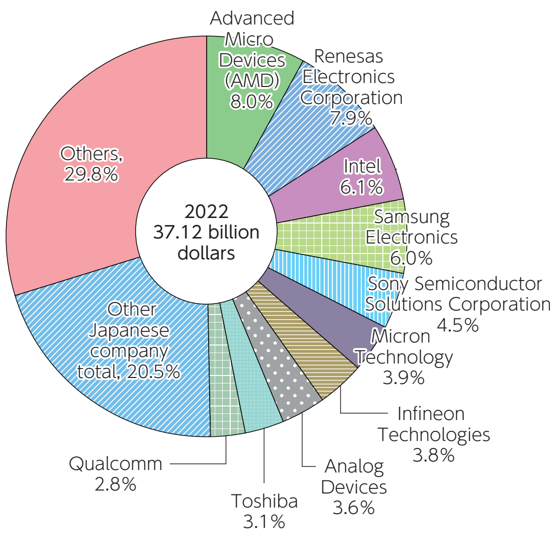
(Source) Omdia

24. Japanese smartphone market share



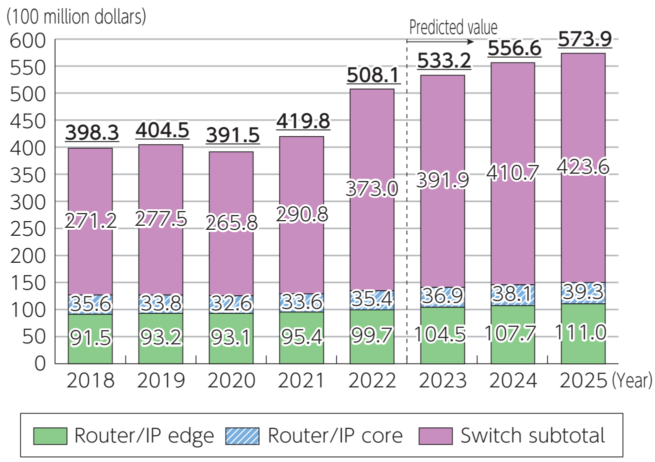
(Source) Omdia

25. Japanese semiconductor market share



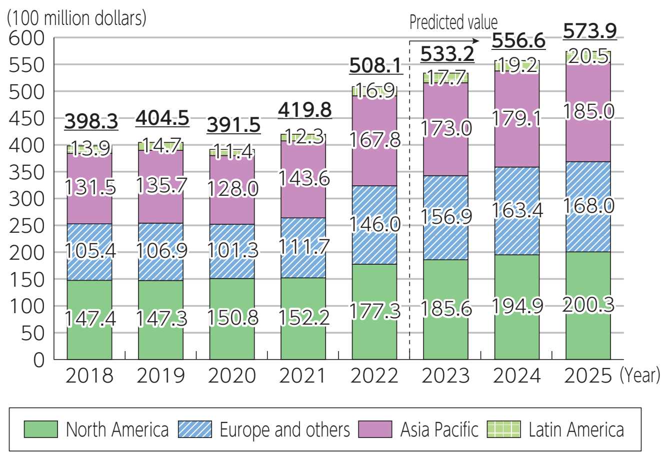
(Source) Omdia

26. Changes and forecasts for the size of the global router/switch market (by category)



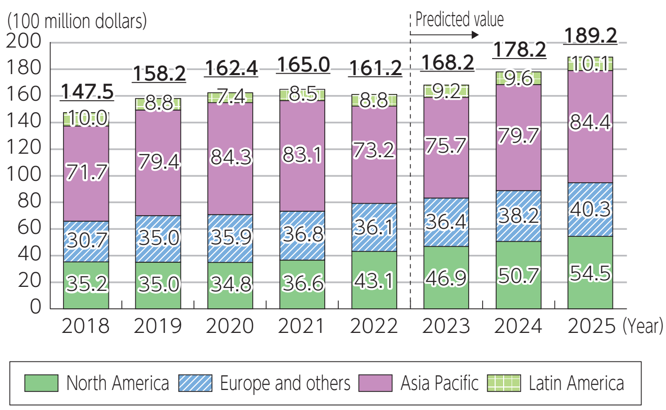
(Source) Omdia

27. Changes and forecasts for the size of the global router/switch market (by region)



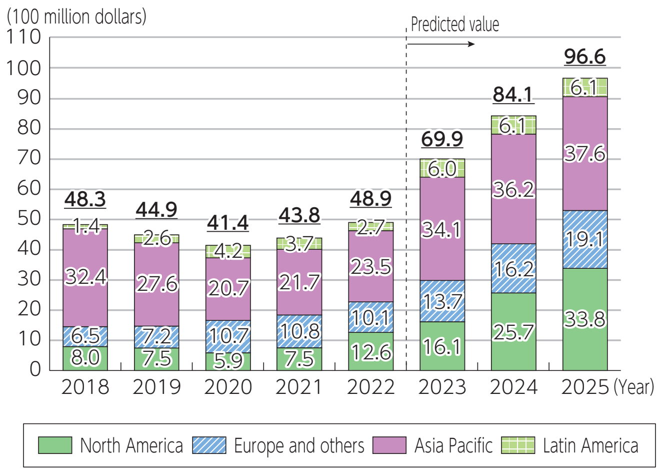
(Source) Omdia

28. "Changes and forecasts for the size of the global optical transmission equipment market"



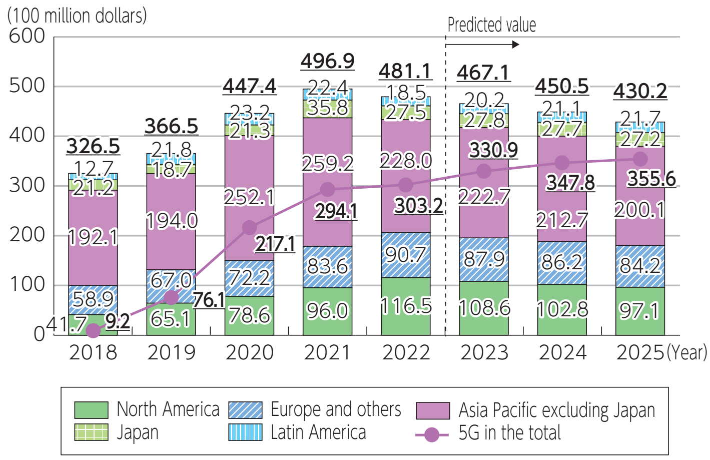
(Source) Omdia

29. Changes and forecasts for the size of the global FTTH equipment market



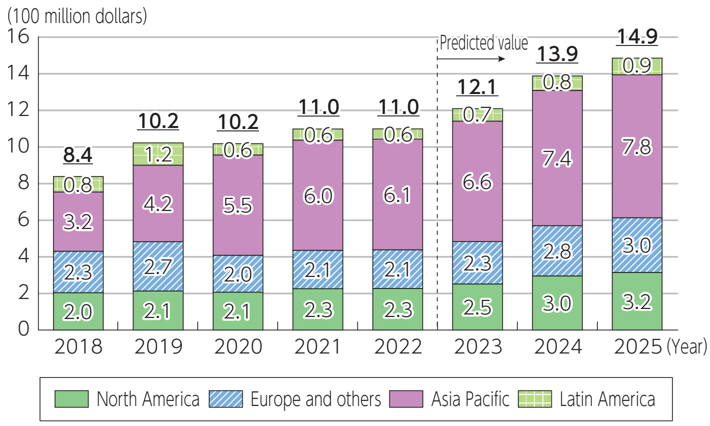
(Source) Omdia

30. Changes and forecasts for the size of the global macrocell base station market



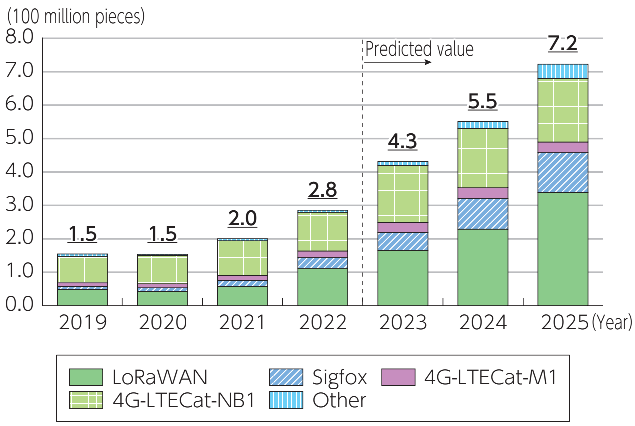
(Source) Omdia

31. Changes and forecasts for the size of the global indoor small cell market



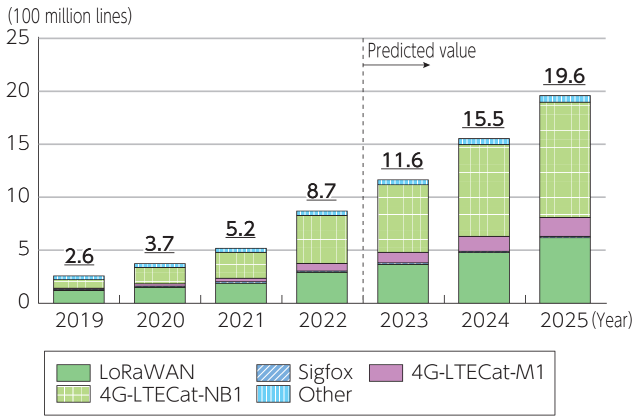
(Source) Omdia

32. Changes and forecasts for the number of global shipments of IC for LPWA module



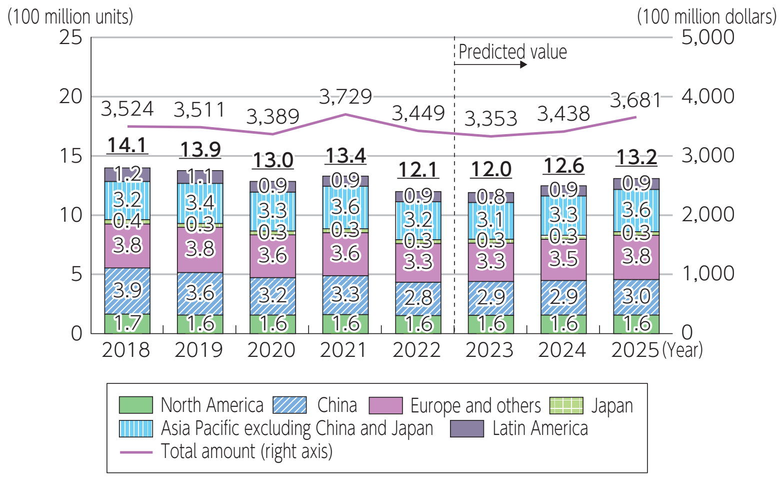
(Source) Omdia

33. Changes and forecasts for the number of global LPWA connection lines



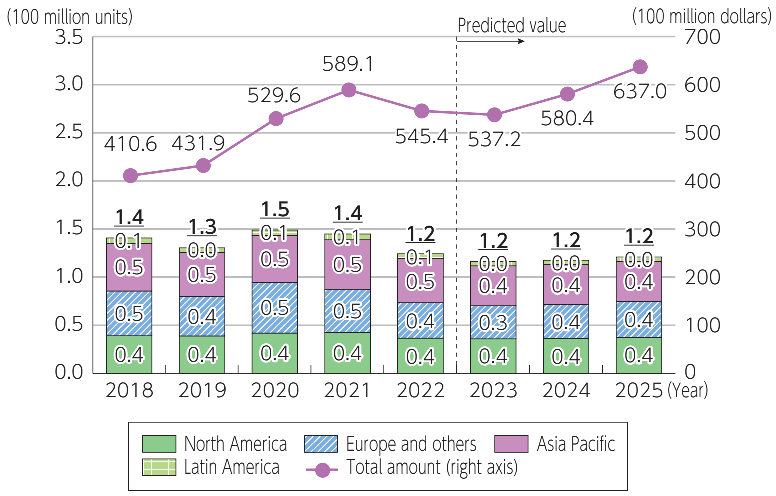
(Source) Omdia

34. Changes and forecasts for the size of the global smartphone market and the number of shipments



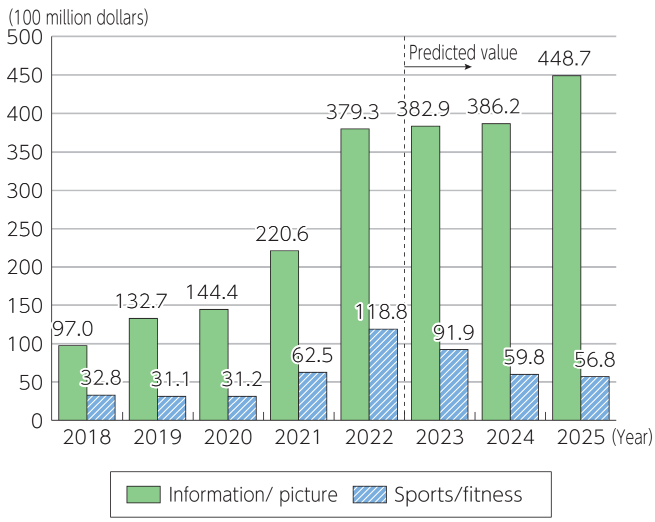
(Source) Omdia

35. Changes and forecasts for the size of the global tablet market and the number of shipments



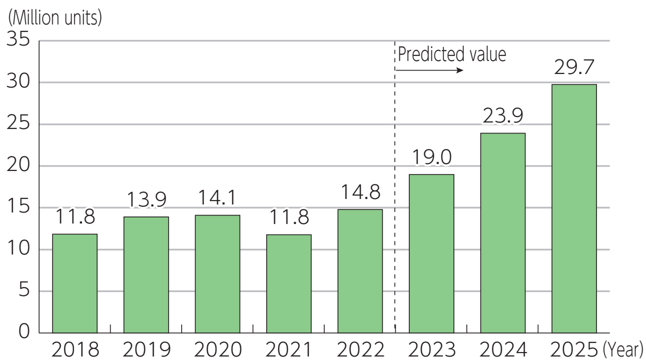
(Source) Omdia

36. Changes and forecasts for the size of the global wearable terminal market



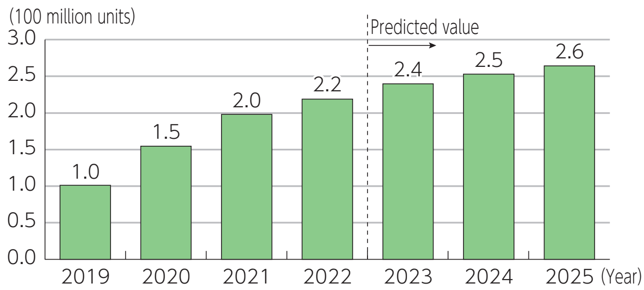
(Source) Omdia

37. Changes and forecasts for the size of the global domestic/consumer robot market and the number of shipments



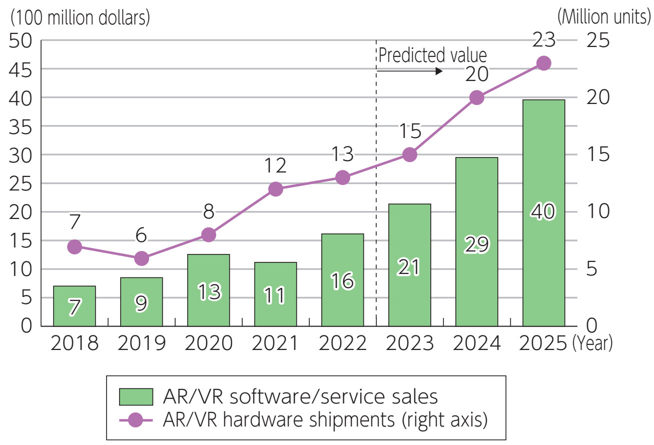
(Source) Omdia

38. Changes and forecasts for the number of global AI speaker (smart speaker) shipments



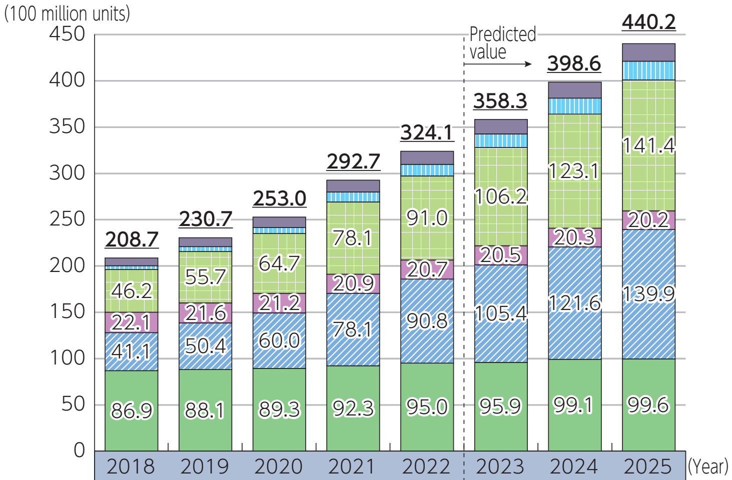
(Source) Omdia

39. Changes and forecasts for the size of the global AR/VR market and the number of shipments



(Source) Omdia

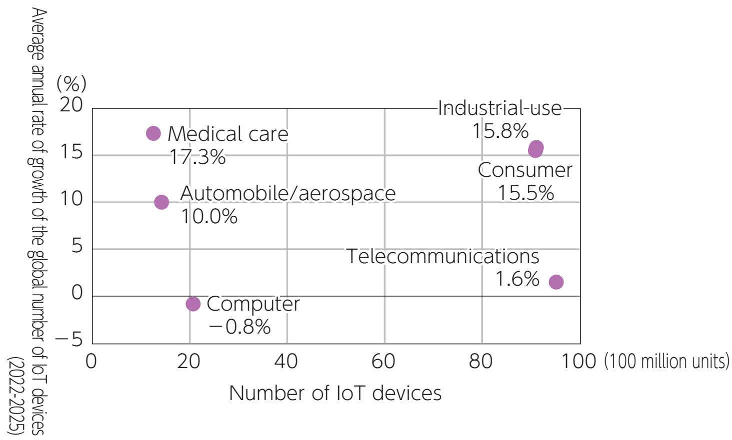
40. Changes and forecasts for the number of global IoT devices



	2018	2019	2020	2021	2022	2023	2024	2025 (Year)
合計	208.7	230.7	253.0	292.7	324.1	358.3	398.6	440.2
Automobile/aerospace	8.5	9.8	11.3	12.7	14.2	15.7	17.3	18.9
Medical care	4.0	5.1	6.5	10.7	12.5	14.6	17.2	20.2
Industrial use	46.2	55.7	64.7	78.1	91.0	106.2	123.1	141.4
Computer	22.1	21.6	21.2	20.9	20.7	20.5	20.3	20.2
Consumer	41.1	50.4	60.0	78.1	90.8	105.4	121.6	139.9
Telecommunications	86.9	88.1	89.3	92.3	95.0	95.9	99.1	99.6

(Source) Omdia

41. Global number and growth-rate forecasts for IoT devices by sector/industry



(Source) Omdia

Section 6

1. Efforts by Japanese telecom operators to utilize and introduce satellites, etc. (Figure4-6-1-1 in White Paper)

2022

Company name	Major business	Country	"Market capitalization (100 million dollars)"
Apple	Hardware, software, services	US	28,282
Microsoft	Cloud service	US	23,584
Alphabet/Google	Search engine	US	18,215
Amazon.com	Cloud service, e-commerce	US	16,353
Meta Platforms/ Facebook	SNS	US	9,267
NVIDIA	Semiconductor	US	6,817
Taiwan Semiconductor Manufacturing	Semiconductor	Taiwan	5,946
Tencent	SNS		5,465
Visa	Payment	US	4,588
Samsung Electronics	Hardware	Korea	4,473
Mastercard	Payment	US	3,637
Alibaba	e-commerce		3,589
Walt Disney	Media	US	2,811
Cisco Systems	Hardware, security	US	2,578
Broadcom	Hardware, semiconductor	US	2,557

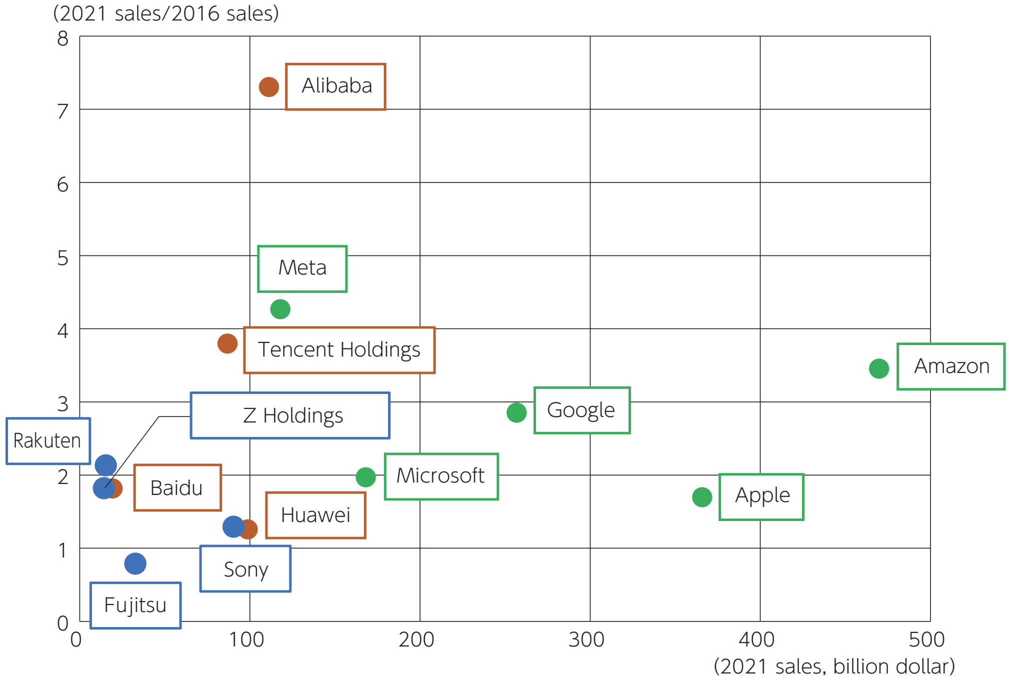
2023

	Company name	Major business	Country	"Market capitalization (100 million dollars)"
	Apple	Hardware, software, services	US	25,470
	Microsoft	Cloud service	US	20,890
	Alphabet/Google	Search engine	US	13,030
	Amazon.com	Cloud service, e-commerce	US	10,270
↑	NVIDIA	Semiconductor	US	6,650
↓	Meta Platforms/ Facebook	SNS	US	5,370
↑	Tencent	SNS		4,690
↑	Visa	Payment	US	4,600
↓	Taiwan Semiconductor Manufacturing	Semiconductor	Taiwan	4,530
↑	Mastercard	Payment	US	3,440
↓	Samsung Electronics	Hardware	Korea	3,280
↑	Broadcom	Hardware, semiconductor	US	2,610
↓	Alibaba	e-commerce		2,570
new	Oracle	Cloud service	US	2,450
↓	Cisco Systems	Hardware, security	US	2,100

* The figures for 2022 are as of January 14, 2022, and the figures for 2023 are as of March 31, 2023.

(Source) Acquired from Wright Investors' Service, Inc.

2. Sales of platform providers in Japan, the U.S. and China (Figure4-6-1-2 in White Paper)



(Source) Prepared based on Statista data

3. Overseas regulation to ensure a competitive environment of the markets

Region	Summary of efforts
Japan	●In February 2021, the "Act on Improving Transparency and Fairness of Digital Platforms" was enacted. Each year, digital platform providers are required to submit reports with self-assessments on the disclosure of terms and conditions of transactions, the development of voluntary procedures and systems, and measures that have been implemented. ●In April 2021, Amazon, Rakuten, Yahoo, Apple, iTunes, and Google were designated as "specified digital platform providers." ●In October 2022, Google, Meta, and Yahoo were designated as "specified digital platform providers" for digital advertising.
US	●In July 2019, the Department of Justice (DoJ) announced a major antimonopoly investigation of major online platform providers (GAFA firms), and a hearing on antitrust laws with respect to the GAFA firms was held before the U.S. House Committee on the Judiciary in July 2020. ●In June 2021, bipartisan members of the House of Representatives introduced five bills to tighten regulations on GAFA, none of which have been voted on. ●In January 2023, the Department of Justice sued Google for antitrust violations in the Internet advertising market. In addition to Google, the GAFA firms have been sued for antitrust violations.
China	●In December 2020, the Central Economic Work Conference included strengthening of regulation on platformers in its eight major tasks and stated "strengthen antitrust and prevent disordered capital expansion." * ●In January 2022, the "Digital Economy Development Plan for the 14th Five-Year Plan" was released, with the main initiatives for the enhancement project including the establishment of a supervisory management system for digital services and the strengthening of control over platforms. ●In February 2022, the Network Safety Review Valuation Act came into effect, making it mandatory for network platform operators with personal information of more than one million people to submit an application when making an IPO overseas, and switching to a pre-screening system. ●In August 2022, the Anti-Monopoly Law was amended to include measures aimed at platform operators that prohibit operators with a dominant market position from abusing their position by using means such as data, algorithms, technology, and platform rules.
Europe	●In December 2020, the Digital Markets Act and the Digital Services Act were announced as regulations with major IT services companies such as the GAFA firms in mind. The Digital Markets Act was adopted in March 2022, and the Digital Service Act was adopted in April. ●In February 2022, the Data Act was proposed to clarify the rules for the use of data generated from IoT devices and create an environment where more data can be used by society as a whole.

* https://www.tkfd.or.jp/research/detail.php?id=3908

(Source) Based on IPA "DX White Paper 2023"
https://www.ipa.go.jp/publish/wp-dx/dx-2023.html

4. Overseas regulation on illegal/harmful contents on the Internet

Country	Initiative
US	●Section 230 of the Communications Decency Act of 1996 exempts platform operators from liability for the content of their communications. However, platform operators have recently been asked to attend hearings in the U.S. Congress to discuss Section 230 of the Communications Decency Act and measures to combat illegal and harmful information on the Internet. ●In May 2020, President Trump signed the "Executive Order on Preventing Online Censorship," which considered limiting the arbitrary removal of user posts by platform operators. However, following Trump's election loss, the FCC stated that it had no intention of clarifying Section 230 of the Act. ●In January 2021, platform operators froze Trump's accounts after his supporters stormed the Capitol Building over the election results.
Europe	●In December 2020, the European Commission published draft legislation for the Digital Service Act (DSA). Legislation was agreed upon in April 2022 after negotiations with the European Parliament and the European Council. ●The DSA came into effect in November 2022, holding intermediary service providers (such as ISPs, hosting service providers, and online platform operators) responsible for the distribution of illegal content, as well as requiring them to protect users, depending on the size of the provider.
UK	●In April 2019, the Department for Digital, Culture, Media and Sport and the Home Office jointly published the "Online Harms White Paper." It formulates a statutory duty of care to require action against harmful content and conduct online, and requires platform operators to comply with this duty of care. ●In December 2020, the government introduced regulations according to the scale of services, based on public comments to "Online Harms White Paper." ●In March 2022, the Department for Digital, Culture, Media and Sport introduced legislation which states that, rather than relying on self-regulation by platform providers and other online companies, the government would regulate and Ofcom would monitor whether the regulations were followed.
France	●In May 2020, the National Assembly passed an anti-hate speech law to combat hate speech online. However, after it was referred to the Constitutional Council for a constitutional review, most of its provisions were declared unconstitutional because they could encourage excessive removal of content. The provisions that were deemed unconstitutional were removed and the law came into effect in June 2020.
Germany	●In October 2017, the Network Enforcement Act was passed, which obliges social media services with more than two million registered users in Germany to publish transparency reports once every six months. ●The Federal Office of Justice has deemed failure to remove content due to "incomplete system functionality" as a breach of public order, and fined Facebook two million euros for content deemed inadequate in the transparency report the company filed in the first half of 2018. ●In April 2021, the revised Network Enforcement Act came into force, making it mandatory for social media platforms to not only delete posts on certain serious matters, but also to report the content of posts that meet criminal constitution requirements along with the IP addresses of the posters to investigative authorities. ●In June 2021, the Network Enforcement Act was amended to include video-sharing platforms and to provide opportunities to raise objections to revise decisions to remove content or disable access.
Australia	●The "Online Safety Act" was passed in July 2021. Users can now file complaints with the eSafety Commissioner about online violence targeting adults or posts that promote violent behavior. The eSafety Commissioner's obligation to respond to takedown notices has been reduced to 24 hours, and civil penalties can now be imposed for failure to comply with takedown or evidence notice requirements for certain content.

(Source) Based on MIC "Second Summary of the Platform Service Study Group"
https://www.soumu.go.jp/menu_news/s-news/01kiban18_01000173.html

5. Trends with major platform providers in the U.S. and China (Figure4-6-2-1 in White Paper)

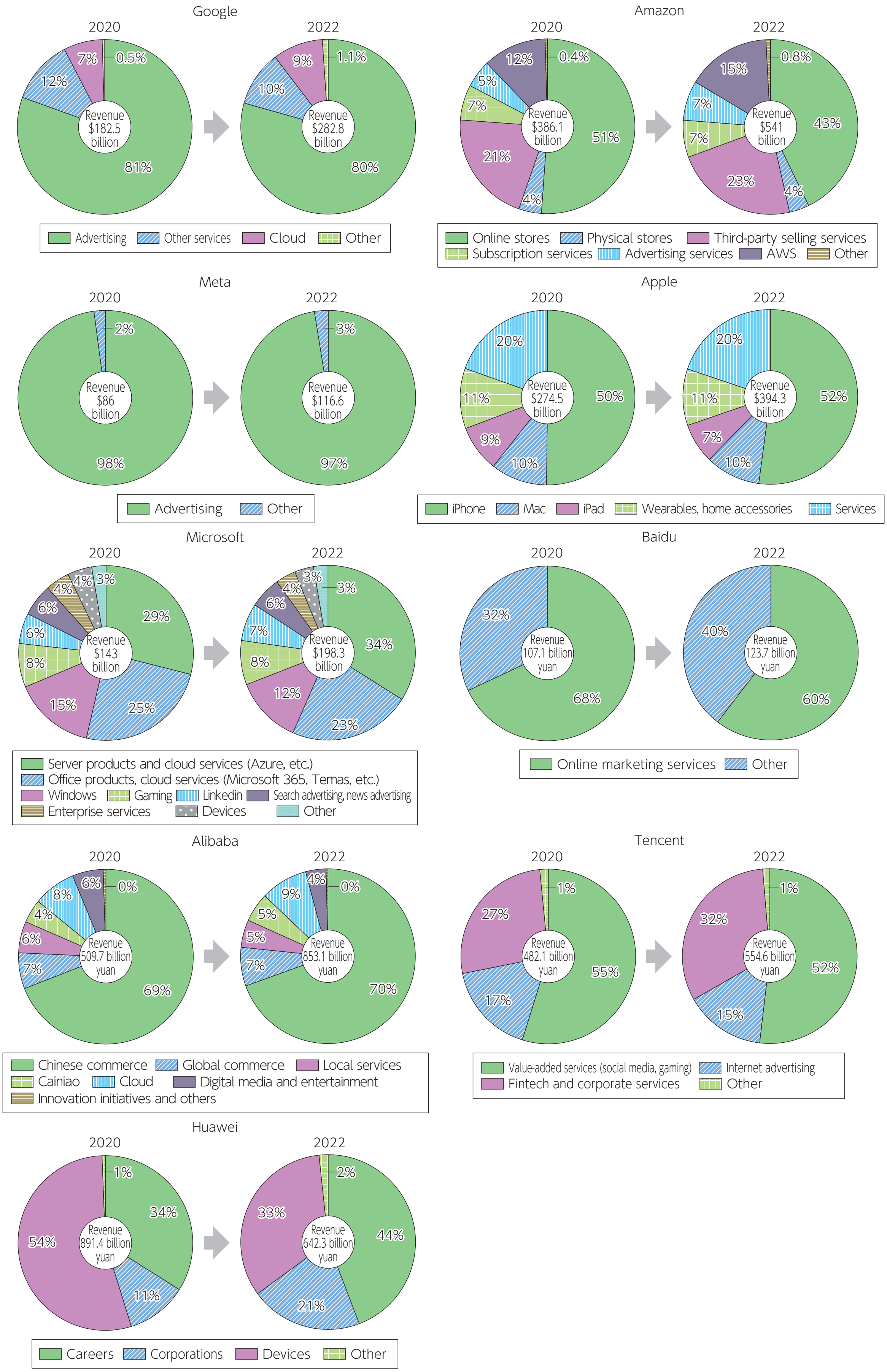
<U.S.>

Key areas	Company	Business overview and areas	New areas and businesses
Advertising, search	Alphabet (Google)	Provides the largest search engine service in the world, and is developing a massive economic sphere including cloud and devices focused mainly insearch advertising.	Recognizing the threat of generative AI to search engines, the company has been strengthening its search engine using AI technology, including the launch of the "Bard" chat AI linked with Google search.
E-commerce	Amazon	One of the largest e-commerce operators in the world, with a huge economic sphere centered on cloud services (AWS).	The company is strengthening its cloud services and advertising services on e-commerce sites.
Social media, apps	Meta (Facebook)	The company provides one of the world's largest social media services, and in 2021 changed its name to Meta Platforms to promote its metaversebusiness.	The company is focusing on its metaverse business as a pillar of its future amid a slight slowdown in advertising revenue on social media.
Communications devices and terminals	Apple	The world's largest manufacturer and retailer of Internet and digital home appliances, the company has developed a massive economic sphere centered on iPhones and other devices.	The company is expanding its business with the iPhone at its core, and in recent years has focused on expanding in the healthcare area with Apple Watch.
Terminals, cloud	Microsoft	One of the largest software vendors in the world, the company has a massive economic sphere centered on software and cloud services such as Windows and Office.	The company is focusing on using generative AI, including expanding its partnership with OpenAI.

<China>

Key areas	Company	Business overview and areas	New areas and businesses
Advertising, search	Baidu	The largest search engine operator in China, the company is now focusing on artificial intelligence (AI) technology based on search engines and expanding into areas such as deep learning, autonomous driving, and AI chips.	On March 16, 2023, the company announced the "ERNIE Bot" generative AI technology based on the latest large language model. It now plans to implement generative AI to own products and other's.
E-commerce	Alibaba	The world's largest e-commerce operator based on gross merchandise volume, the company is now leveraging data technology to provide services ranging from marketing to logistics and payments.	On April 11, 2023, Alibaba Cloud, a group company, announced "Tongyi Qianwen," a new AI language model for companies, and is currently developing its AI business.
Social media, apps	Tencent	China's largest social media app platformer, the company has built a massive ecosystem to provide payment services, games, and other service based on "WeChat."	On November 30, 2022, the company announced the "Kurumazukumo" cloud solution specializing in smart mobility, and then began providing mapping services necessary for autonomous driving, in order tofocus on the mobility field.
Communications devices and terminals	Huawei	A leading global communications device vendor with operations in four key areas: telecom networks, IT, smart devices, and cloud services.	In June 2021, Huawei Digital Power Technologies, a subsidiary providing digital energy products and solutions, was established to expand into the energy field, including green power generation.

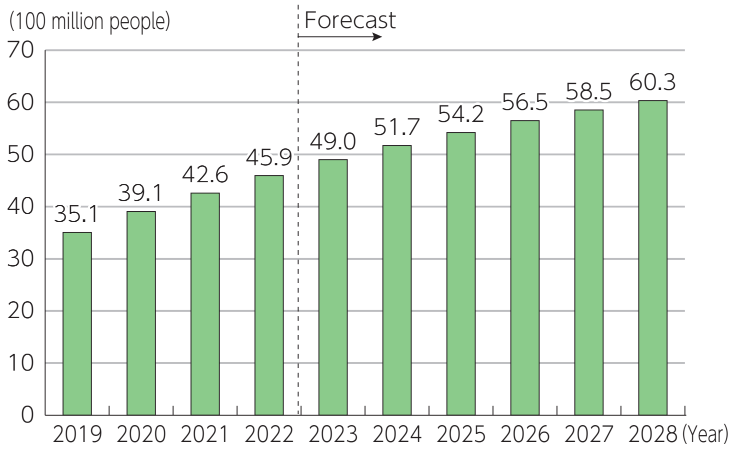
6. Sales of major platform providers in the U.S. and China by business



(Source) Prepared based on financial results material released by each company

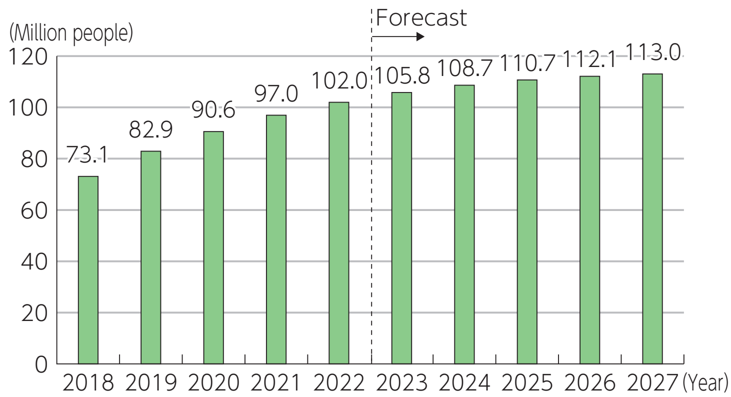
Section 7

1. Changes and forecast in the number of global social media users (Figure4-7-1-1 in White Paper)



(Source) Statista

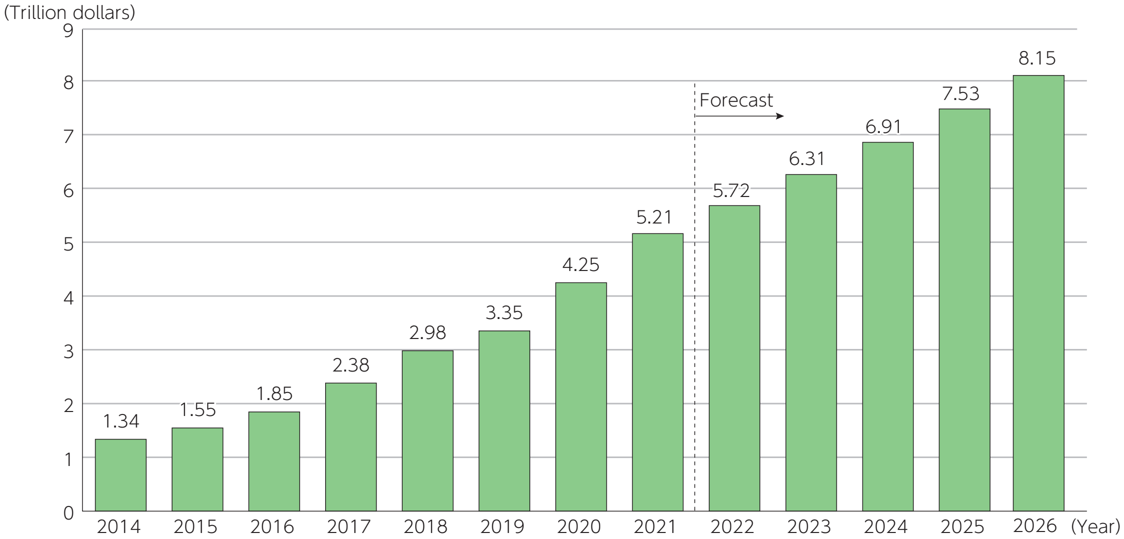
2. Changes and forecast in the number of social media users in Japan (Figure4-7-1-2 in White Paper)



* Number of people who use social media sites and applications at least once a month, with or without an account

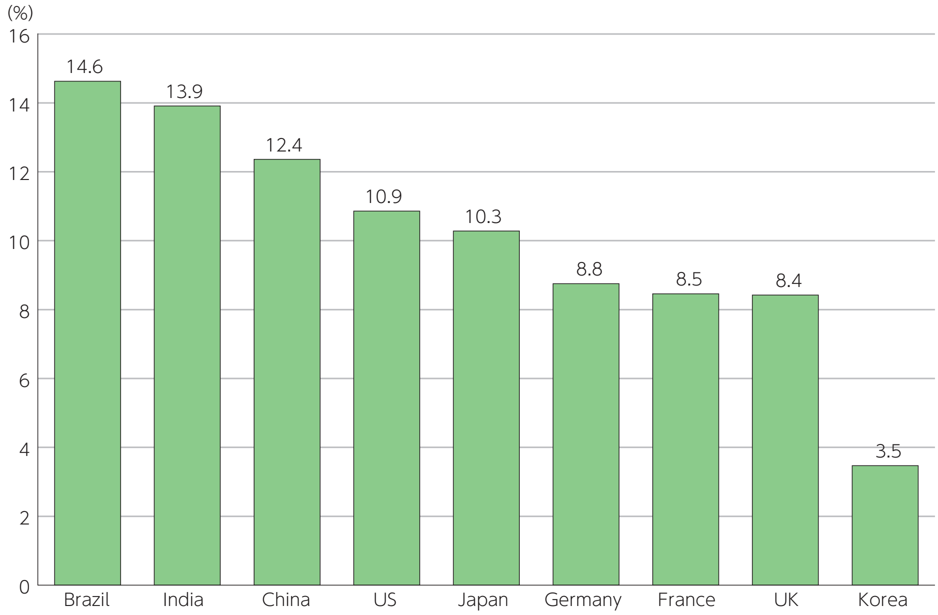
(Source) Statista

3. Changes and forecast in sales in the global EC market



(Source) Statista (eMarketer)
https://www.statista.com/statistics/379046/worldwide-retail-e-commerce-sales/

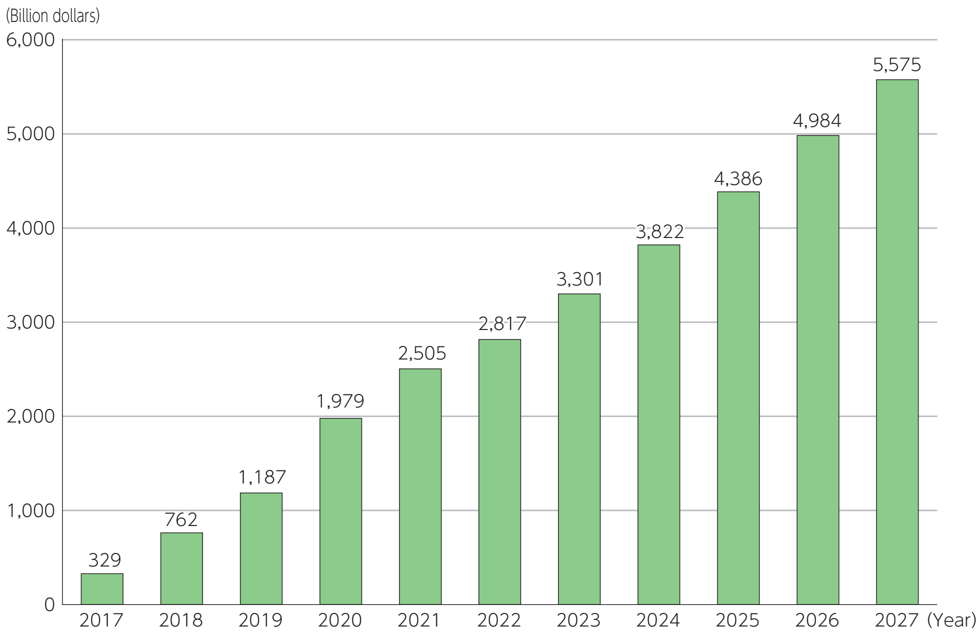
4. Growth rate of EC market by country (2023 to 2027)



* Compound annual growth rate from 2023 to 2027

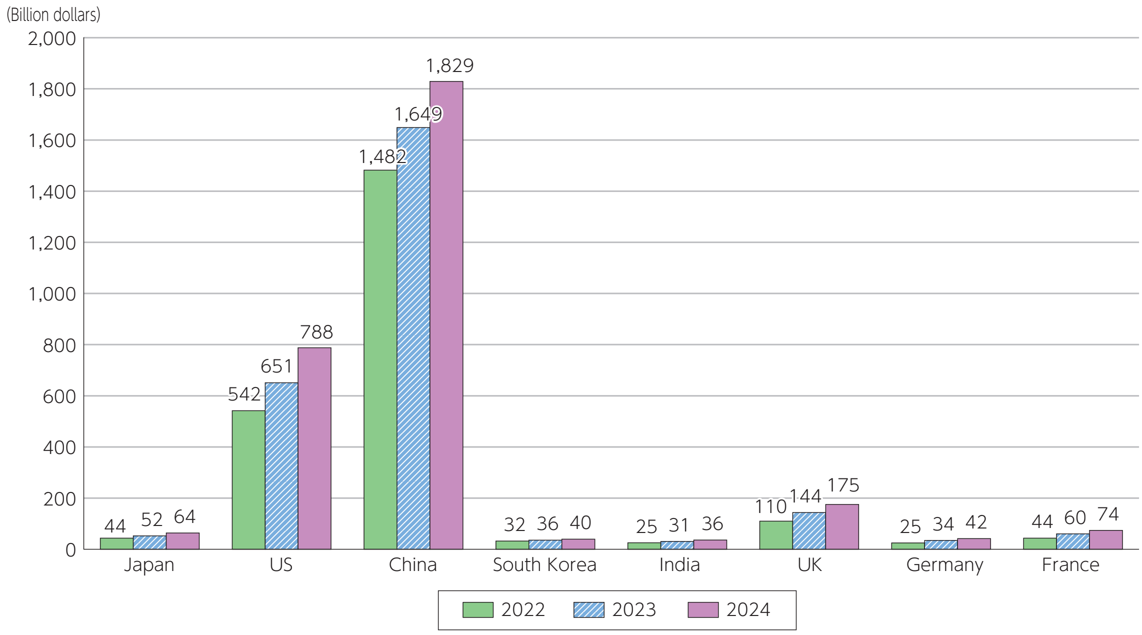
(Source) Statista [Statista Digital Market Insights]
https://www.statista.com/forecasts/220177/b2c-e-commerce-sales-cagr-forecast-for-selected-countries

5. Changes and forecasts for transaction values of global mobile payment



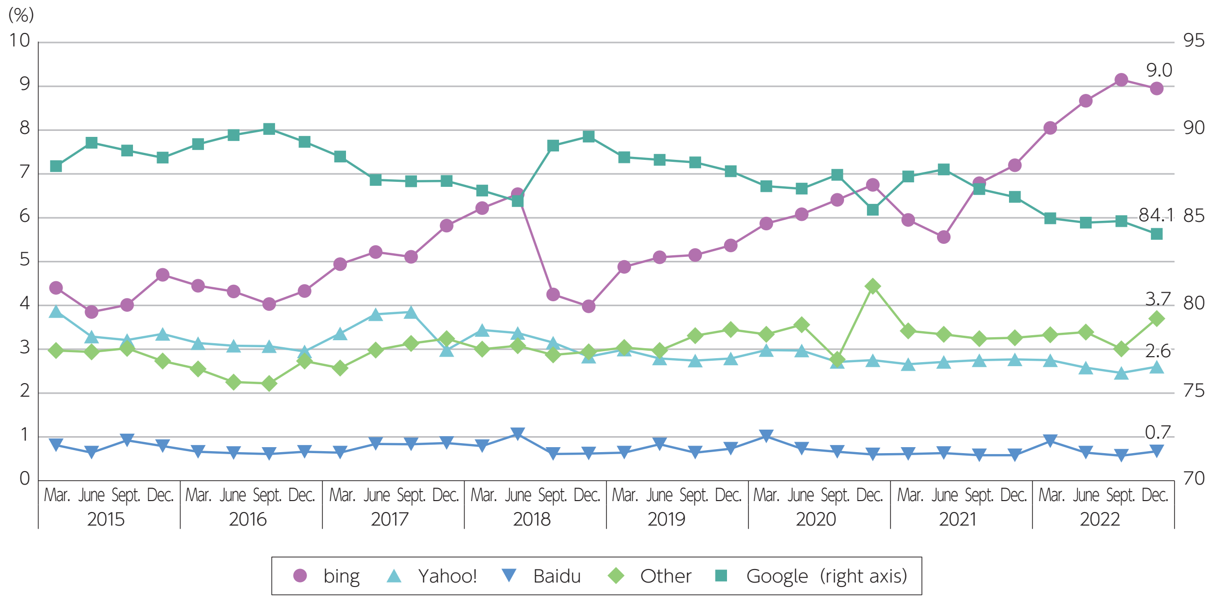
(Source) Statista
https://www.statista.com/outlook/dmo/fintech/digital-payments/mobile-pos-payments/worldwide#transaction-value

6. Transaction values of mobile payment in each country (2021)



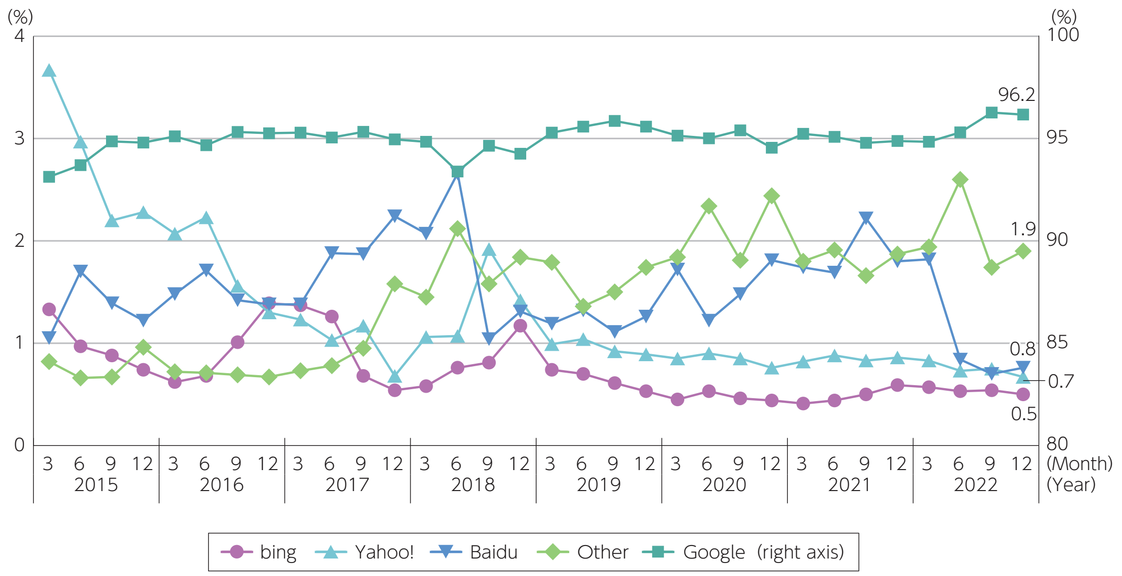
(Source) Statista
https://www.statista.com/outlook/dmo/fintech/digital-payments/mobile-pos-payments/worldwide#global-comparison

7. Changes in global market share of search engines (Desktop)



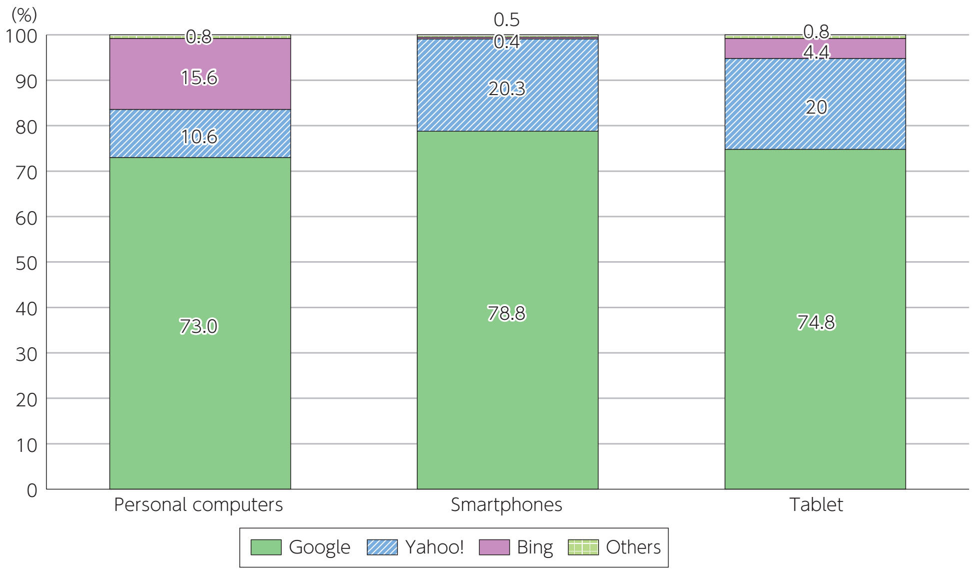
(Source) Statista (StatCounter)
https://www.statista.com/statistics/216573/worldwide-market-share-of-search-engines/

8. Changes in global market share of search engines (mobile)



(Source) Statista (StatCounter)
https://www.statista.com/statistics/216573/worldwide-market-share-of-search-engines/

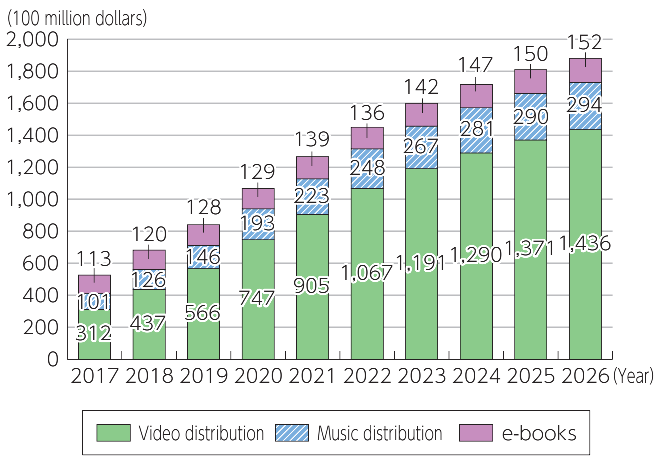
9. Market share of search engines in Japan



* PCs: As of September 2022; Smartphones and tablets: As of March 2022

(Source) Statista (StatCounter)
https://www.statista.com/statistics/1270637/japan-leading-desktop-search-engines/
https://www.statista.com/statistics/1270599/japan-leading-mobile-search-engines/
https://www.statista.com/statistics/1270602/japan-leading-tablet-search-engines/

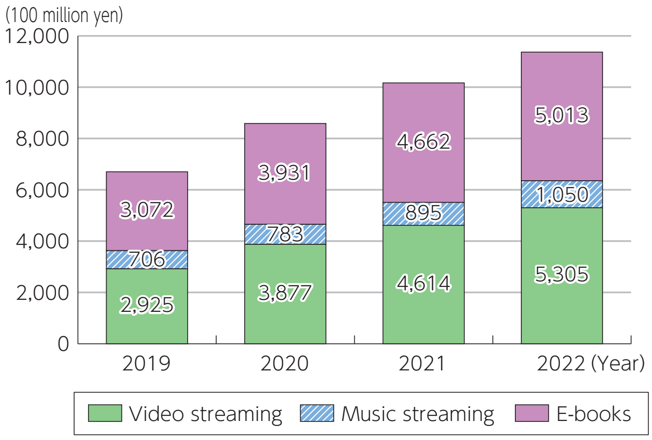
10. Changes and forecast in size of global video streaming, music streaming and E-book market



* Video streaming and e-books: Forecast for 2023 onward
* Music streaming: Forecast for 2022 onward

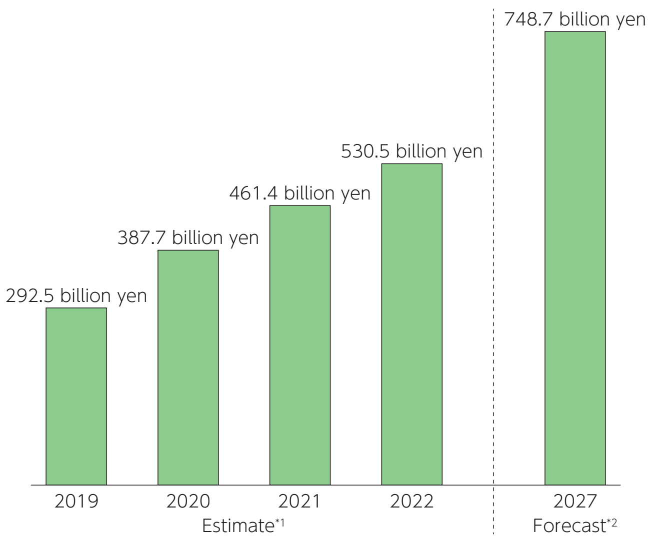
(Source) Omdia, Statista
https://www.statista.com/outlook/dmo/digital-media/epublishing/worldwide#revenue

11. Changes in the size of the Japanese video streaming, music streaming, and e-book markets (Figure4-7-4-1 in White Paper)



(Source) Prepared based on GEM Partners' "Video Streaming (VOD) Market Forecast for Five Years (2022 - 2026) Report," the Recording Industry Association of Japan's "Japan Recording Industry 2023," and the All Japan Magazine and Book Publisher's and Editor's Association and Research Institute for Publications' (2023) "Publishing Monthly Report.

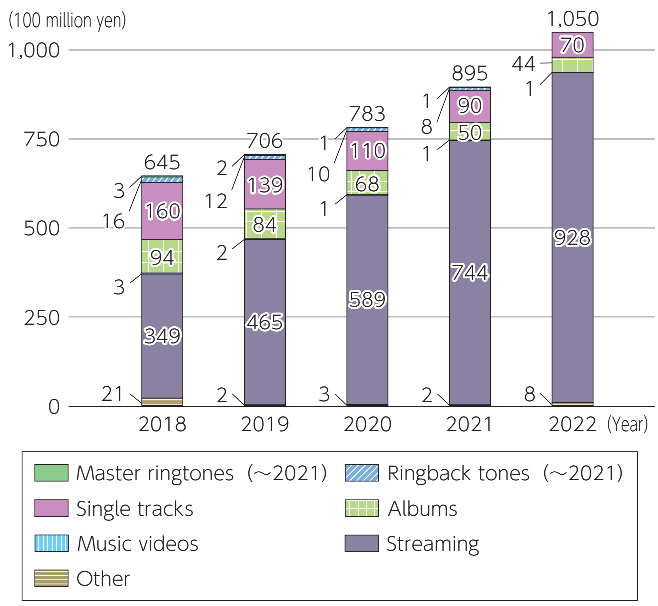
12. Changes in size of Japanese video streaming market



* 1 Total amount paid by consumers to video streaming service providers regardless of contract type
* 2 Based on the results of the consumer survey, calculations were made for three scenarios (base, optimistic, and pessimistic) taking into consideration the spread of video streaming in Japan and the U.S., the ratio of the DVD/BD market and video streaming with regard to overall video home entertainment, and the impact of the COVID-19 pandemic. This value is based on the "base" scenario
https://gem-standard.com/columns/674

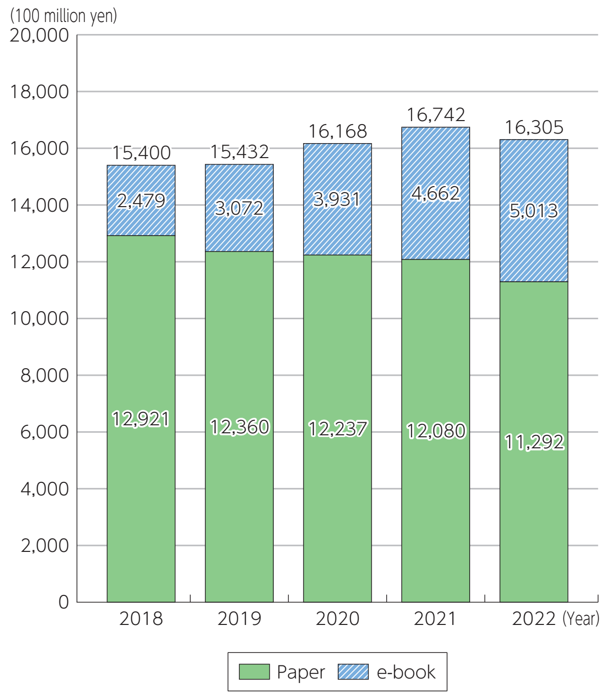
(Source) GEM Partners "Video Streaming (VOD) Market Five-Year Forecast (2022-2026) Report"
https://www.gempartners.com/news/20230217_01/

13. Changes in the music distribution market in Japan



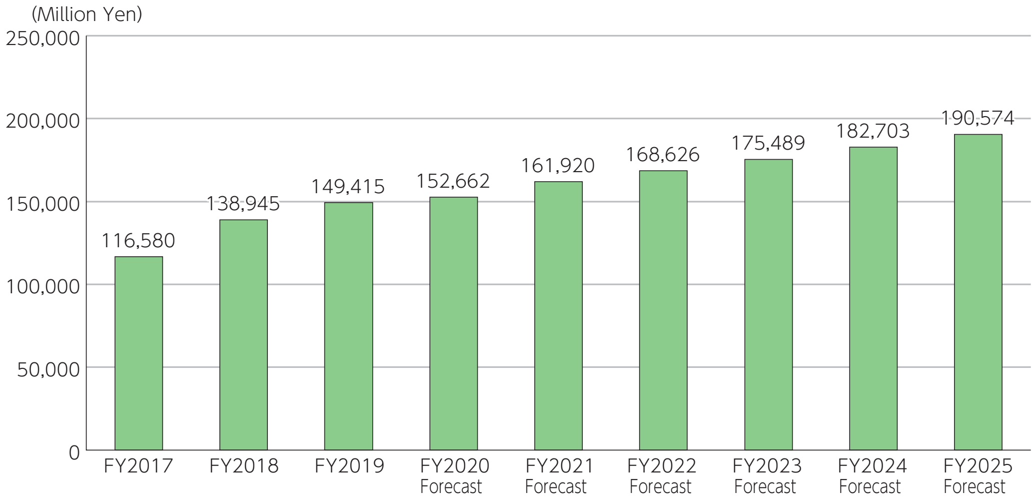
(Source) Recording Industry Association of Japan "Japanese Recording Industry 2023"
https://www.riaj.or.jp/f/pdf/issue/industry/RIAJ2023.pdf

14. Changes in the e-book market in Japan



(Source) The All Japan Magazine and Book Publisher's and Editor's Association/The Research Institute for Publications (2023), "Monthly Report of Publications"
https://shuppankagaku.com/wp/wp-content/uploads/2023/01/
%E3%83%8B%E3%83%A5%E3%83%BC%E3%82%B9%E3%83%AA%E3%83%AA%E3%83%BC%E3%82%B92301%E3%80%80.pdf

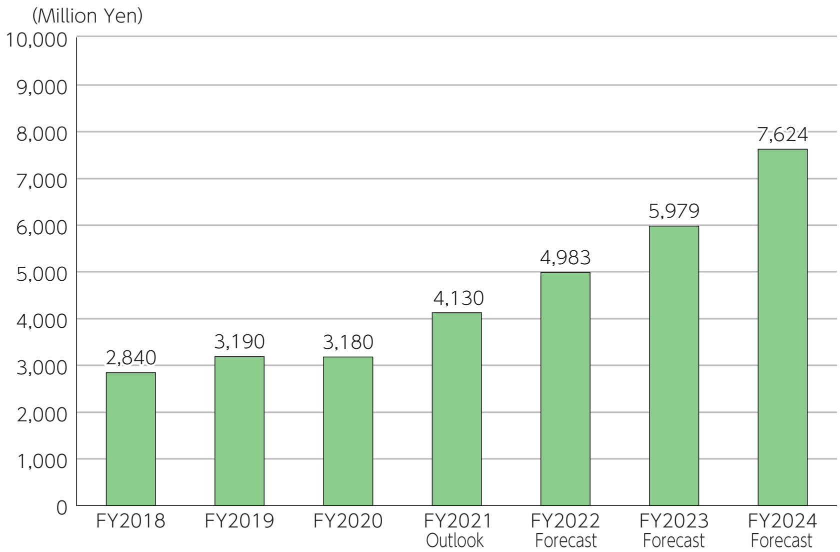
15. Transition and Forecast of Domestic Location and Geographic Information Service Market Size (Figure4-7-5-1 in White Paper)



* 1 Based on sales by business operators.
* 2 The values for fiscal 2020 and later are forecasts.
* 3 Market size was calculated based on (1) map databases, (2) GIS engines, and various GIS applications ((3) traffic related location applications, (4) store development/location advertisements, (5) spot store information/coupons/check-in, (6) location game applications, (7) IoT location applications, (8) delivery/logistics related location applications, (9) Industrial location applications, (10) location applications for infrastructure development, (11) traffic jam prevention location applications, (12) disaster prevention location applications).

(Source) Yano Research Institute Ltd., "Location and Geographic Information Service Market in Japan: Key Research Findings 2020", November 5, 2020

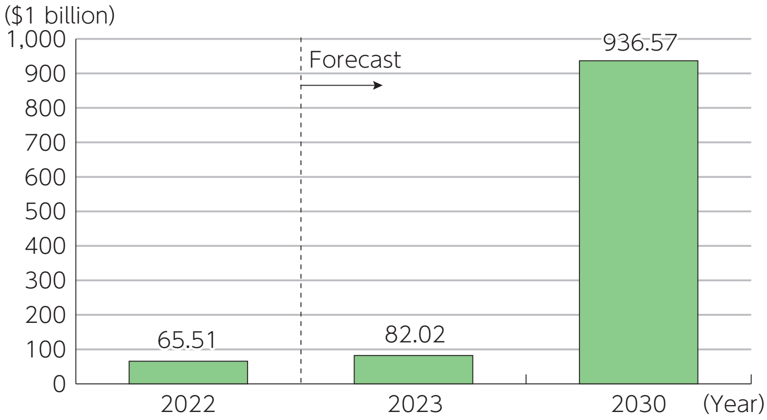
16. Transition and Forecast of Indoor Positioning Solutions Market Size (Figure4-7-5-2 in White Paper)



* 1 Based on the sales of indoor location information service and solution providers
* 2 Market size was calculated based on services and solutions that utilize indoor location information utilization using indoor positioning technology and indoor map information.
* 3 The value for fiscal 2021 is an estimate, and the values for fiscal 2022 and later are forecasts.

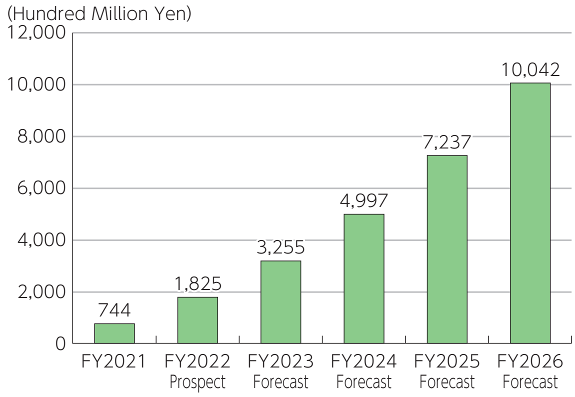
(Source) Yano Research Institute Ltd., "Indoor Positioning Solutions Market in Japan: Key Research Finding 2021", January 7, 2022

17. Changes and forecast in the size of the global metaverse market (Figure4-7-5-3 in White Paper)



(Source) Statista

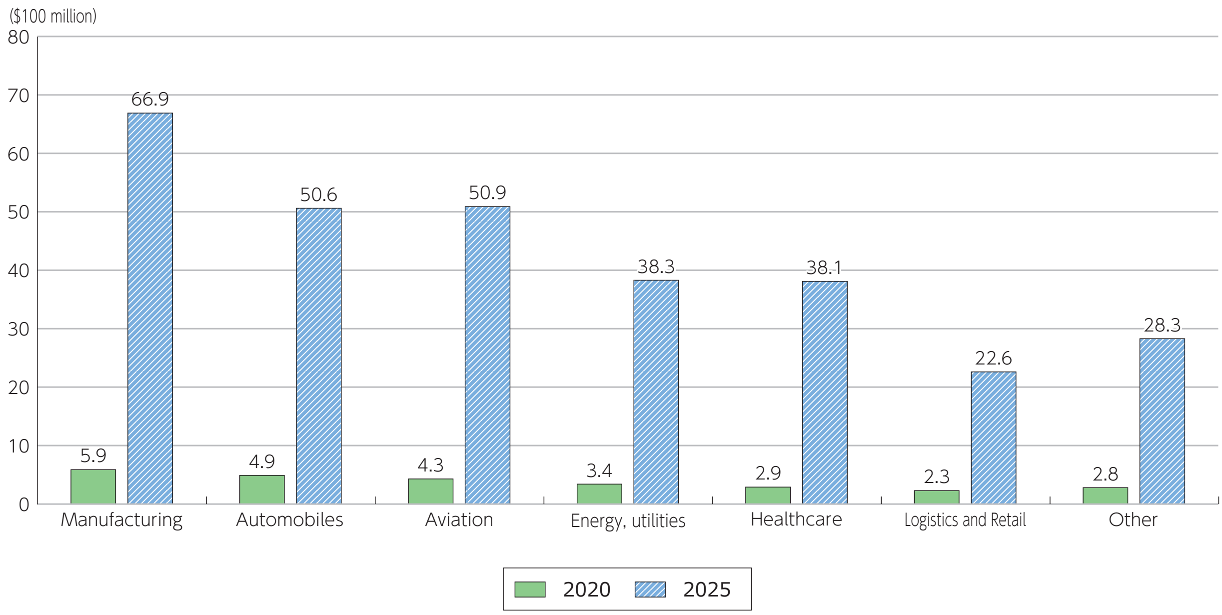
18. Domestic Metaverse Market Size Forecast (Figure4-7-5-4 in White Paper)



* 1 Based on sales by business operators.
* 2 The value for fiscal 2022 is an estimate, and the values for fiscal 2023 and later are forecasts.
* 3 The total market size is the sum of metaverse platforms, non-platforms (content, infrastructure, etc.), and XR (VR, AR, MR) equipment. Note that XR (VR, AR, MR) equipment is calculated on a sales price basis.

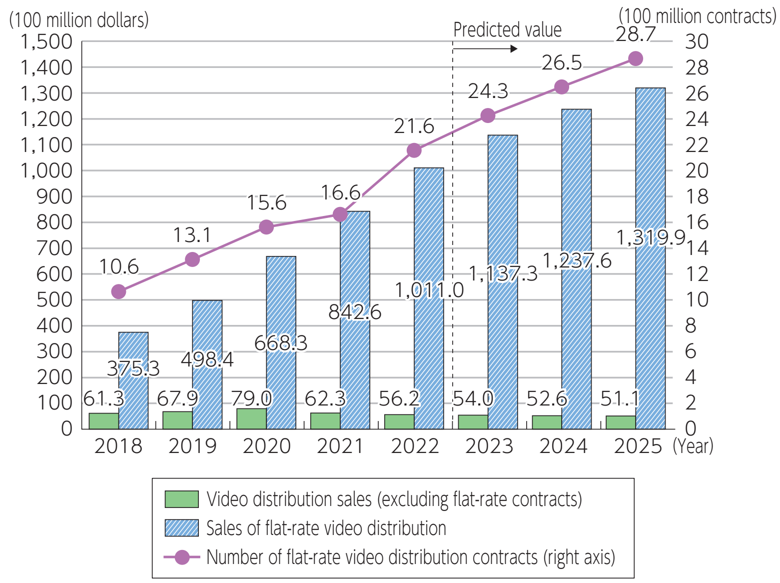
(Source) Yano Research Institute Ltd., "Metaverse Market in Japan: Key Research Findings 2022, September 21", 2022

19. Size of the global digital twin market (by industry) (Figure4-7-5-5 in White Paper)



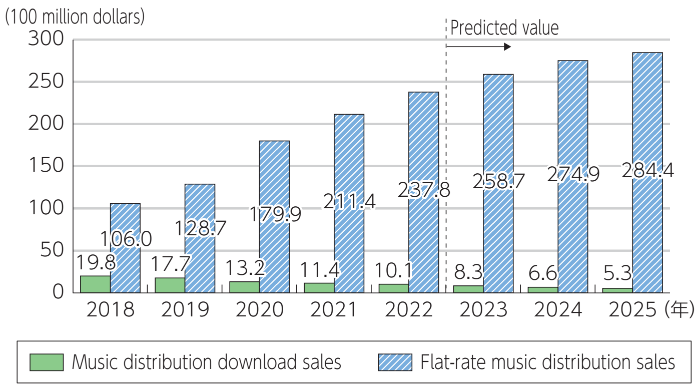
(Source) Statista (BIS Research)

20. Changes and forecasts for the size of the global video distribution markets and the number of contracts



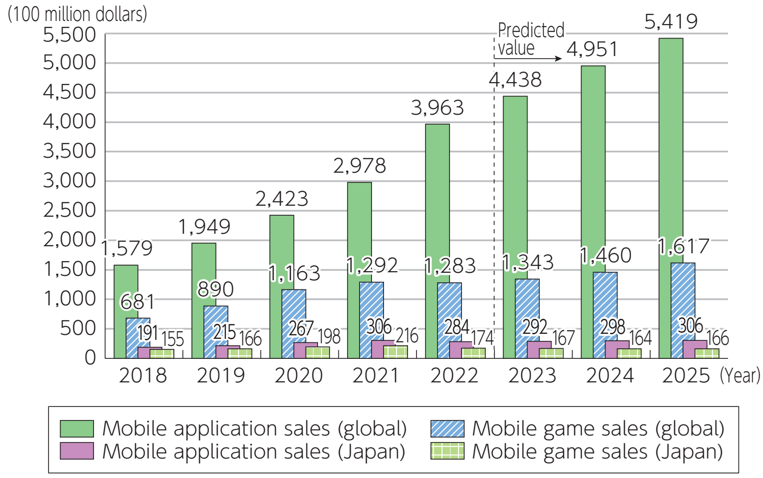
(Source) Omdia

21. Changes and forecasts for the size of the global music distribution market



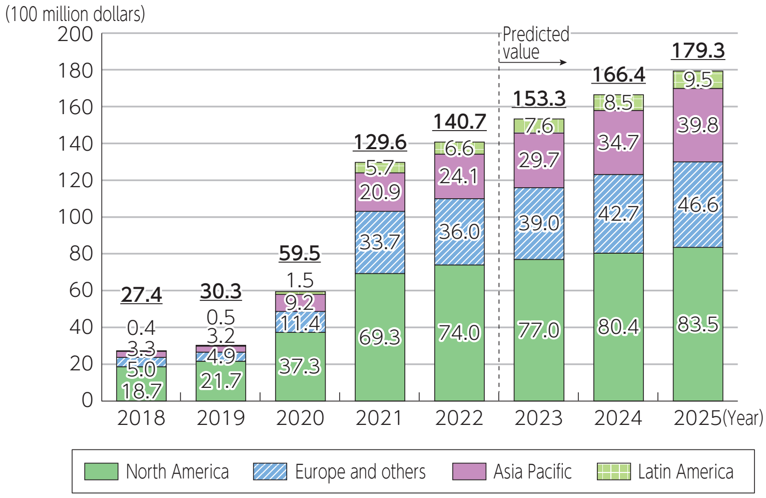
(Source) Omdia

22. Changes and forecasts for the size of the global mobile application market



(Source) Omdia

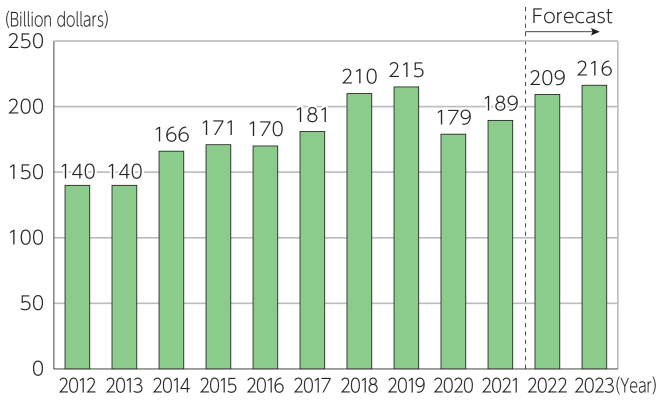
23. Changes and forecasts for the size of the global Web conference market



(Source) Omdia

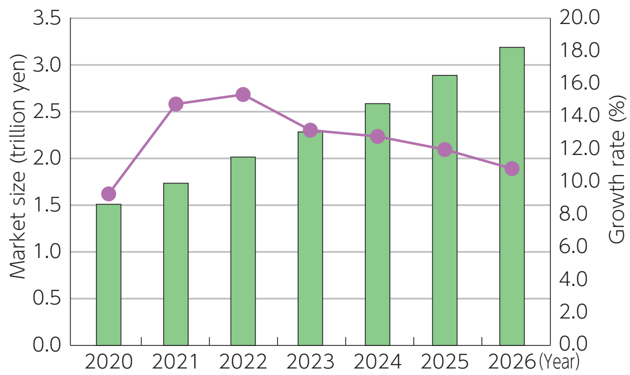
Section 8

1. Changes and forecast in the size of the global data center systems market (in terms of expenditure) (Figure4-8-1-1 in White Paper)



(Source) Statista (Gartner)

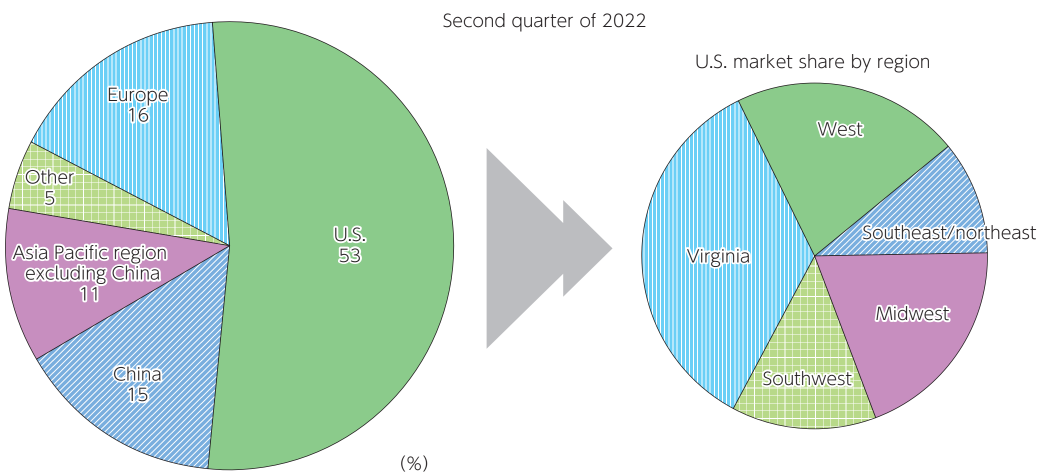
2. Changes and forecast in the size (in terms of sales) of the Japanese data center systems market (Figure4-8-1-2 in White Paper)



* *2022 is an estimate, and 2023 and beyond are forecasts.

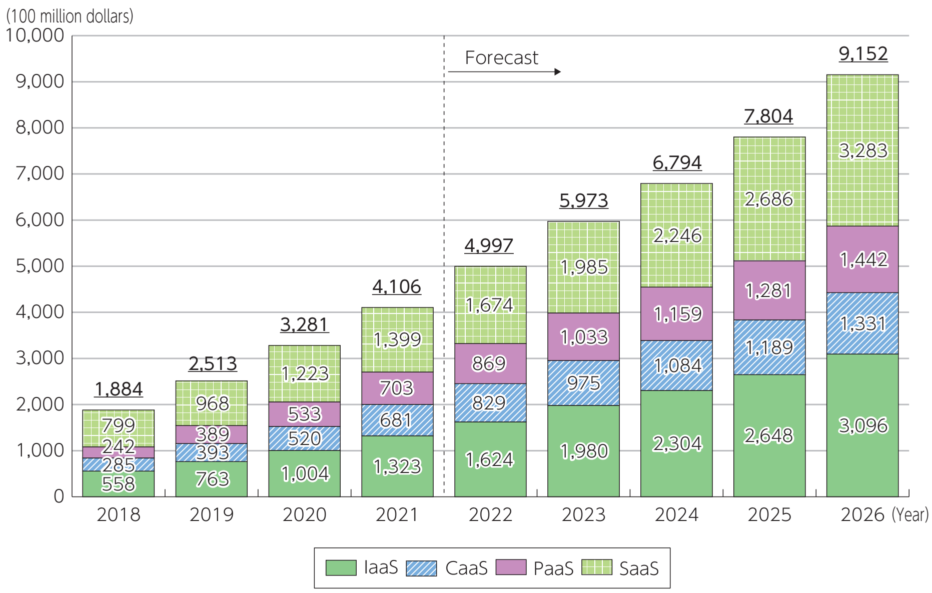
(Source) IDC "Japan Datacenter Services Forecast" (August 29, 2022)

3. Share of global large-scale data center market by region (data capacity)



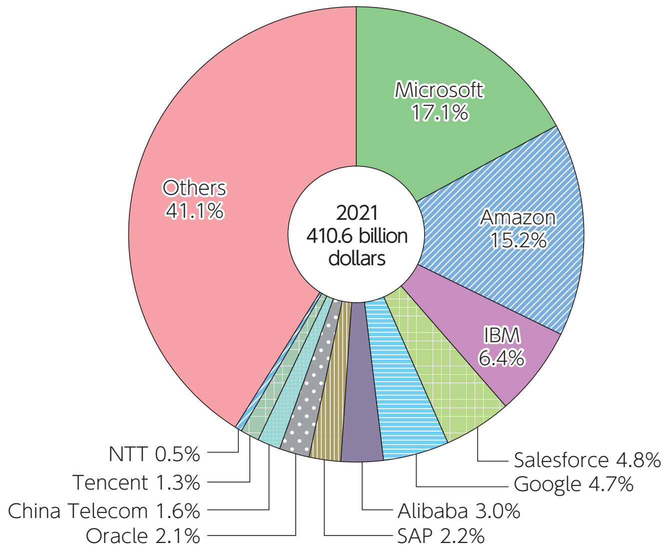
(Source) Synergy "Virginia Still Has More Hyperscale Data Center Capacity Than Either Europe or China"
https://www.srgresearch.com/articles/virginia-still-has-more-hyperscale-data-center-capacity-than-either-europe-or-china

4. Changes and forecast in the size (in terms of sales) of the global public cloud service market (Figure4-8-2-1 in White Paper)



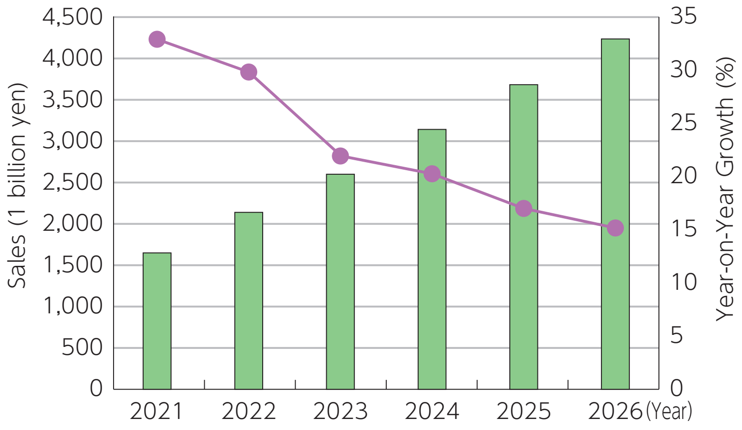
(Source) Omdia

5. Share of the global public cloud services market (Figure4-8-2-2 in White Paper)



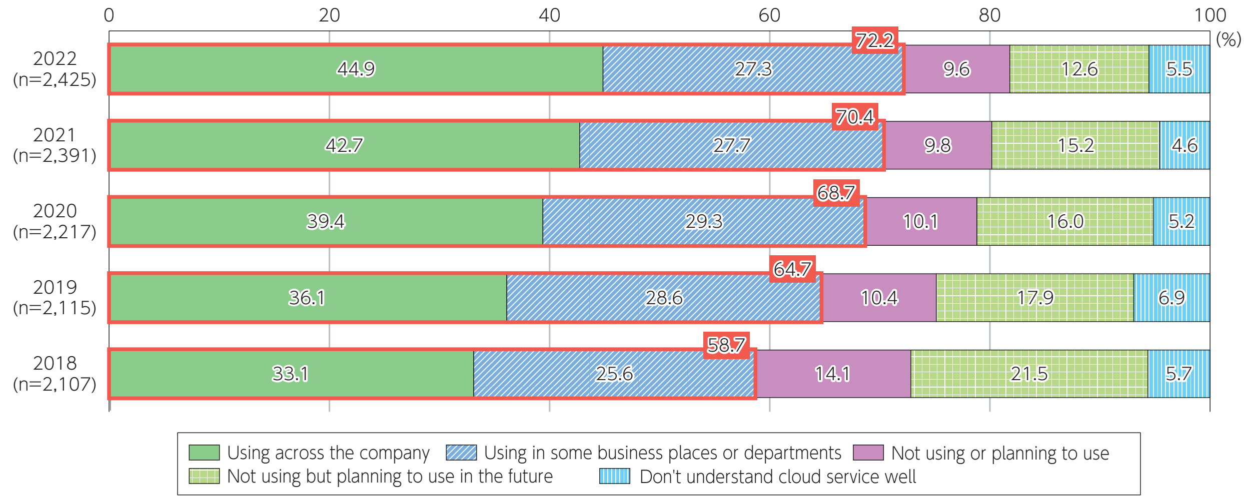
(Source) Omdia

6. Changes and forecast in the size (in terms of sales) of the Japanese public cloud service market (Figure4-8-2-3 in White Paper)



(Source) IDC "Japan Public IT Cloud Services Forecast" (September 15, 2022)

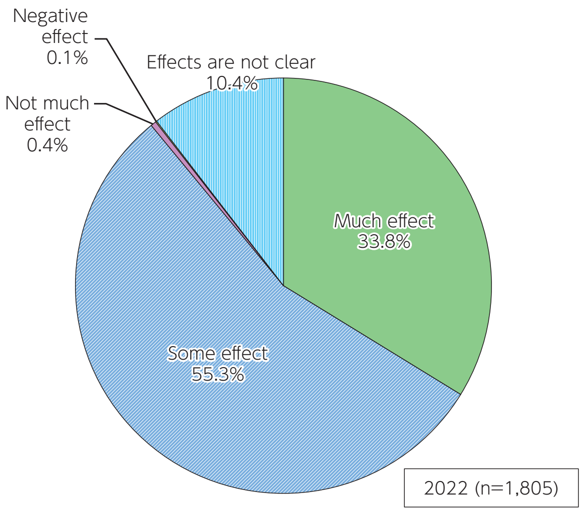
7. Enterprise cloud service usage



	Number of companies totaled	The number of companies totaled after adjustment	Use state of cloud service (S)							
			Using			Not using			Don't understand cloud service well	No answer
				Using across the company	Using in some business places or departments		Not using but planning to use in the future	Not using or planning to use		
Total	2,428	2,428	1,749	1,087	662	539	233	306	134	6
Industrial classification										
Construction	368	102	86	55	31	14	8	6	2	–
Manufacturing	387	639	455	271	183	153	85	68	28	4
Transportation/postal services	408	227	145	77	67	70	30	40	12	–
Wholesale/retail	364	489	377	245	133	91	35	55	21	–
Finance/insurance	165	29	27	21	6	2	1	1	0	–
Real estate	159	38	32	25	7	4	1	3	2	–
Information and communications	257	132	123	101	22	9	5	4	1	–
Services, other	320	772	505	293	213	197	68	129	68	2

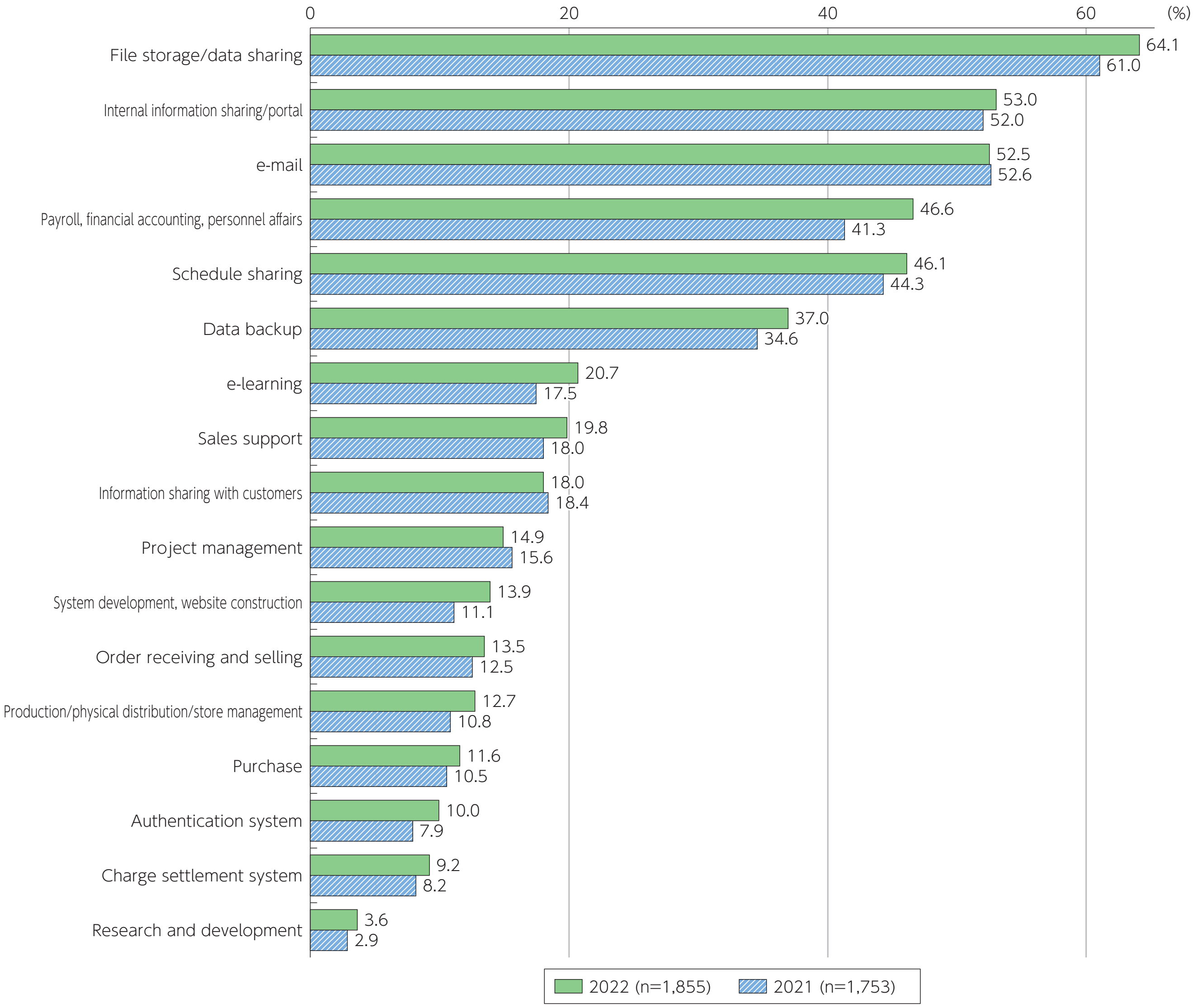
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

8. Effect of cloud service usage in enterprises



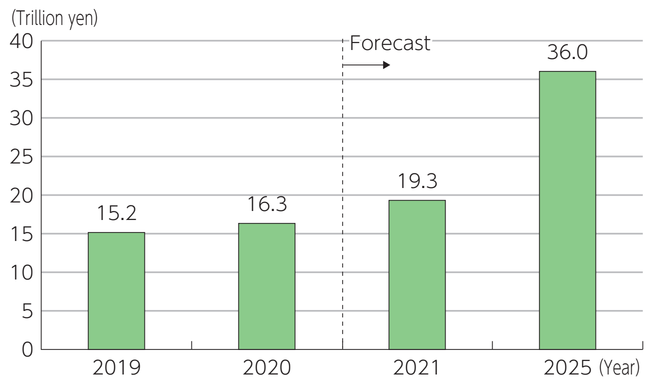
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

9. Cloud services used in enterprises (multiple selections allowed)



(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

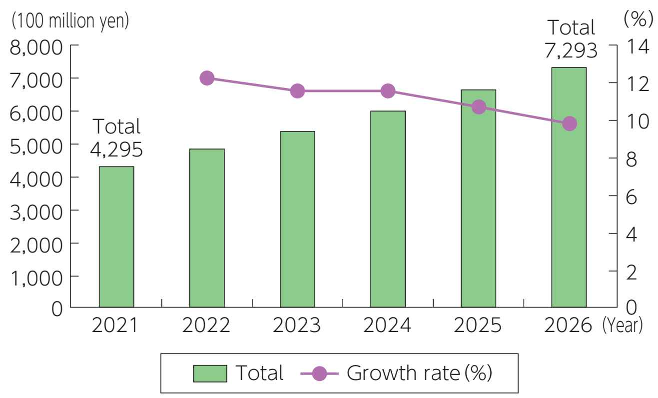
10. Changes and forecast in the size of the global edge infrastructure market (revenue) (Figure4-8-3-1 in White Paper)



* 2025 is calculated at the 2022 exchange rate

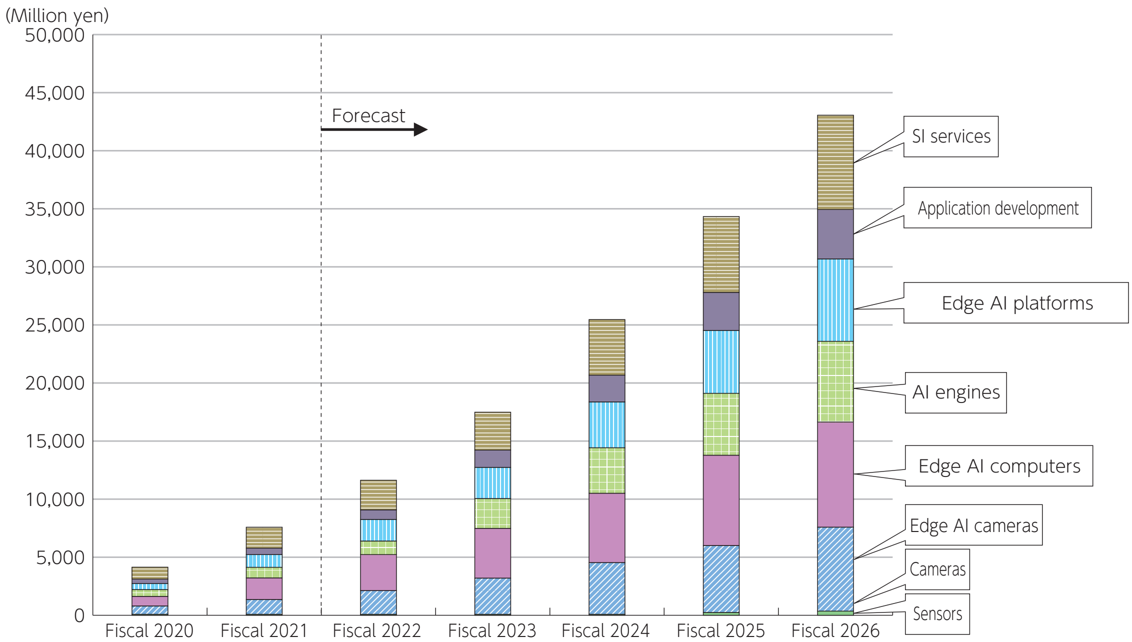
(Source) Statista (IDC)

11. Changes and forecast in the size (in terms of expenditure) of the Japanese edge infrastructure market (Figure4-8-3-2 in White Paper)



(Source) IDC "Japan Edge Infrastructure Forecast" (January 18, 2023)

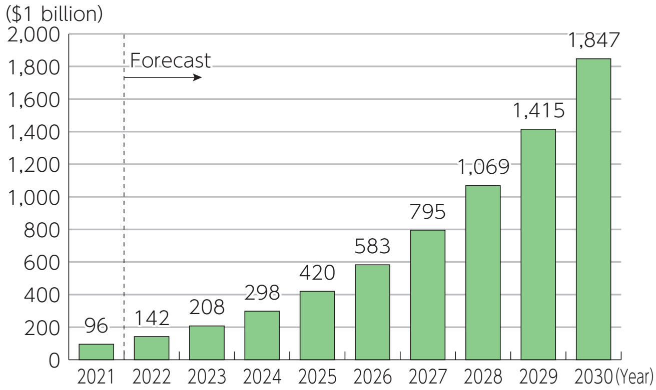
12. Changes and forecast in the size (in terms of sales) of the Japanese edge AI solutions market



(Source) Deloitte Tohmatsu MIC Research Institute "Reality and Future Prospects of Edge AI Computing Market" (October 24, 2022)
https://mic-r.co.jp/mr/02530/

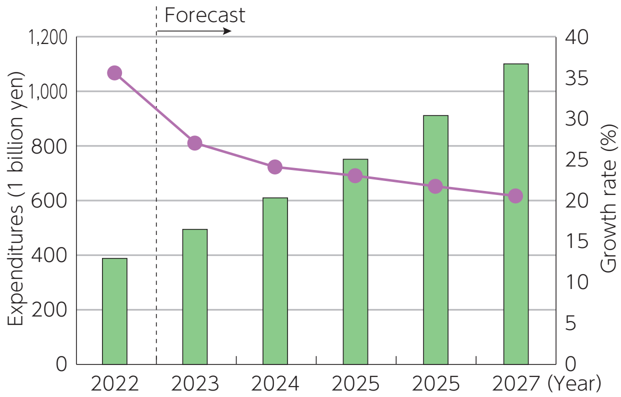
Section 9

1. Changes and forecast in the size (in terms of sales) of the global AI market (Figure4-9-1-1 in White Paper)



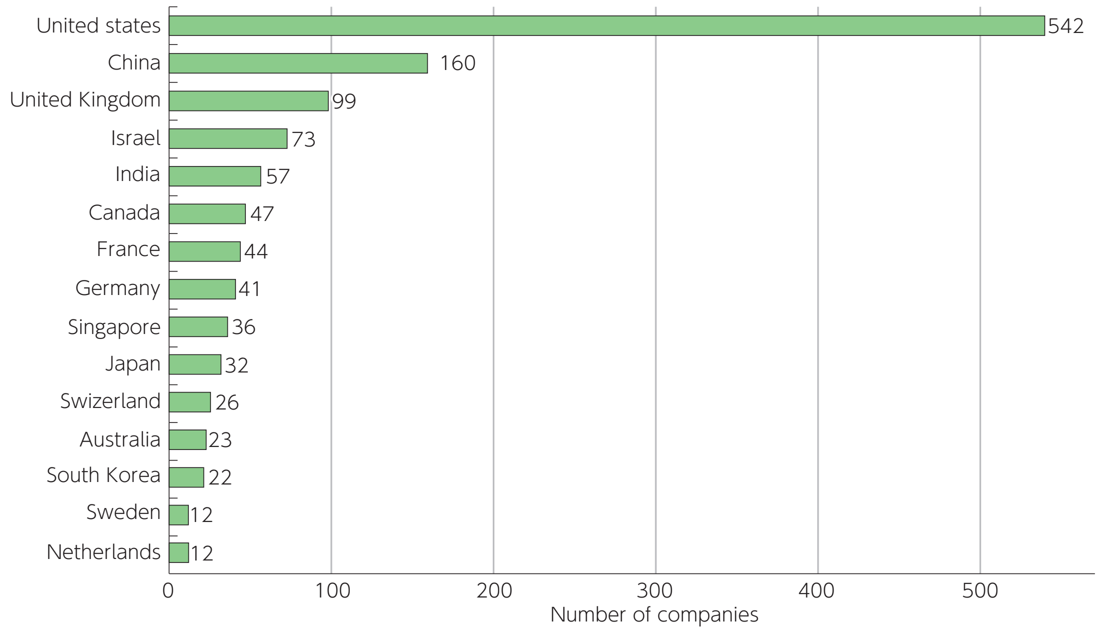
(Source) (Source) Statista (Next Move Strategy Consulting)

2. Size (in terms of expenditure) of the Japanese AI systems market and forecast (Figure4-9-1-2 in White Paper)



(Source) IDC "Japan Artificial Intelligence Systems Forecast" (April 27, 2023)

3. Number of newly funded AI companies by country (2022) (Figure4-9-2-1 in White Paper)



(Source) Stanford University "Artificial Intelligence Index Report 2023"

4. Changes in AI rankings by country (top 10)

	2020	2021	2022
1	US	US	US
2	China	China	China
3	England	England	England
4	France	Canada	Germany
5	Canada	France	Canada
6	Germany	Germany	France
7	Switzerland	Switzerland	South Korea
8	Japan	South Korea	Switzerland
9	South Korea	Japan	Israel
10	Israel	Israel	Japan

* Thundermark Capital ranks leading countries, companies, and universities based on factors such as the number of papers published

(Source) Prepared based on Thundermark Capital's AI Research Ranking 2022
https://thundermark.medium.com/ai-research-rankings-2022-sputnik-moment-for-china-64b693386a4

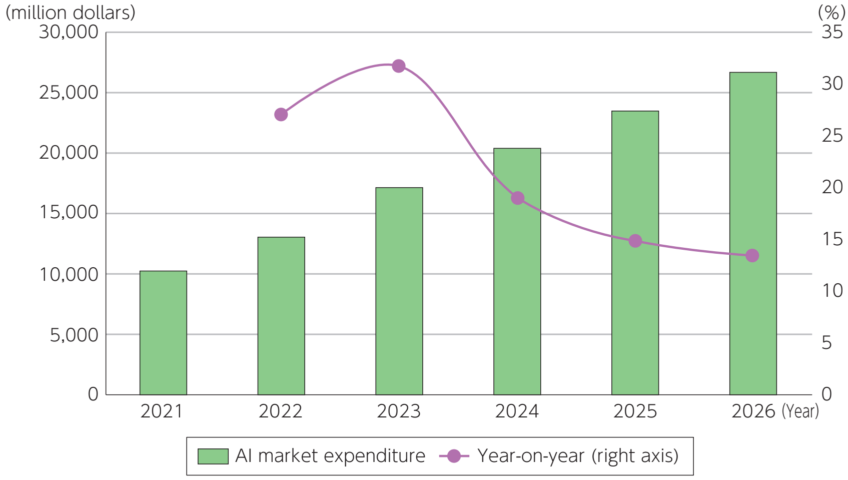
5. Changes in AI rankings by organization (top 10)

	2020	2021	2022
1	Google (U.S.)	Google (U.S.)	Google (U.S.)
2	Stanford University (U.S.)	Stanford University (U.S.)	MIT (U.S.)
3	MIT (U.S.)	MIT (U.S.)	Stanford University (U.S.)
4	Carnegie Mellon University (U.S.)	UC Berkeley (U.S.)	Carnegie Mellon University (U.S.)
5	UC Berkeley (U.S.)	Carnegie Mellon University (U.S.)	UC Berkeley (U.S.)
6	Microsoft (U.S.)	Microsoft (U.S.)	Microsoft (U.S.)
7	University of Oxford (England)	University of Oxford (England)	University of Oxford (England)
8	Facebook (U.S.)	Facebook (U.S.)	Tsinghua University (China)
9	Princeton University (U.S.)	Tsinghua University (China)	Facebook (U.S.)
10	Cornell University (U.S.)	Princeton University (U.S.)	UC Los Angeles (U.S.)

* Thundermark Capital ranks leading countries, companies, and universities based on factors such as the number of papers published

(Source) Prepared based on Thundermark Capital's AI Research Ranking 2022
https://thundermark.medium.com/ai-research-rankings-2022-sputnik-moment-for-china-64b693386a4

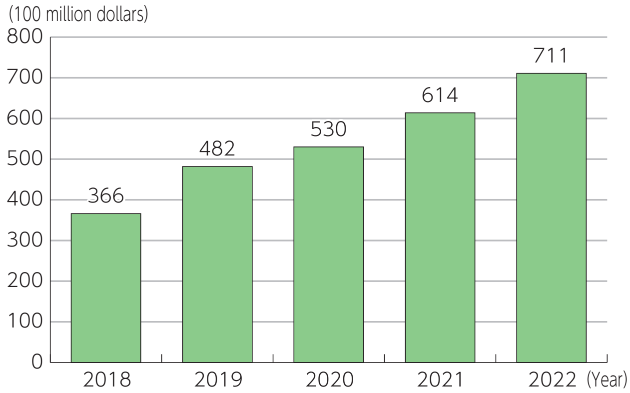
6. China's AI market expenditure forecast



(Source) IDC "China's Artificial Intelligence Market Will Exceed US$26.7 Billion by 2026, according to IDC" (October 4, 2022)
https://www.idc.com/getdoc.jsp?containerId=prAP49740122

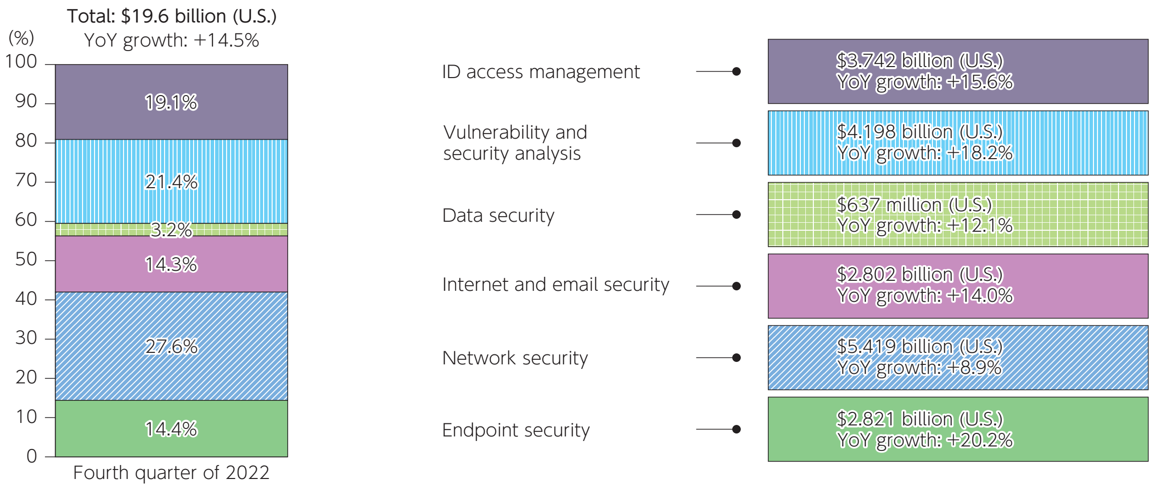
Section 10

1. Changes in global cybersecurity market size (sales) (Figure4-10-1-1 in White Paper)



(Source) Based on Canalys estimates

2. Global cybersecurity market size (by product category)



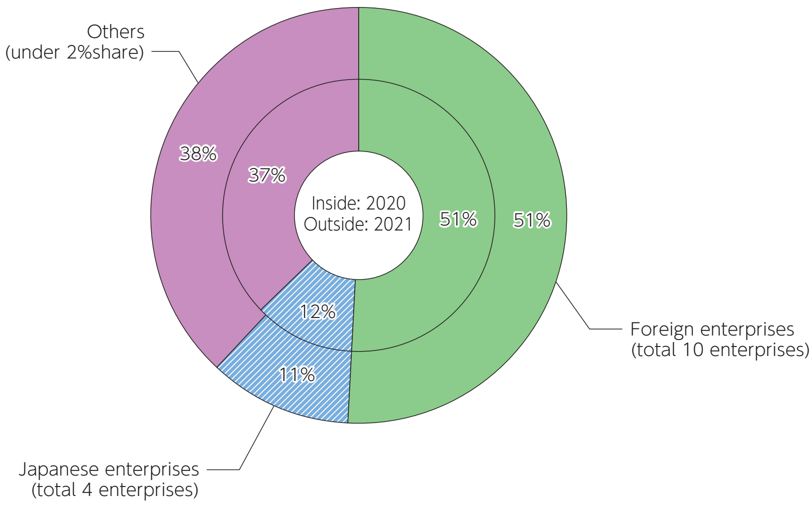
(Source) Based on Canalys "Strong channel sales propel the cybersecurity market to US$20 billion in Q4 2022"

3. Major global cybersecurity companies

Rank	2018		2019		2020		2021		2022	
	Operators	Share	Operators	Share	Operators	Share	Operators	Share	Operators	Share
1	Cisco	8.1%	Cisco	8.4%	Cisco	7.9%	Palo Alto Networks	7.4%	Palo Alto Networks	8.2%
2	Palo Alto Networks	5.6%	Palo Alto Networks	6.3%	Palo Alto Networks	6.7%	Cisco	7.1%	Cisco	6.6%
3	Symantec	4.9%	Fortinet	4.8%	Fortinet	5.2%	Fortinet	5.8%	Fortinet	6.6%
4	Check Point	4.9%	Check Point	4.8%	Check Point	4.5%	Check Point	4.1%	Check Point	3.8%
5	Fortinet	4.4%	Symantec	4.5%	Trellix	4.1%	Trellix	3.6%	Trellix	3.1%

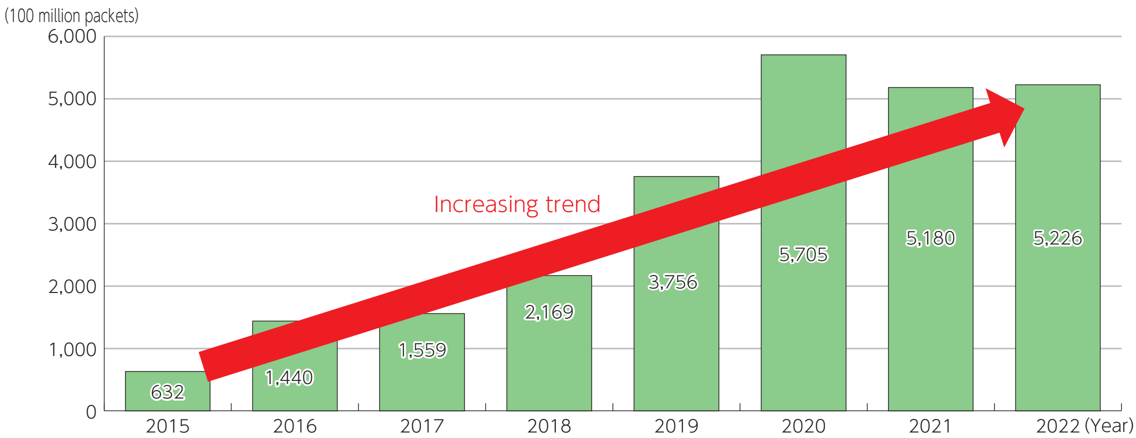
(Source) Based on Canalys data

4. Domestic information security products market share (sales), 2020-2021 (Figure4-10-1-2 in White Paper)



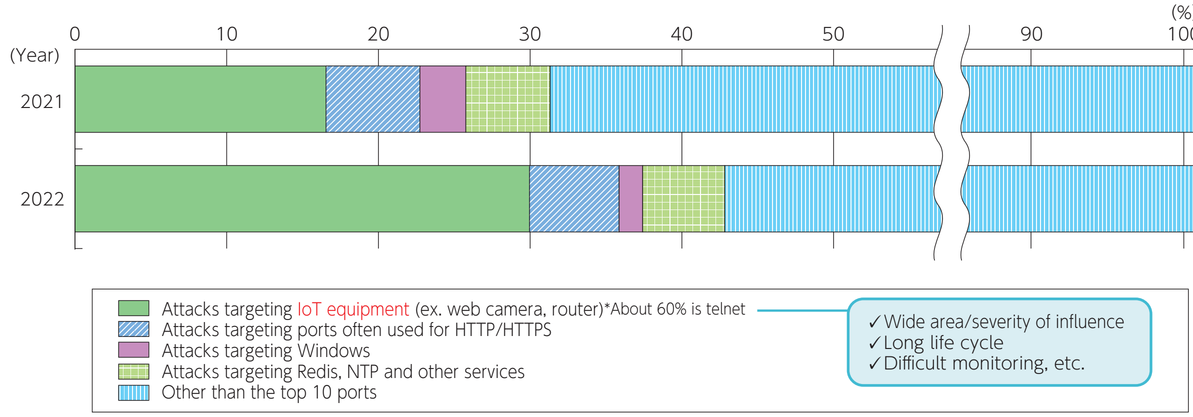
(Source) Based on IDC Japan, July 2022 "Japan IT Security Products Market Shares, 2021: External Threat Measures and Internal Threat Measures" (JPJ47880222)

5. Changes in the number of cyberattack-related communications detected by NICTER (Figure4-10-2-1 in White Paper)



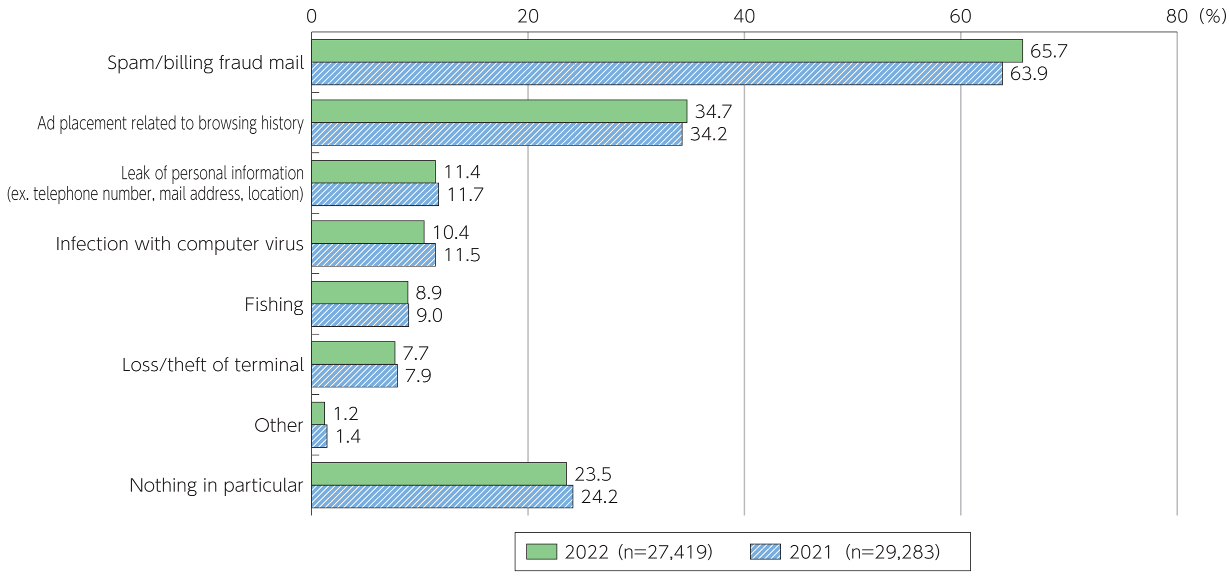
(Source) Based on NICT "NICTER Observation Report 2022"

6. Targets of cyberattack-related communications detected by NICTER (Figure4-10-2-2 in White Paper)



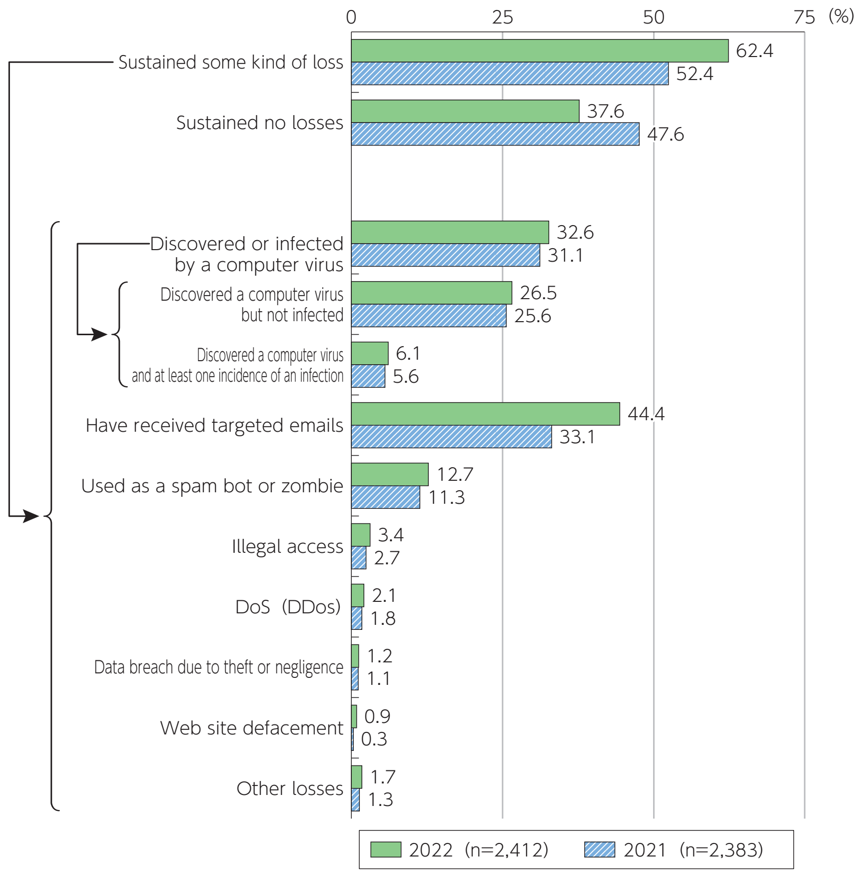
(Source) Based on "NICTER Observation Report 2022" of National Institute of Information and Communications Technology

7. Damage when using personal information and communication equipment (multiple answers)



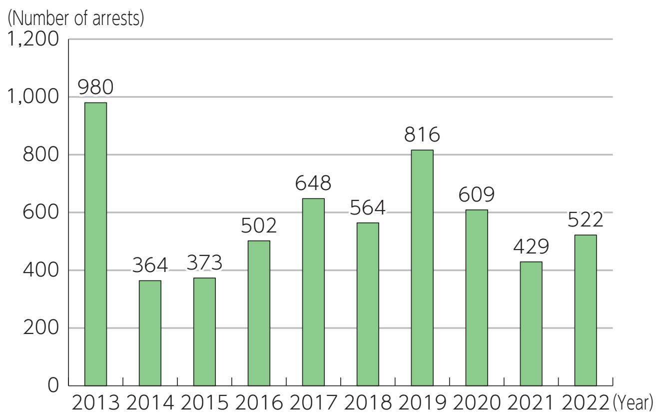
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

8. Security intrusion when using an information and communication network in enterprises (multiple answers)



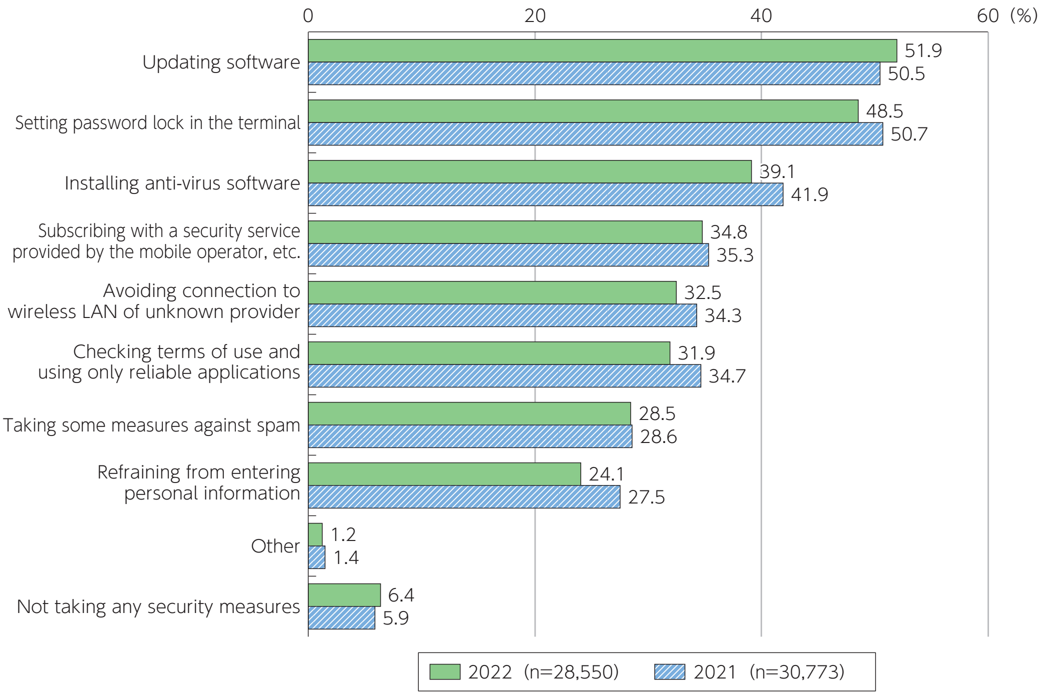
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

9. Changes in arrests for violation of the Unauthorized Access Prohibition Act



(Source) Based on NPA/MIC/METI "Unauthorized Access Activities and Status of Research and Development of Access Control Technology"
https://www.soumu.go.jp/menu_news/s-news/01cyber01_02000001_00161.html

10. Implementation status of information security measures by individuals (multiple answers)



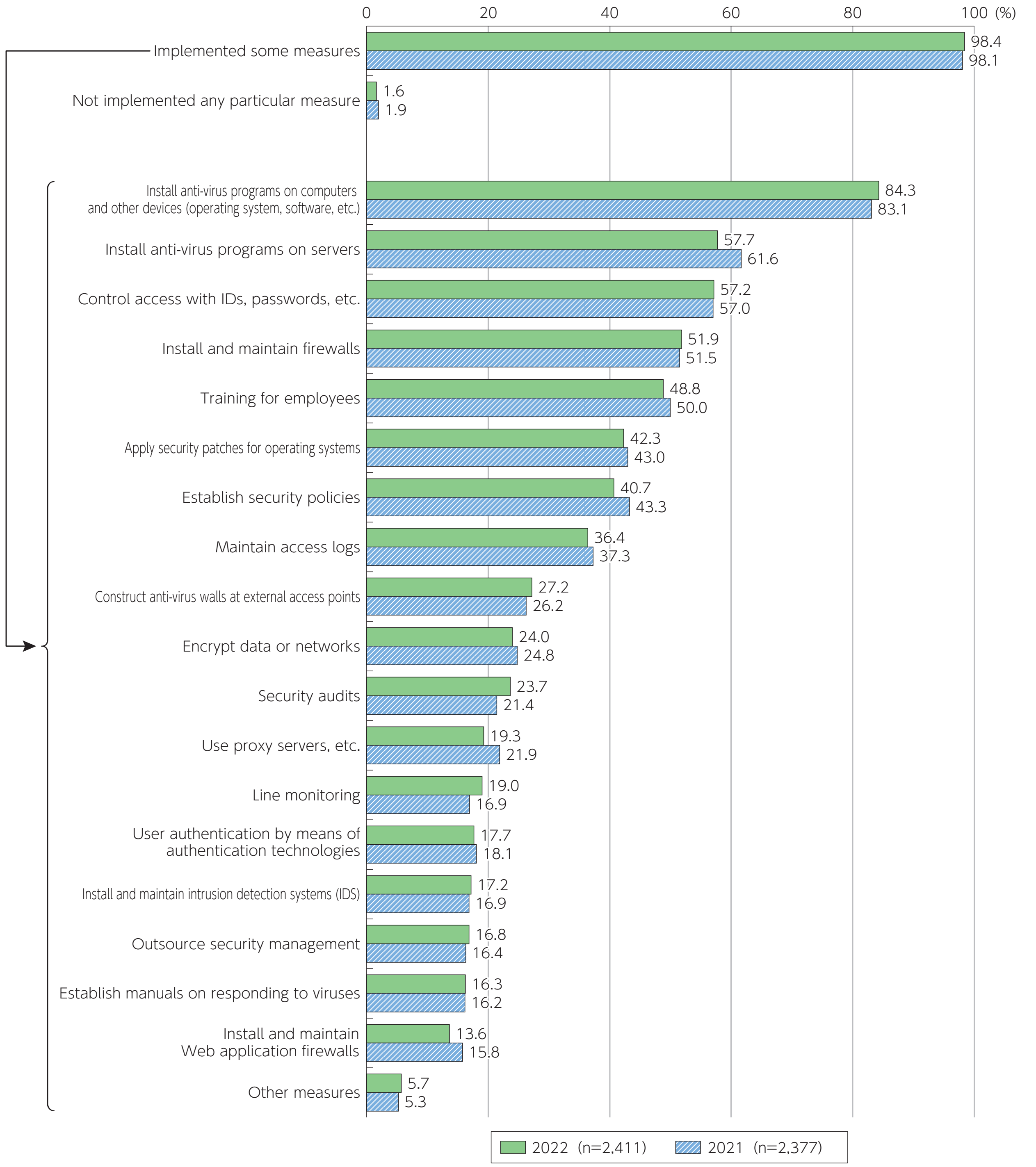
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

11. Economic losses caused by cybersecurity issues (Figure4-10-2-3 in White Paper)

Investigation/ analysis entity	Target area	Period covered	Overview of economic loss	Loss amount
Trend Micro	Japan	Fiscal 2021	Average annual damage per organization resulting from security incidents	328.5 million yen
National Police Agency	Japan	First half of 2022	Total investigation and recovery costs associated with ransomware damage	20%: < 1 million yen 14%: 1 million to < 5 million yen 10%: 5 million to < 10 million yen 37%: 10 million yen to < 50 million yen 18%: 50 million yen or more
FBI	U.S.	2021	Total amount of damage reported for cybercrime incidents	$6.9 billion
NFIB	UK	2022	Total amount of damage reported for cybercrime	£6.3 million
Sophos	31 countries	2021	Average annual cost per organization to recover from most recent ransomware attack	$1.4 million
IBM	World	2022	Global average cost of single data breach for an organization	$4.35 million
Cybersecurity Ventures	World	2023 [expected]	Cost of cybercrime	$8 trillion
McAfee, CSIS	World	2020	Cost of cybercrime	$945 billion

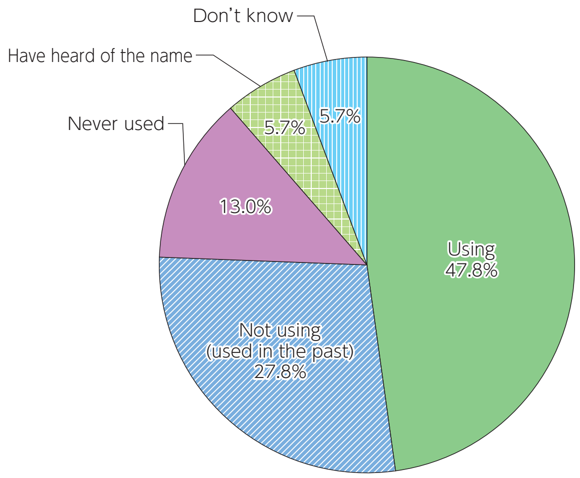
(Source) Based on the published materials of each company

12. Implementation status of information security measures by enterprises (multiple answers)



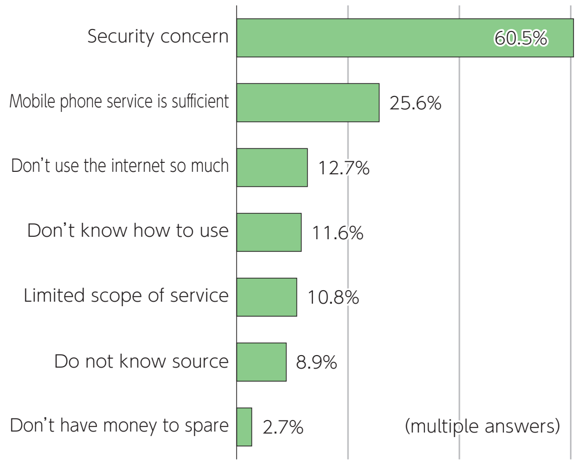
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

13. Using or not using public wireless LAN



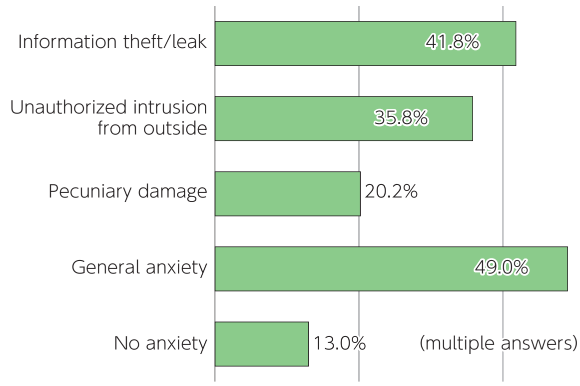
(Source) Prepared from MIC, "Fiscal 2022 Result of Survey of Wireless LAN Users"

14. Reasons for not using public wireless LAN (multiple answers)



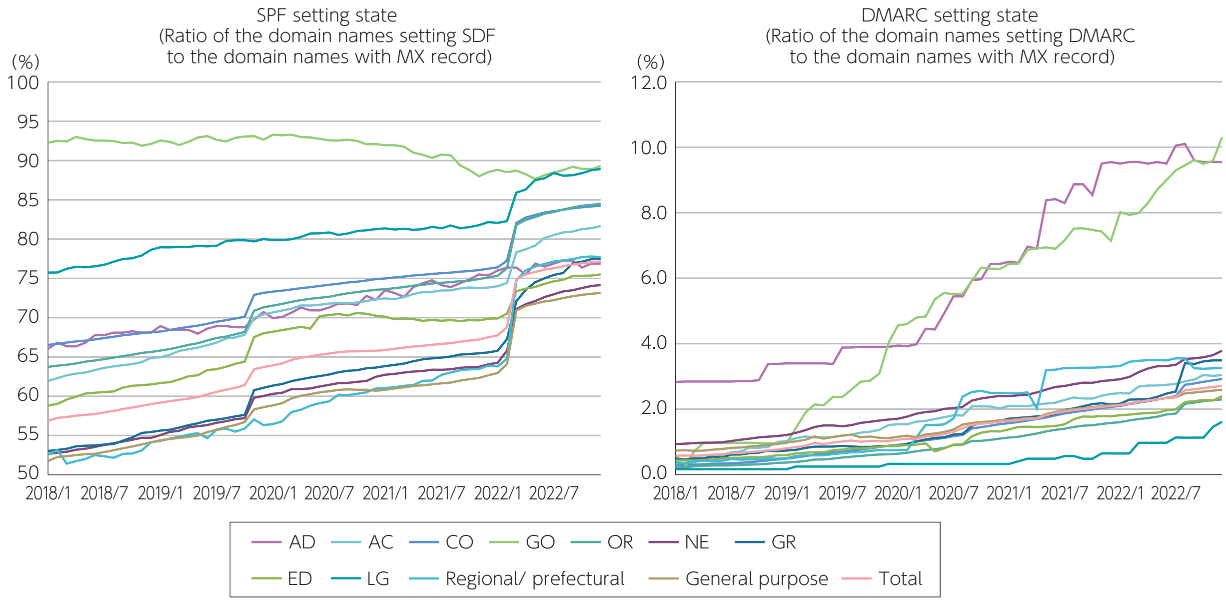
(Source) Prepared from MIC, "Fiscal 2022 Result of Survey of Wireless LAN Users"

15. Anxiety about security of public wireless LAN (multiple answers)



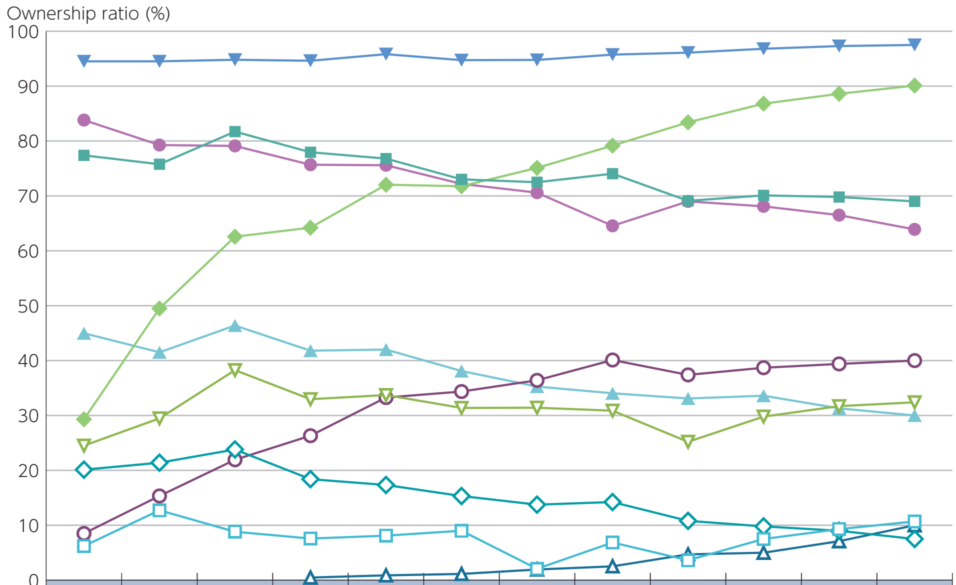
(Source) Prepared from MIC, "Fiscal 2022 Result of Survey of Wireless LAN Users"

16. Introduction of sender domain authentication technologies for JP domains



Section 11

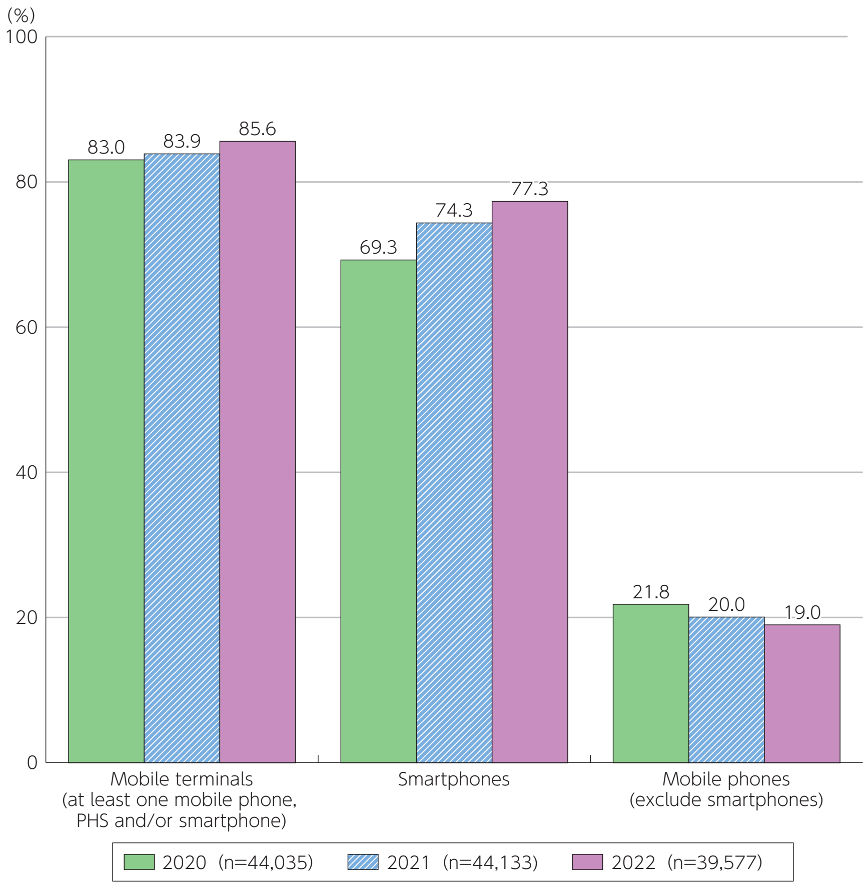
1. Changes in household ownership of ICT devices (Figure4-11-1-1 in White Paper)



	2011 (n=16,530)	2012 (n=20,418)	2013 (n=15,599)	2014 (n=16,529)	2015 (n=14,765)	2016 (n=17,040)	2017 (n=16,117)	2018 (n=16,255)	2019 (n=15,410)	2020 (n=17,345)	2021 (n=17,365)	2022 (n=15,951)
Fixed-line telephone	83.8	79.3	79.1	75.7	75.6	72.2	70.6	64.5	69.0	68.1	66.5	63.9
FAX	45.0	41.5	46.4	41.8	42.0	38.1	35.3	34.0	33.1	33.6	31.3	30.0
Mobile devices (overall)	94.5	94.5	94.8	94.6	95.8	94.7	94.8	95.7	96.1	96.8	97.3	97.5
Smartphones	29.3	49.5	62.6	64.2	72.0	71.8	75.1	79.2	83.4	86.8	88.6	90.1
Computers	77.4	75.8	81.7	78.0	76.8	73.0	72.5	74.0	69.1	70.1	69.8	69.0
Tablets	8.5	15.3	21.9	26.3	33.3	34.4	36.4	40.1	37.4	38.7	39.4	40.0
Wearable devices	–	–	–	0.5	0.9	1.1	1.9	2.5	4.7	5.0	7.1	10.0
Home game consoles	24.5	29.5	38.3	33.0	33.7	31.4	31.4	30.9	25.2	29.8	31.7	32.4
Portable music players	20.1	21.4	23.8	18.4	17.3	15.3	13.8	14.2	10.8	9.8	9.0	7.5
Smart appliances	6.2	12.7	8.8	7.6	8.1	9.0	2.1	6.9	3.6	7.5	9.3	10.7

(Source) MIC "Communications Usage Trend Survey"

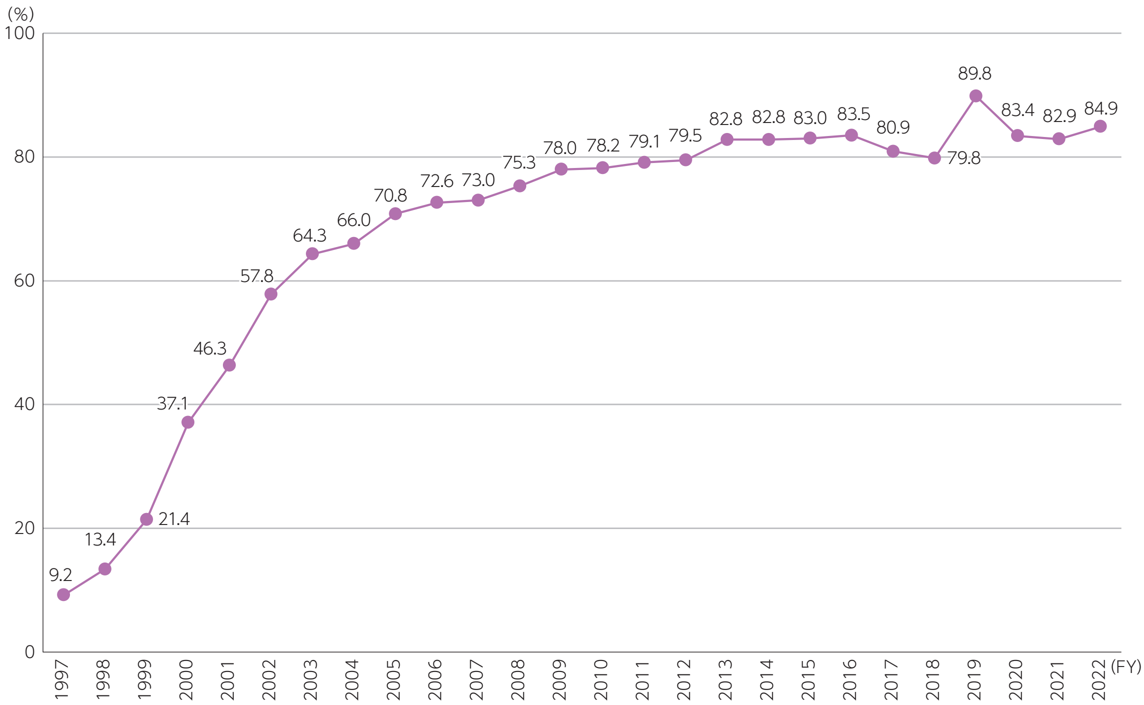
2. Mobile device ownership



* "Mobile devices" and "mobile phones (excluding smartphones)" in 2020 include PHS.
"Smartphones" in 2020 excludes 5G devices.

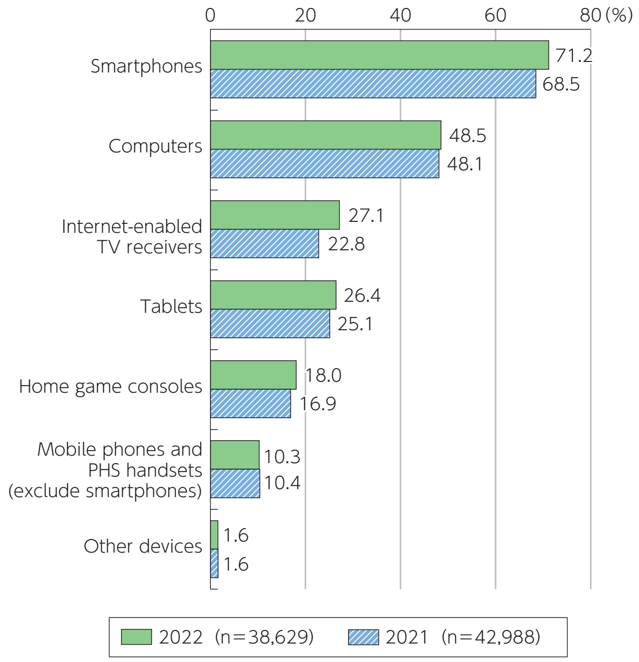
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

3. Changes in Internet usage rate (individuals) (Figure4-11-1-2 in White Paper)



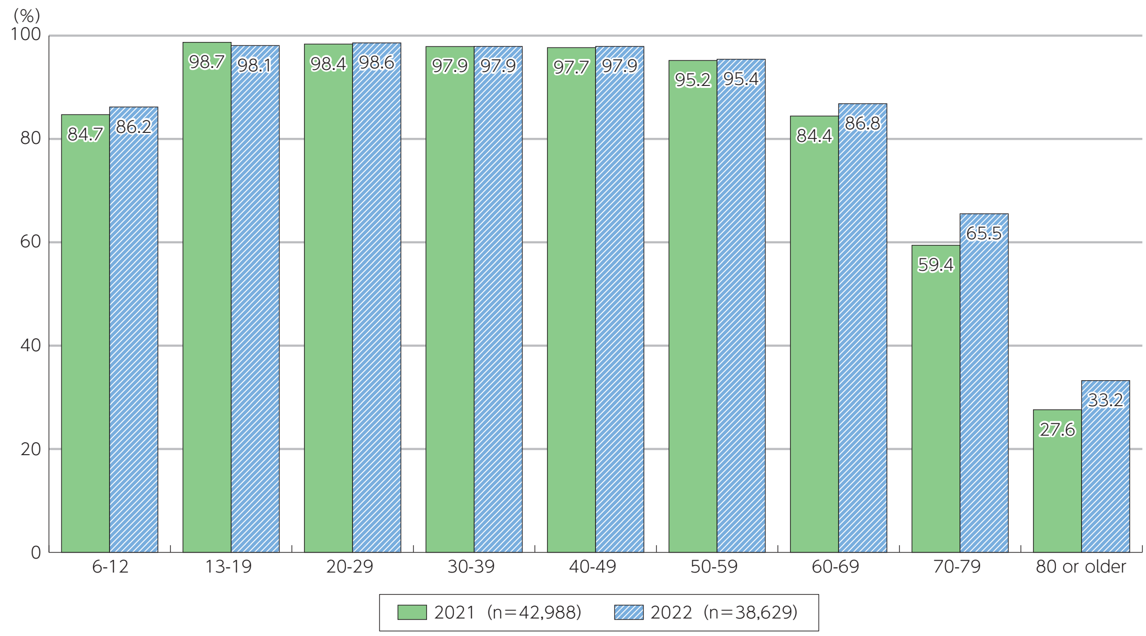
(Source) MIC "Communications Usage Trend Survey"

4. Types of Internet devices (individual)



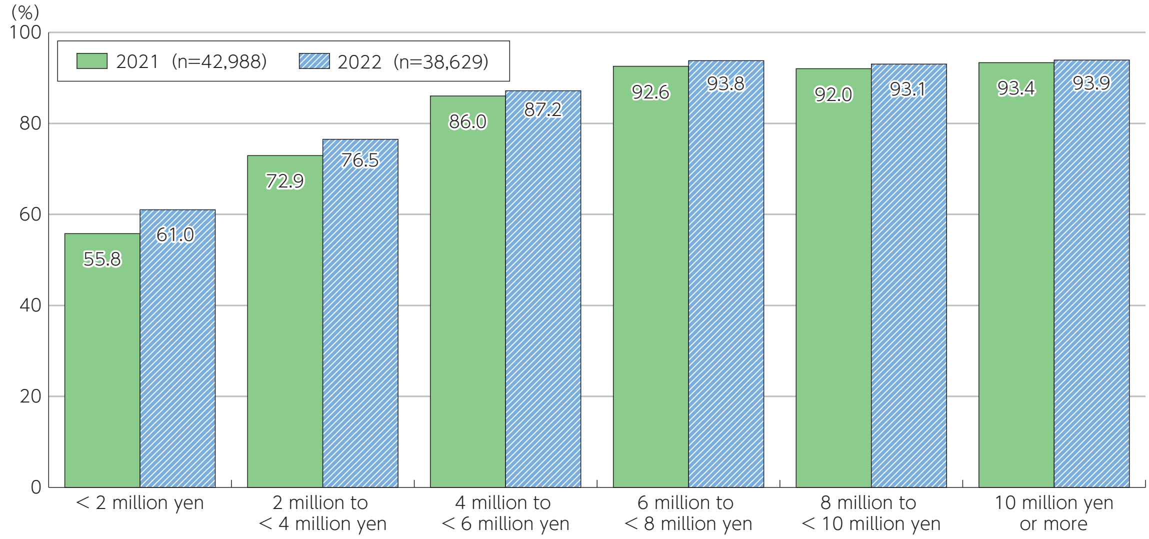
(Source) MIC "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

5. Internet usage by age group (Figure4-11-1-3 in White Paper)



(Source) MIC "Communications Usage Trend Survey"

6. Internet usage by annual household income (Figure4-11-1-4 in White Paper)



(Source) MIC "Communications Usage Trend Survey"

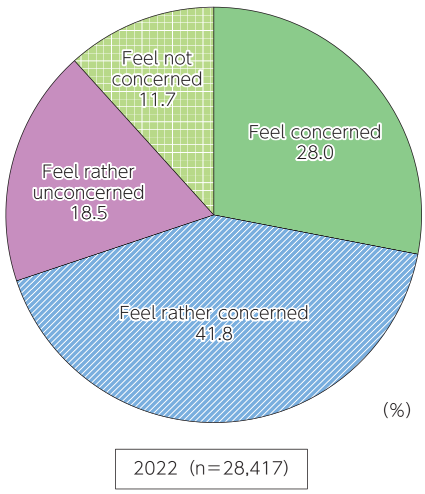
7. Internet usage by prefecture and usage by device (individual) (2022)

Prefecture	(n)	Percentage of internet users				
		Total	Computes	Mobile phones (including PHS)	Smartphones	Tablets
Hokkaido	(726)	87.6	51.2	10.3	70.7	24.1
Aomori	(776)	75.2	35.0	7.4	60.7	19.1
Iwate	(838)	73.8	33.3	12.7	57.1	17.4
Miyagi	(787)	85.2	51.7	10.3	72.1	28.6
Akita	(936)	74.9	37.7	9.3	56.8	16.8
Yamagata	(1,063)	77.3	37.8	9.3	57.5	17.0
Fukushima	(766)	77.4	42.8	8.1	64.9	22.7
Ibaraki	(715)	80.9	36.6	11.9	60.9	23.5
Tochigi	(954)	82.6	45.0	9.3	66.4	24.2
Gunma	(982)	82.4	44.6	11.3	67.6	24.1
Saitama	(844)	84.8	43.2	9.2	70.2	24.5
Chiba	(809)	89.4	59.1	10.1	79.3	27.7
Tokyo	(841)	90.4	62.4	11.2	81.3	42.2
Kanagawa	(758)	87.7	56.9	10.7	75.5	27.2
Niigata	(1,002)	81.1	37.3	8.7	62.8	20.0
Toyama	(1,150)	84.1	46.7	6.9	67.3	21.5
Ishikawa	(997)	83.6	46.6	7.8	69.1	22.4
Fukui	(874)	80.5	42.7	9.7	59.8	21.1
Yamanashi	(981)	84.4	47.0	9.9	70.9	25.7
Nagano	(936)	82.6	43.3	8.5	66.2	26.6
Gifu	(976)	82.7	40.6	10.3	70.0	24.2
Shizuoka	(998)	84.1	45.6	8.9	71.0	24.4
Aichi	(810)	86.6	50.8	10.8	73.3	27.2
Mie	(801)	85.7	47.1	8.8	69.9	27.3

Prefecture	(n)	Percentage of internet users				
		Total	Computes	Mobile phones (including PHS)	Smartphones	Tablets
Shiga	(820)	88.0	52.3	9.4	74.0	28.3
Kyoto	(763)	87.0	50.1	9.8	73.8	26.4
Osaka	(725)	88.8	49.9	11.9	76.4	25.3
Hyogo	(600)	81.8	48.6	12.8	66.3	22.6
Nara	(871)	89.7	51.4	9.4	77.2	23.5
Wakayama	(772)	80.4	41.6	8.8	65.8	20.1
Tottori	(804)	78.2	39.8	8.8	63.1	22.8
Shimame	(874)	79.5	44.1	9.4	64.9	21.7
Okayama	(816)	81.4	42.9	9.1	66.0	22.1
Hiroshima	(844)	87.8	48.3	9.5	72.5	23.4
Yamaguchi	(879)	77.6	39.8	6.1	63.1	22.6
Tokushima	(784)	80.6	43.2	8.9	67.9	24.1
Kagawa	(850)	82.3	43.1	9.6	66.6	24.3
Ehime	(746)	82.3	41.3	10.7	67.5	25.7
Kochi	(691)	76.3	40.6	6.8	64.5	16.6
Fukuoka	(544)	83.8	43.5	11.4	69.5	26.0
Saga	(821)	82.3	42.3	8.2	65.7	20.0
Nagasaki	(788)	82.8	38.0	7.9	67.1	21.1
Kumamoto	(794)	76.5	37.7	9.4	58.9	19.9
Oita	(707)	77.9	36.6	10.3	63.0	22.7
Miyazaki	(772)	78.2	33.0	11.8	58.6	18.5
Kagoshima	(587)	78.0	38.2	9.8	65.9	25.1
Okinawa	(457)	83.3	40.9	12.2	67.5	23.1
Total	(38,629)	84.9	48.5	10.3	71.2	26.4

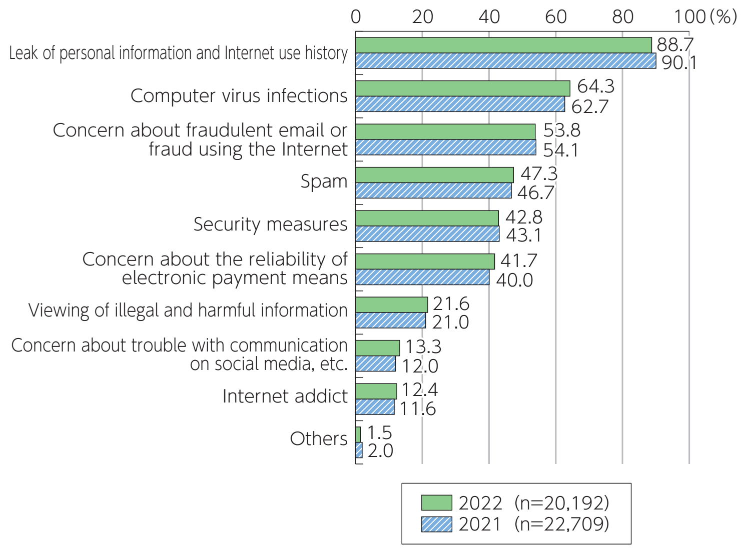
(Source) MIC "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

8. Percentage of individuals who feel anxiety when using the Internet (Figure4-11-1-5 in White Paper)



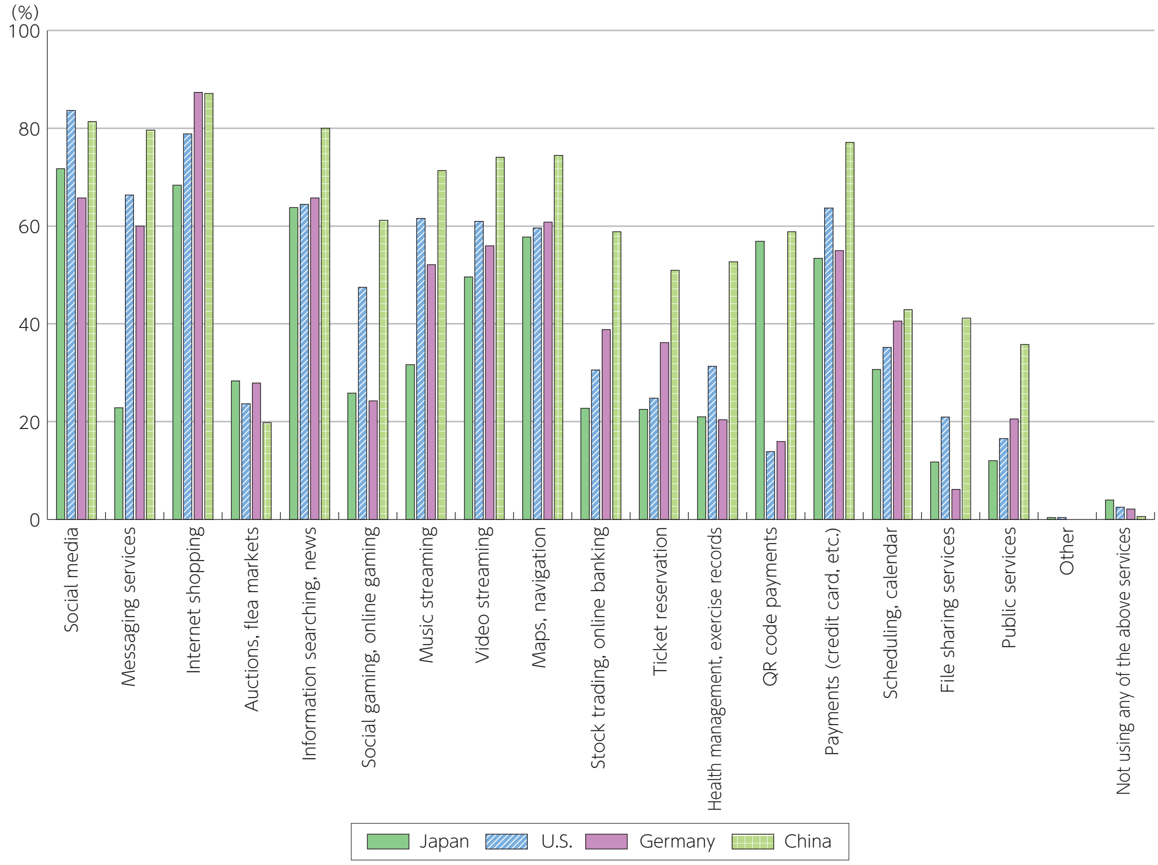
(Source) MIC "Communications Usage Trend Survey"

9. Anxiety felt when using the Internet (multiple answers allowed) (Figure4-11-1-6 in White Paper)



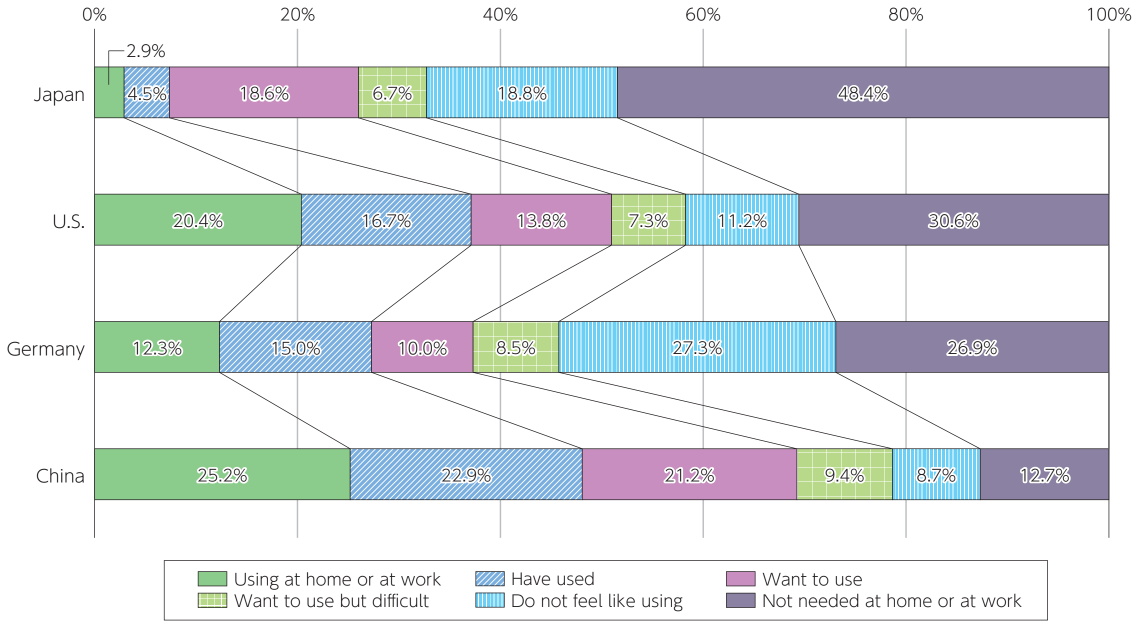
(Source) MIC "Communications Usage Trend Survey"

10. Overall usage of digital services (Figure4-11-1-7 in White Paper)



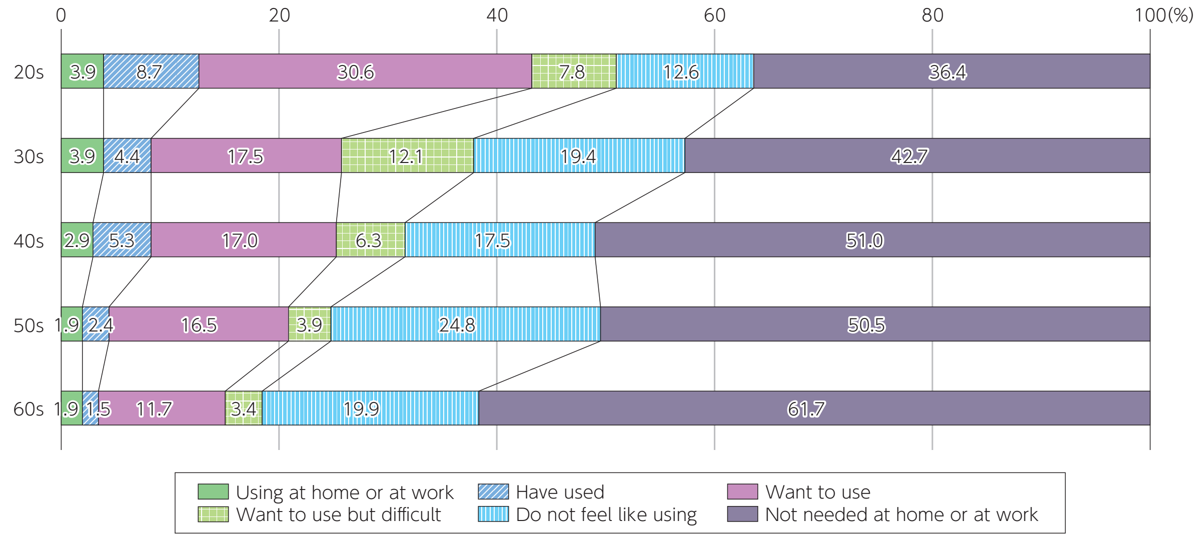
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

11. Usage of interactive entertainment services in virtual spaces (comparison by country) (Figure4-11-1-8 in White Paper)



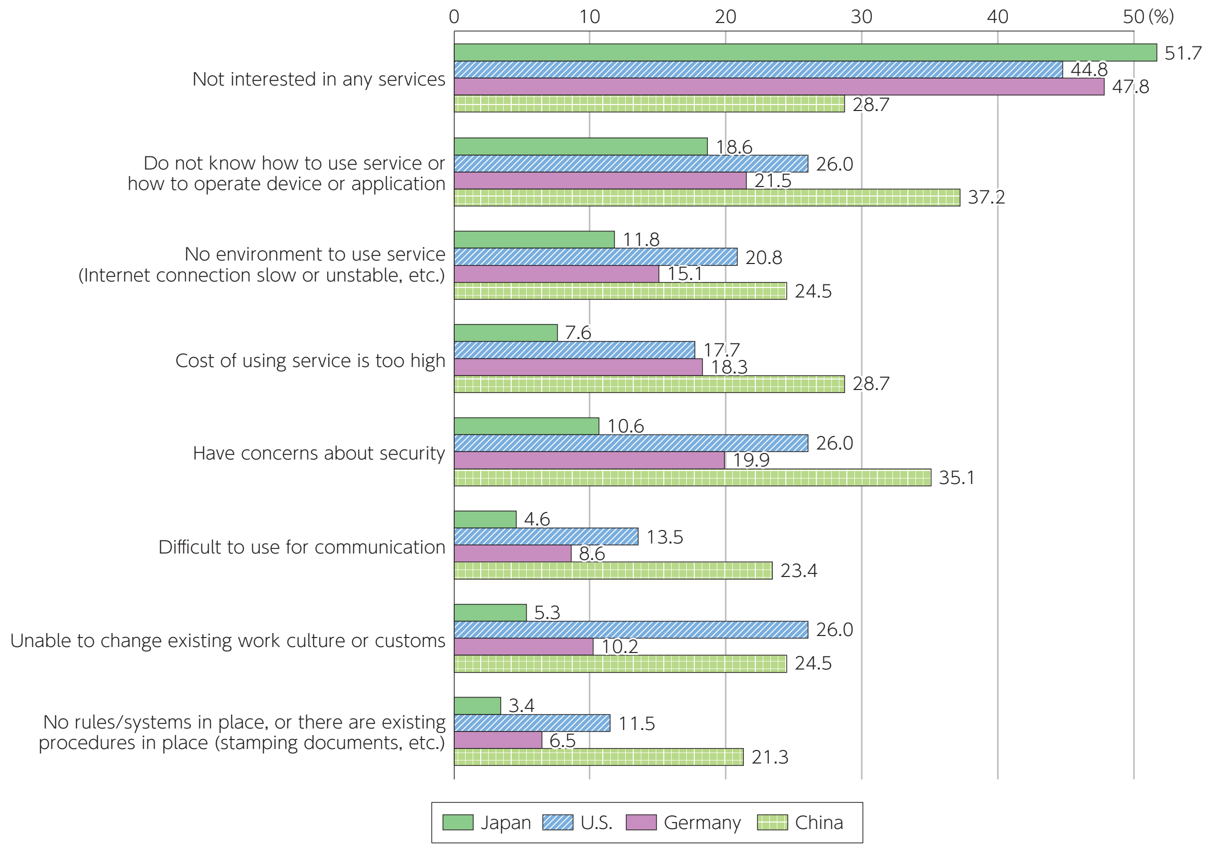
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

12. Usage of interactive entertainment services in virtual spaces (by age)



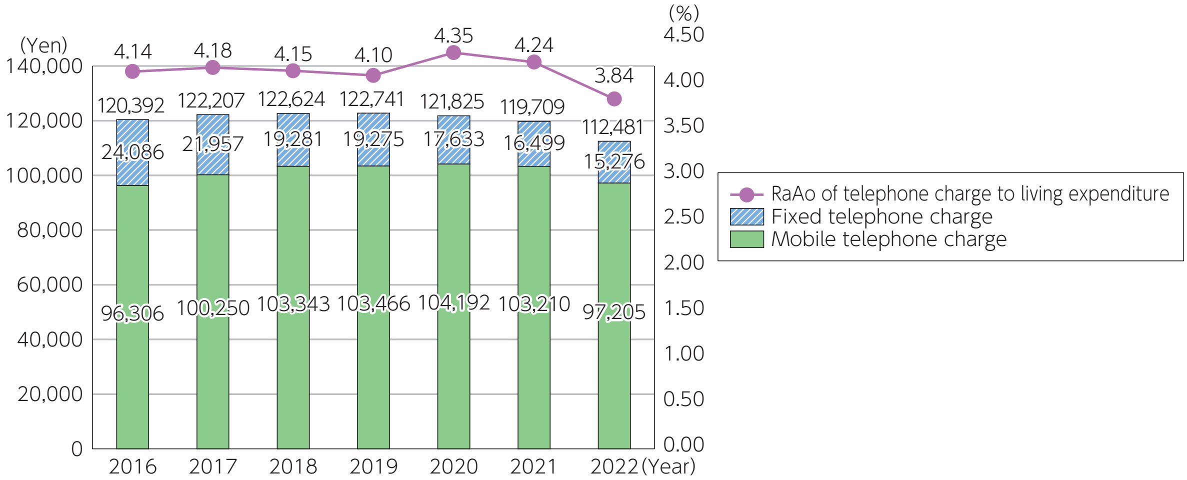
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

13. Reasons why entertainment services in virtual spaces are unavailable



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

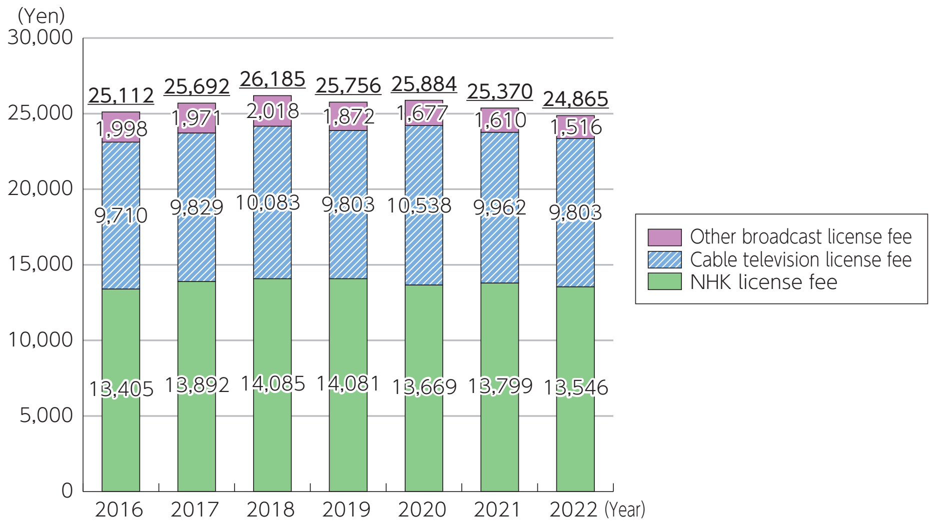
14. Changes in telephone charge and its ratio to living expenditure



* Household accounts used in the survey have been revised since January 2018, and care should be taken when making chronological comparisons over a period that includes 2018 or covers 2018, as changes due to the revision are included.
Certain figures for 2021 differ from previously published figures due to revisions.

(Source) Prepared from MIC, "Family Income and Expenditure Survey" (all households)
https://www.stat.go.jp/data/kakei/index.html

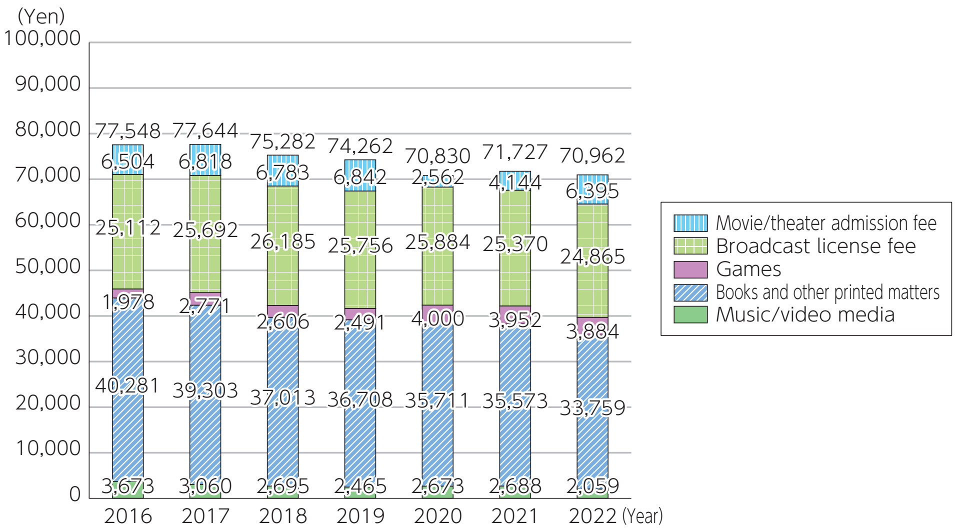
15. Household expenditure for broadcast services



* Household accounts used in the survey have been revised since January 2018, and care should be taken when making chronological comparisons over a period that includes 2018 or covers 2018, as changes due to the revision are included.
Certain figures for 2021 differ from previously published figures due to revisions.

(Source) Based on MIC "Survey on Household Income and Expenditures" (total households):
Annual Report on Survey on Household Income and Expenditures (household income and expenditure)
(Item classification) Table 10 Annual income five categories per household by class
https://www.stat.go.jp/data/kakei/index.html

16. Annual content-related expenditure per household



* "Game" is sum of "Game device" and "Game software, etc."
Household accounts used in the survey have been revised since January 2018, and care should be taken when making chronological comparisons over a period that includes 2018 or covers 2018, as changes due to the revision are included.
Certain figures for 2021 differ from previously published figures due to revisions.

(Source) Prepared from MIC, "Family Income and Expenditure Survey" (all households)
https://www.stat.go.jp/data/kakei/index.html

17. Average usage time for major media and user ratio (Figure4-11-1-9 in White Paper)

<Weekday (one day)>

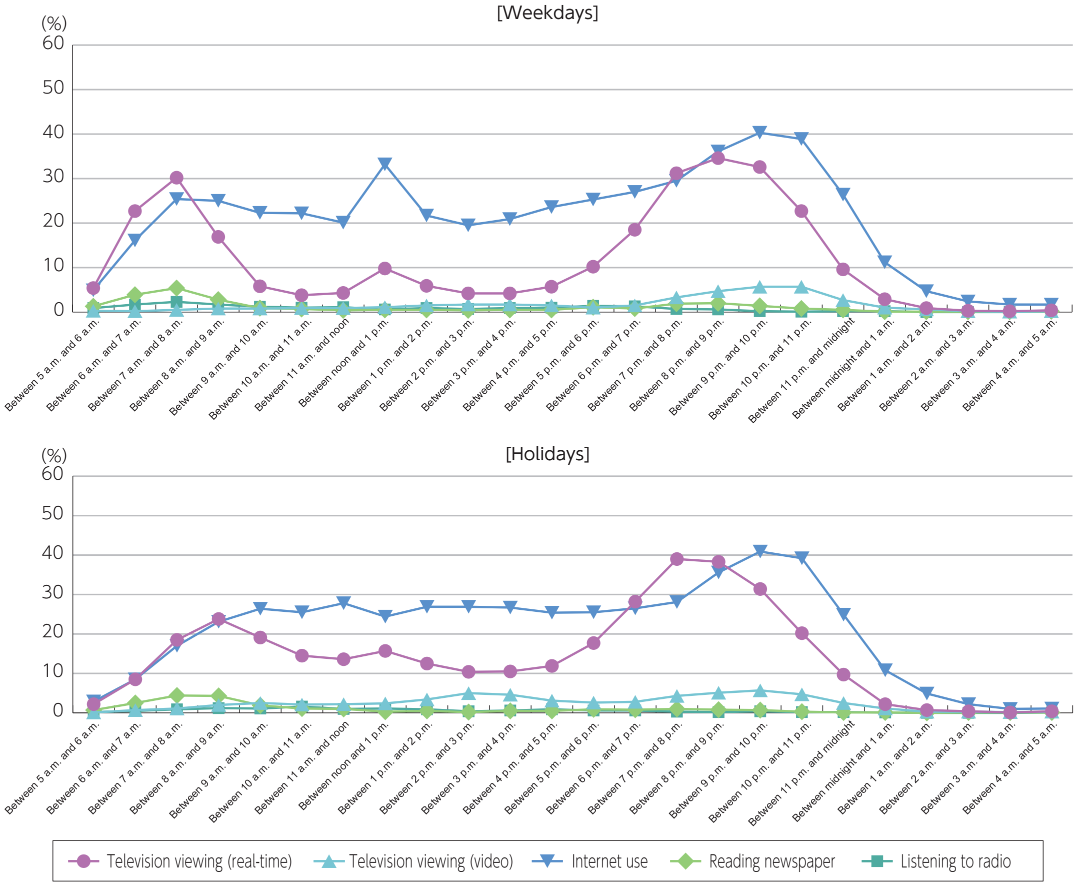
		Average usage time (minute)					Doers' ratio				
		Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening	Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening
All age groups	2018	156.7	20.3	112.4	8.7	13.0	79.3	18.7	82.0	26.6	6.5
	2019	161.2	20.3	126.2	8.4	12.4	81.6	19.9	85.5	26.1	7.2
	2020	163.2	20.2	168.4	8.5	13.4	81.8	19.7	87.8	25.5	7.7
	2021	146.0	17.8	176.8	7.2	12.2	74.4	18.6	89.6	22.1	6.2
	2022	135.5	18.2	175.2	6.0	8.1	73.7	17.5	90.4	19.2	6.0
10s	2018	71.8	12.7	167.5	0.3	0.2	63.1	15.2	89.0	2.5	1.1
	2019	69.0	14.7	167.9	0.3	4.1	61.6	19.4	92.6	2.1	1.8
	2020	73.1	12.2	224.2	1.4	2.3	59.9	14.8	90.1	2.5	1.8
	2021	57.3	12.1	191.5	0.4	3.3	56.7	16.3	91.5	1.1	0.7
	2022	46.0	6.9	195.0	0.9	0.8	50.7	10.0	94.3	2.1	1.8
20s	2018	105.9	18.7	149.8	1.2	0.9	67.5	16.5	91.4	5.3	0.7
	2019	101.8	15.6	177.7	1.8	3.4	65.9	14.7	93.4	5.7	3.3
	2020	88.0	14.6	255.4	1.7	4.0	65.7	13.6	96.0	6.3	3.1
	2021	71.2	15.1	275.0	0.9	7.0	51.9	13.7	96.5	2.6	3.0
	2022	72.9	14.8	264.8	0.4	2.1	54.4	11.8	97.7	2.8	2.3
30s	2018	124.4	17.4	110.7	3.0	9.4	74.1	19.1	91.1	13.0	4.3
	2019	124.2	24.5	154.1	2.2	5.0	76.7	21.9	91.9	10.5	2.2
	2020	135.4	19.3	188.6	1.9	8.4	78.2	19.4	95.0	8.8	6.0
	2021	107.4	18.9	188.2	1.5	4.8	65.8	20.9	94.9	5.9	3.2
	2022	104.4	14.6	202.9	1.2	4.1	67.1	14.9	95.7	4.1	3.9
40s	2018	150.3	20.2	119.7	4.8	16.6	79.2	18.8	87.0	23.1	7.4
	2019	145.9	17.8	114.1	5.3	9.5	84.0	18.9	91.3	23.6	6.0
	2020	151.0	20.3	160.2	5.5	11.7	86.2	23.0	92.6	24.1	6.0
	2021	132.8	13.6	176.8	4.3	12.9	77.8	15.3	94.6	17.9	5.4
	2022	124.1	17.2	176.1	4.1	5.5	75.7	18.0	91.5	16.5	6.3
50s	2018	176.9	20.8	104.3	12.9	17.2	88.5	20.6	82.0	43.9	9.3
	2019	201.4	22.5	114.0	12.0	18.3	92.8	21.9	84.2	38.5	12.2
	2020	195.6	23.4	130.0	11.9	26.9	91.8	20.7	85.0	39.4	13.4
	2021	187.7	18.7	153.6	9.1	23.6	86.4	20.9	89.4	33.8	11.1
	2022	160.7	18.6	143.5	7.8	14.0	84.0	19.5	88.8	29.6	8.6
60s	2018	248.7	27.3	60.9	23.1	22.8	91.6	19.7	59.0	52.8	11.7
	2019	260.3	23.2	69.4	22.5	27.2	93.6	21.2	65.7	57.2	13.4
	2020	271.4	25.7	105.5	23.2	18.5	92.9	22.3	71.3	53.7	12.1
	2021	254.6	25.8	107.4	22.0	14.4	92.0	23.0	72.8	55.1	10.0
	2022	244.2	30.5	103.2	17.7	16.7	92.8	25.2	78.5	46.1	9.9

<Holiday (one day)>

		Average usage time (minute)					Doers' ratio				
		Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening	Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening
All age groups	2018	219.8	31.3	145.8	10.3	7.5	82.2	23.7	84.5	27.6	5.1
	2019	215.9	33.0	131.5	8.5	6.4	81.2	23.3	81.0	23.5	4.6
	2020	223.3	39.6	174.9	8.3	7.6	80.5	27.6	84.6	22.8	4.7
	2021	193.6	26.3	176.5	7.3	7.0	75.0	21.3	86.7	19.3	4.2
	2022	182.9	30.2	187.3	5.6	5.5	72.2	22.7	88.5	17.7	4.1
10s	2018	113.4	28.6	271.0	0.9	0.7	67.4	27.7	91.5	3.5	2.1
	2019	87.4	21.3	238.5	0.1	0.0	52.8	17.6	90.1	0.7	0.0
	2020	93.9	29.8	290.8	0.9	0.0	54.9	25.4	91.5	1.4	0.0
	2021	73.9	12.3	253.8	0.0	0.0	57.4	14.9	90.8	0.0	0.0
	2022	69.3	17.4	285.0	1.0	2.8	46.4	19.3	92.9	2.1	2.1
20s	2018	151.0	32.8	212.9	2.1	2.1	66.5	24.9	95.7	6.2	2.4
	2019	138.5	23.0	223.2	0.9	1.2	69.7	19.9	91.0	3.3	1.9
	2020	132.3	26.5	293.8	2.0	1.9	64.3	20.2	97.7	6.6	2.3
	2021	90.8	17.2	303.1	0.7	1.8	49.3	14.0	97.2	2.3	1.4
	2022	89.6	25.1	330.3	0.5	1.0	48.4	16.1	96.8	2.3	1.4
30s	2018	187.2	26.6	150.2	3.5	3.9	79.8	19.1	92.6	11.7	3.5
	2019	168.2	31.0	149.5	2.5	2.0	78.3	23.3	90.1	9.9	2.0
	2020	198.1	45.0	191.3	1.6	7.4	77.2	31.6	91.2	5.6	3.2
	2021	147.6	30.3	212.3	1.5	3.2	69.6	22.7	92.3	4.0	1.2
	2022	152.5	25.9	199.9	0.8	6.9	63.3	19.6	92.7	3.3	4.1
40s	2018	213.9	39.0	145.3	6.4	8.2	82.7	25.9	90.4	25.3	3.4
	2019	216.2	37.5	98.8	6.0	5.0	83.7	25.5	84.7	20.2	3.7
	2020	232.7	41.5	154.5	5.2	4.2	85.3	28.5	89.3	19.9	3.1
	2021	191.1	28.5	155.7	4.9	6.3	79.0	21.0	91.0	14.8	3.4
	2022	191.0	29.7	157.5	4.6	4.8	76.5	22.9	89.0	16.3	2.8
50s	2018	260.8	22.9	115.0	15.3	10.4	91.9	21.5	80.7	42.2	7.0
	2019	277.5	48.0	107.9	12.9	6.6	90.3	30.6	77.3	37.4	6.5
	2020	256.5	49.8	127.8	12.5	16.3	91.6	31.4	81.5	36.6	7.7
	2021	242.6	28.9	119.0	9.2	14.2	84.8	24.9	82.2	29.6	8.1
	2022	220.5	33.0	134.9	7.6	5.6	85.7	24.8	85.3	24.4	4.6
60s	2018	315.3	34.6	64.3	26.1	14.1	93.0	24.4	63.2	56.9	10.0
	2019	317.6	28.1	56.1	21.8	18.5	94.5	19.0	60.7	51.7	10.3
	2020	334.7	37.2	83.7	22.0	10.9	91.8	25.9	63.1	50.4	9.2
	2021	326.1	31.4	92.7	22.3	11.2	93.5	25.4	71.0	50.4	8.0
	2022	291.4	42.2	105.4	15.0	10.1	92.3	29.8	78.7	45.2	8.5

(Source) MIC Institute for Information and Communications Policy "Fiscal 2022 Survey on Information and Communications Media Usage Time and Information Behavior"

18. User ratio of major media by time of day (all ages) (2022)



(Source) Institute for Information and Communications Policy, MIC, "FY2022 Survey on Usage Time of Information and Communication Media and Information Behavior"

19. Internet usage time and doers' ratio with major equipment

Weekday		Average time of internet use (minute)			Internet doers' ratio		
		PC	Mobile	Tablet	PC	Mobile	Tablet
All age groups	2018	34.0	72.9	6.3	24.6	74.3	7.5
	2019	35.4	85.4	6.3	24.1	80.2	7.4
	2020	58.1	105.8	9.7	30.2	81.6	8.4
	2021	57.6	110.0	12.4	30.7	83.5	10.4
	2022	56.5	113.3	10.9	28.3	84.9	8.6
10s	2018	8.3	144.7	9.5	9.2	81.2	8.2
	2019	13.1	150.1	5.8	9.2	87.7	6.3
	2020	34.0	186.8	6.4	15.5	84.5	8.1
	2021	14.7	154.2	19.9	11.0	84.0	12.8
	2022	32.6	160.5	12.9	15.7	89.3	11.8
20s	2018	21.8	122.0	4.6	17.2	89.0	6.7
	2019	30.5	147.3	5.5	20.1	91.5	7.8
	2020	73.8	177.4	15.6	31.0	93.9	7.5
	2021	76.1	201.0	16.9	32.3	94.0	10.2
	2022	65.0	207.7	15.0	27.2	95.6	9.2
30s	2018	28.5	76.2	5.4	22.8	87.5	6.0
	2019	48.3	98.5	6.2	24.3	89.3	6.7
	2020	64.4	114.0	9.4	30.8	90.8	7.0
	2021	56.1	121.0	13.2	31.0	91.3	10.3
	2022	66.6	120.2	8.9	25.7	91.4	7.8
40s	2018	45.1	69.8	6.4	29.9	81.6	8.8
	2019	35.5	69.4	7.7	27.0	86.2	8.1
	2020	59.0	98.2	8.0	30.1	89.3	7.7
	2021	67.6	101.0	10.3	36.6	89.7	9.4
	2022	63.5	111.5	9.5	33.2	88.1	7.1
50s	2018	51.9	53.1	5.4	34.8	69.3	8.0
	2019	44.0	68.3	5.8	31.8	77.2	9.4
	2020	62.9	64.6	9.2	36.9	74.2	10.6
	2021	65.7	79.1	6.3	34.2	81.1	7.9
	2022	61.9	70.0	13.5	34.2	80.5	10.4
60s	2018	31.2	23.3	7.3	23.7	46.0	7.4
	2019	30.2	31.7	6.1	23.6	56.7	5.7
	2020	46.9	54.1	9.7	29.6	61.5	8.9
	2021	46.1	50.3	13.2	28.8	63.6	13.0
	2022	38.7	58.4	7.3	25.6	69.3	6.8

Holiday		Average time of internet use (minute)			Internet doers' ratio		
		PC	Mobile	Tablet	PC	Mobile	Tablet
All age groups	2018	27.5	107.7	8.7	18.9	76.9	8.6
	2019	22.2	99.4	8.9	15.0	75.9	6.7
	2020	31.1	126.4	12.5	18.9	77.9	8.7
	2021	30.5	126.8	13.8	18.9	80.5	8.9
	2022	32.4	139.7	11.6	18.0	82.9	7.8
10s	2018	3.7	242.4	12.3	4.3	85.1	9.9
	2019	32.8	197.1	11.0	12.0	85.9	6.3
	2020	28.9	247.5	18.9	12.0	85.2	9.2
	2021	27.6	200.6	23.4	13.5	82.3	10.6
	2022	54.5	234.3	17.6	17.9	89.3	7.9
20s	2018	29.7	177.3	6.6	12.9	93.3	8.6
	2019	29.4	186.9	9.6	12.8	87.2	6.6
	2020	40.2	230.7	16.3	15.0	94.4	7.0
	2021	52.0	251.3	12.8	20.5	96.3	6.5
	2022	48.9	276.5	17.4	21.2	93.5	9.2
30s	2018	27.7	108.6	8.5	14.4	89.1	7.8
	2019	29.2	108.8	11.1	13.0	87.7	5.9
	2020	31.1	137.1	9.6	15.6	84.8	8.0
	2021	32.5	147.2	15.6	17.4	89.1	8.5
	2022	34.2	148.1	8.5	15.5	88.6	6.5
40s	2018	28.9	102.4	12.1	22.2	84.0	9.9
	2019	14.6	73.8	7.9	15.0	80.1	6.7
	2020	26.0	109.8	12.3	19.9	84.7	8.0
	2021	23.4	110.8	13.4	14.8	87.3	8.3
	2022	14.1	118.8	9.8	11.0	85.3	6.0
50s	2018	39.1	74.2	5.0	27.8	69.3	8.5
	2019	22.2	74.6	10.4	19.4	68.3	7.6
	2020	34.1	77.2	14.8	24.4	70.4	11.5
	2021	24.9	75.8	8.8	21.5	73.4	7.7
	2022	30.0	86.1	12.4	22.5	76.5	9.8
60s	2018	25.0	30.8	8.1	22.4	50.2	7.4
	2019	14.0	32.4	5.3	15.5	55.2	6.9
	2020	28.4	46.5	6.9	21.3	55.7	8.2
	2021	28.0	47.3	14.1	23.6	59.4	12.3
	2022	30.6	59.2	7.7	21.0	70.2	7.7

(Source) Institute for Information and Communications Policy, MIC, "FY2022 Survey on Usage Time of Information and Communication Media and Information Behavior"

20. Usage time and doers' ratio of major means of communication

Weekday

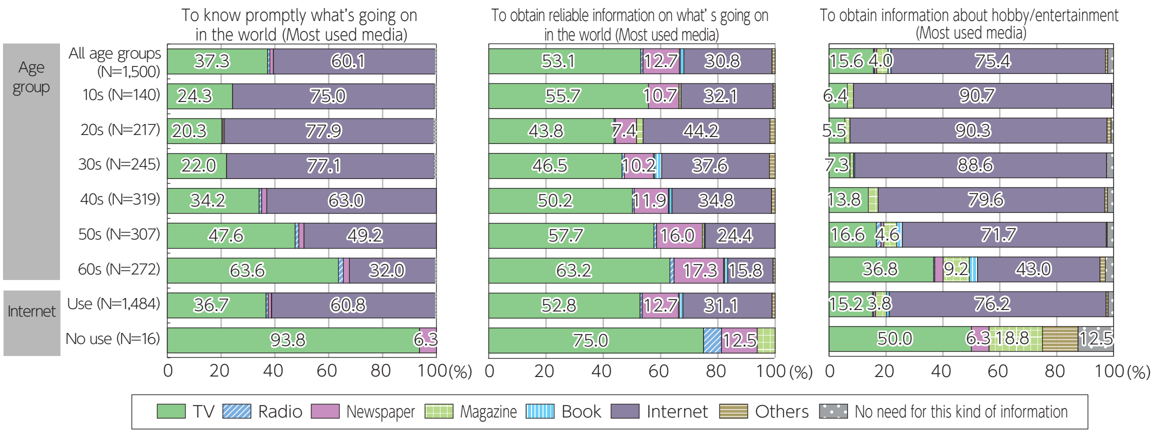
		Average usage time (minute)					Doers' ratio				
		Mobile-phone call	Fixed-phone call	Internet call	Social media	メール	Mobile-phone call	Fixed-phone call	Internet call	Social media	e-mail
All age groups	2018	5.0	0.7	2.2	26.7	30.8	15.8	2.4	4.3	38.8	46.4
	2019	6.2	1.5	3.1	32.3	34.6	19.8	3.4	5.4	44.0	48.4
	2020	7.4	2.3	3.8	37.9	40.8	18.4	3.4	5.5	47.0	49.5
	2021	6.4	1.1	4.2	40.2	35.7	17.0	2.5	5.0	50.0	47.9
	2022	6.4	0.5	4.8	43.3	40.3	14.9	1.5	4.5	49.9	44.3
10s	2018	3.1	0.0	5.1	71.6	13.5	6.4	0.7	6.4	55.3	22.7
	2019	3.3	0.4	9.2	64.1	16.0	8.5	1.4	9.2	63.0	24.6
	2020	6.7	0.0	8.8	72.3	18.4	9.9	0.4	9.9	61.3	22.9
	2021	8.4	0.0	5.3	64.4	19.6	11.0	0.0	7.4	62.8	23.1
	2022	6.3	0.2	19.0	64.2	16.1	4.6	0.7	9.3	60.0	22.9
20s	2018	3.1	0.0	6.1	51.9	21.4	8.6	0.2	7.4	63.6	39.0
	2019	6.3	0.1	7.8	71.4	25.9	16.1	0.9	9.0	65.9	36.0
	2020	4.8	4.1	7.9	84.6	39.6	10.8	2.6	8.2	69.5	42.3
	2021	6.0	1.7	14.0	84.1	20.1	12.6	0.5	9.3	72.1	30.5
	2022	5.8	0.0	10.5	87.3	39.2	9.2	0.2	8.3	70.0	32.3
30s	2018	4.3	1.3	1.6	23.5	32.0	16.5	2.9	4.9	49.0	54.3
	2019	7.2	3.6	2.2	35.3	45.3	17.4	2.2	6.3	51.2	50.8
	2020	6.4	2.1	2.9	40.9	39.7	20.8	2.2	6.8	54.2	51.2
	2021	4.3	2.7	5.1	46.2	36.0	17.4	3.4	5.1	60.5	45.3
	2022	4.9	1.3	1.1	48.2	41.1	13.7	1.6	3.3	59.6	41.8
40s	2018	4.9	0.6	1.6	23.2	39.6	18.1	1.9	4.2	42.3	49.1
	2019	6.1	1.3	1.3	19.5	34.1	21.8	3.2	3.8	45.6	56.9
	2020	10.7	3.1	2.1	27.5	44.8	18.7	3.4	3.1	51.1	56.3
	2021	8.4	0.7	1.5	32.2	39.9	17.1	2.2	3.1	53.1	56.6
	2022	8.5	0.2	1.7	38.6	52.4	18.5	1.1	3.6	47.0	49.2
50s	2018	7.5	0.1	0.3	15.8	43.2	17.8	1.7	1.5	28.5	56.9
	2019	5.9	1.0	0.9	23.9	45.8	22.5	4.5	2.9	38.3	55.0
	2020	6.1	1.5	1.3	20.1	45.4	20.0	4.5	4.5	37.3	55.4
	2021	4.7	0.8	1.7	25.7	50.9	16.3	3.0	4.4	38.9	58.1
	2022	7.9	0.6	3.5	26.6	48.4	19.1	1.8	3.3	45.1	53.7
60s	2018	5.7	1.3	1.1	4.5	23.5	20.2	5.5	3.5	10.2	43.8
	2019	7.3	1.7	1.7	8.2	30.5	25.5	6.2	4.3	16.0	51.0
	2020	8.4	2.0	3.5	12.9	44.5	24.3	5.5	3.9	21.5	53.0
	2021	6.8	0.7	1.2	13.3	34.5	23.7	4.5	3.4	25.2	55.4
	2022	4.2	0.4	1.2	17.4	29.8	16.7	2.8	2.6	28.5	50.7

Holiday

		Average usage time (minute)					Doers' ratio				
		Mobile-phone call	Fixed-phone call	Internet call	Social media	メール	Mobile-phone call	Fixed-phone call	Internet call	Social media	e-mail
All age groups	2018	4.6	0.2	3.4	35.6	23.6	16.5	1.5	6.1	39.1	42.9
	2019	4.0	0.3	3.7	36.2	22.4	16.8	1.3	4.7	42.9	40.9
	2020	6.2	0.3	2.8	44.2	22.0	14.9	1.3	5.1	44.9	37.5
	2021	3.8	0.2	3.7	45.1	18.3	13.5	1.1	5.0	46.5	37.9
	2022	4.4	0.2	4.3	54.8	22.9	11.3	0.7	4.7	49.9	34.0
10s	2018	6.2	0.5	10.9	98.7	27.7	10.6	1.4	10.6	58.2	26.2
	2019	3.0	0.4	13.8	83.4	20.6	9.9	1.4	13.4	64.1	19.7
	2020	8.4	0.0	8.7	85.4	14.5	9.2	0.0	10.6	60.6	18.3
	2021	6.3	1.5	6.8	74.2	22.5	8.5	0.7	6.4	60.3	24.8
	2022	11.8	0.0	21.3	100.3	24.6	10.7	0.0	12.1	61.4	18.6
20s	2018	2.8	0.0	8.1	64.6	20.5	12.4	0.0	10.5	64.1	36.8
	2019	3.4	0.3	10.7	81.1	20.5	12.8	0.5	7.6	67.3	32.2
	2020	3.4	0.0	4.3	110.8	27.0	9.9	0.0	6.1	70.0	32.9
	2021	3.4	0.1	12.3	114.2	6.8	10.7	0.5	7.4	71.2	21.9
	2022	7.3	0.0	8.0	115.7	35.9	6.5	0.0	7.4	71.4	24.0
30s	2018	5.5	0.0	1.2	38.4	23.1	18.3	0.0	5.4	52.5	47.5
	2019	5.3	0.0	2.1	38.4	26.4	17.0	0.0	4.0	52.6	41.5
	2020	3.5	0.0	2.7	43.8	14.3	13.6	0.0	5.2	51.2	34.0
	2021	2.8	0.0	3.9	50.5	14.1	11.3	0.0	4.5	58.7	32.4
	2022	2.8	0.0	1.3	62.8	16.0	9.0	0.0	4.1	59.6	26.5
40s	2018	3.8	0.1	2.4	27.3	22.4	15.1	1.2	6.2	40.7	41.0
	2019	2.5	0.2	0.6	19.5	19.3	17.2	0.6	2.1	42.3	43.6
	2020	4.2	0.1	1.3	28.2	24.3	14.7	0.6	3.1	47.2	42.6
	2021	4.0	0.0	2.0	32.0	18.2	13.0	0.6	6.2	50.9	41.7
	2022	2.5	0.5	1.3	38.9	18.3	10.0	1.6	3.1	48.6	32.9
50s	2018	4.0	0.4	1.6	20.2	28.8	17.0	2.6	3.7	25.6	48.9
	2019	5.7	0.2	0.6	24.0	21.6	19.1	1.4	2.9	34.5	45.7
	2020	6.6	0.3	2.0	22.5	22.4	17.1	2.4	4.9	34.5	42.2
	2021	3.0	0.1	0.8	22.7	21.6	14.5	1.3	3.0	31.0	45.8
	2022	3.5	0.3	1.5	32.6	25.3	14.0	1.0	2.9	39.4	42.7
60s	2018	5.7	0.5	1.0	6.1	20.9	21.7	3.0	3.3	11.7	47.8
	2019	3.7	0.7	1.3	9.1	25.3	20.3	3.8	3.8	14.8	49.3
	2020	11.8	1.0	1.4	14.3	25.9	20.9	3.9	4.3	20.6	43.3
	2021	4.4	0.3	0.4	11.3	25.3	19.6	2.9	3.6	21.0	48.9
	2022	2.6	0.1	1.8	19.0	20.6	16.2	0.7	2.9	31.3	48.2

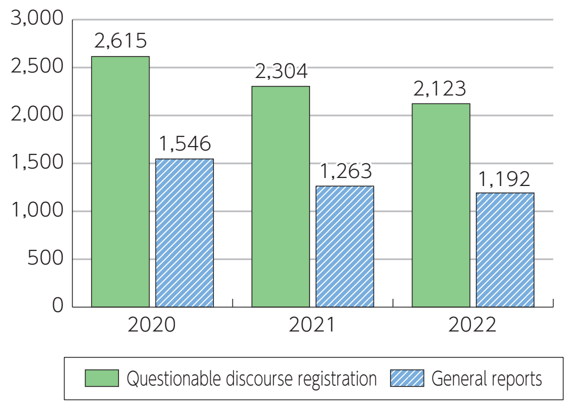
(Source) Institute for Information and Communications Policy, MIC, "FY2022 Survey on Usage Time of Information and Communication Media and Information Behavior"

21. Media used by purpose (most used media; for all age groups, by age group, and by using or not using the Internet) (Figure4-11-1-10 in White Paper)



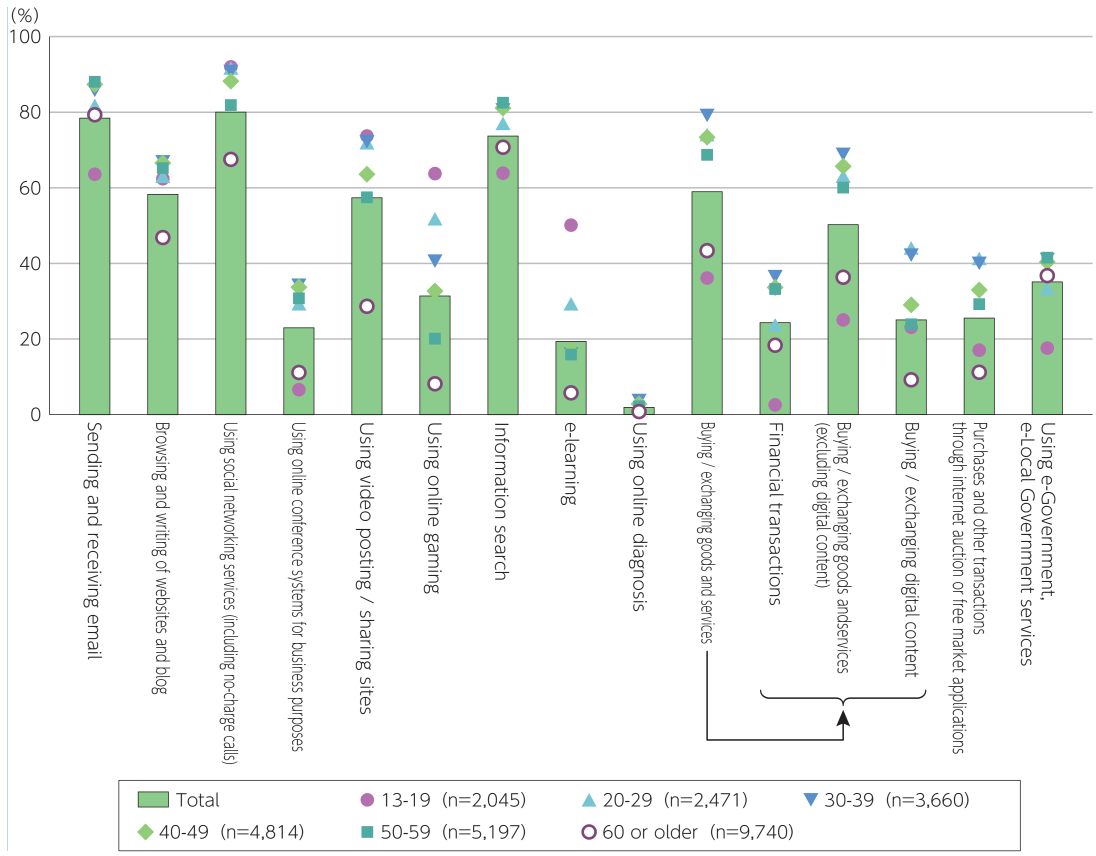
(Source) MIC Institute for Information and Communications Policy "Fiscal 2022 Survey on Information and Communications Media Usage Time and Information Behavior"

22. Questionable discourse database registrations



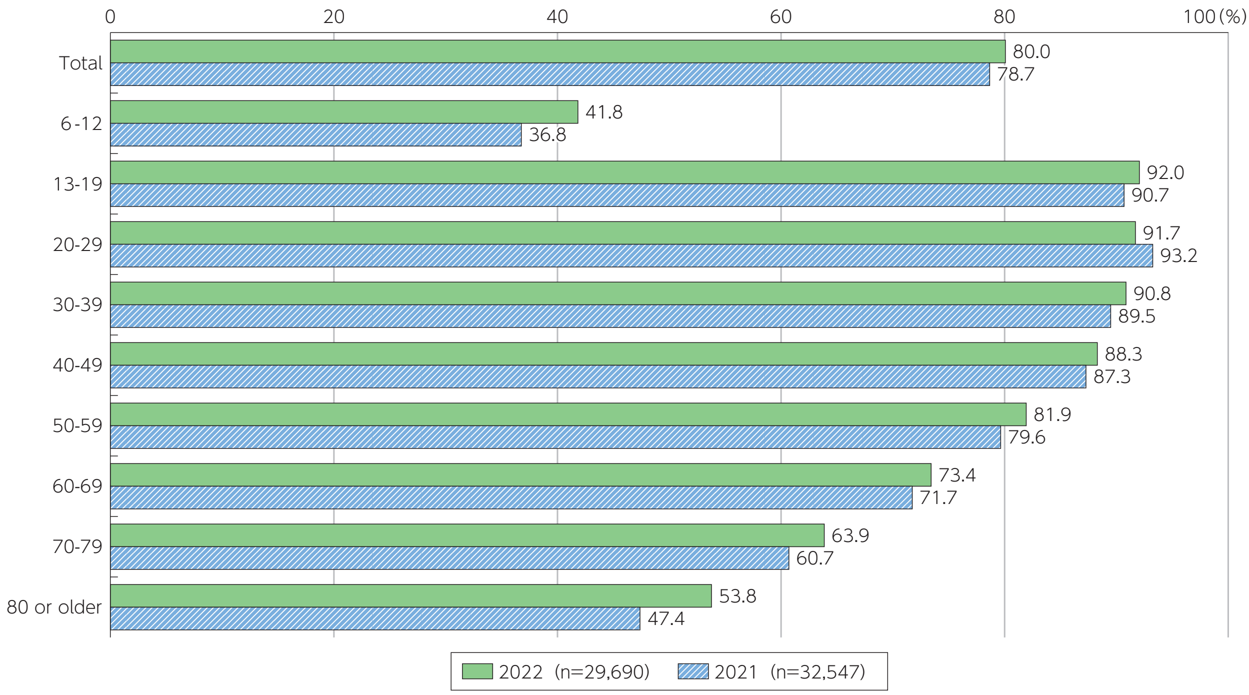
(Source) FactCheck Initiative "Questionable Discourse Database (ClaimMonitor)"

23. Purpose of internet usage by age group (multiple answers) (2022)



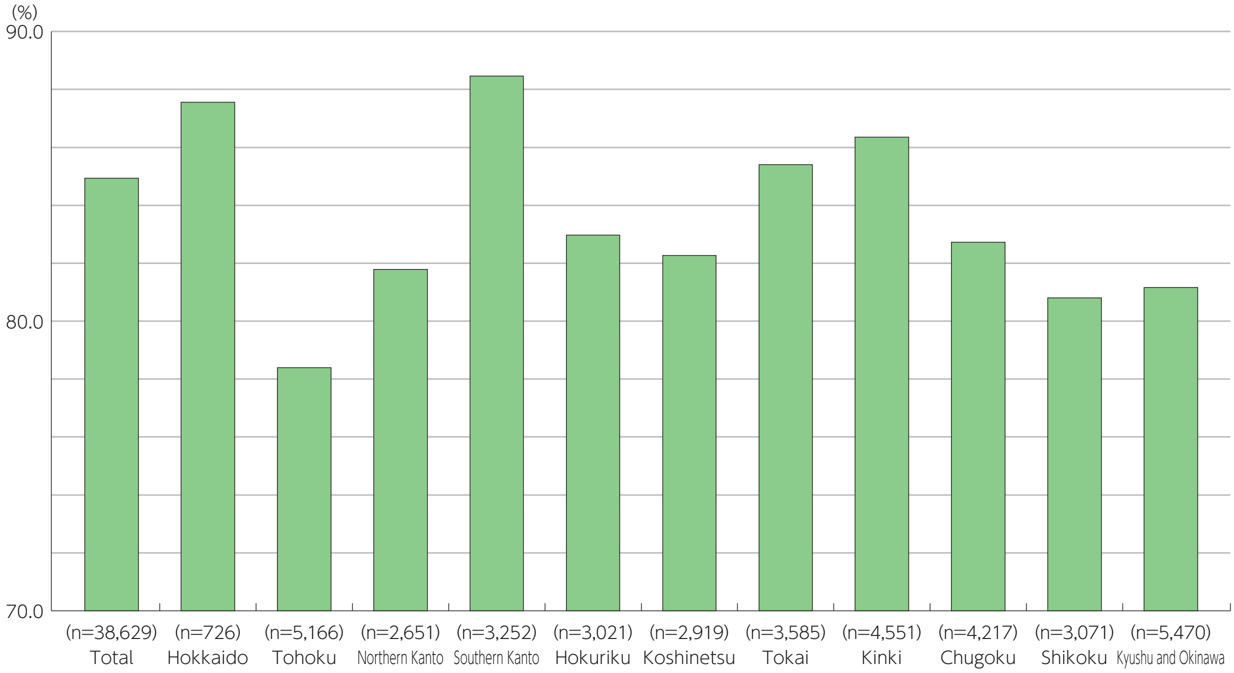
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

24. SNS usage state by age group



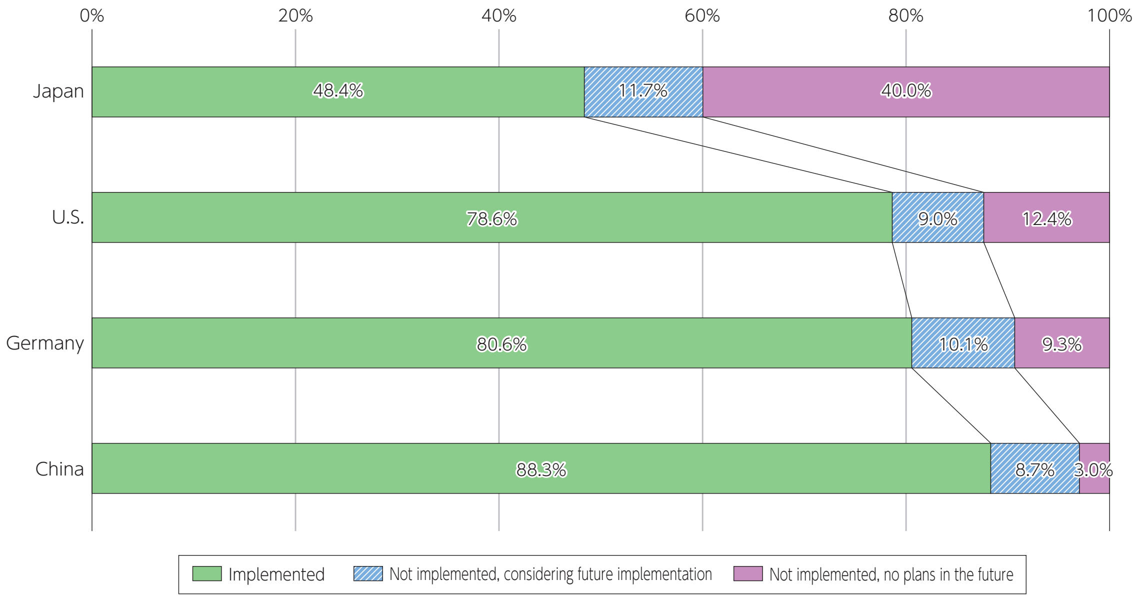
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

25. Internet usage rate by region



(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

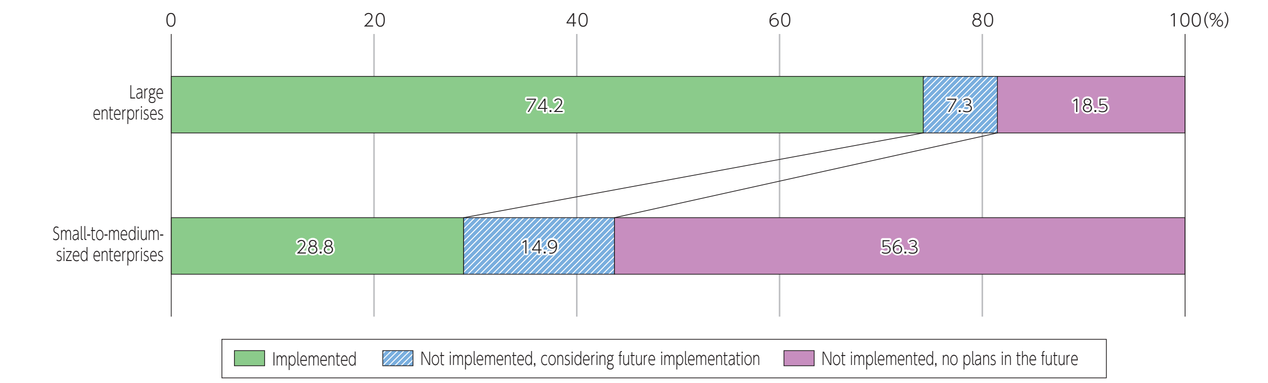
26. Status of digitalization (comparison by country) (Figure4-11-2-1 in White Paper)



* Based on the results of a screening survey conducted to identify companies engaged in digitalization

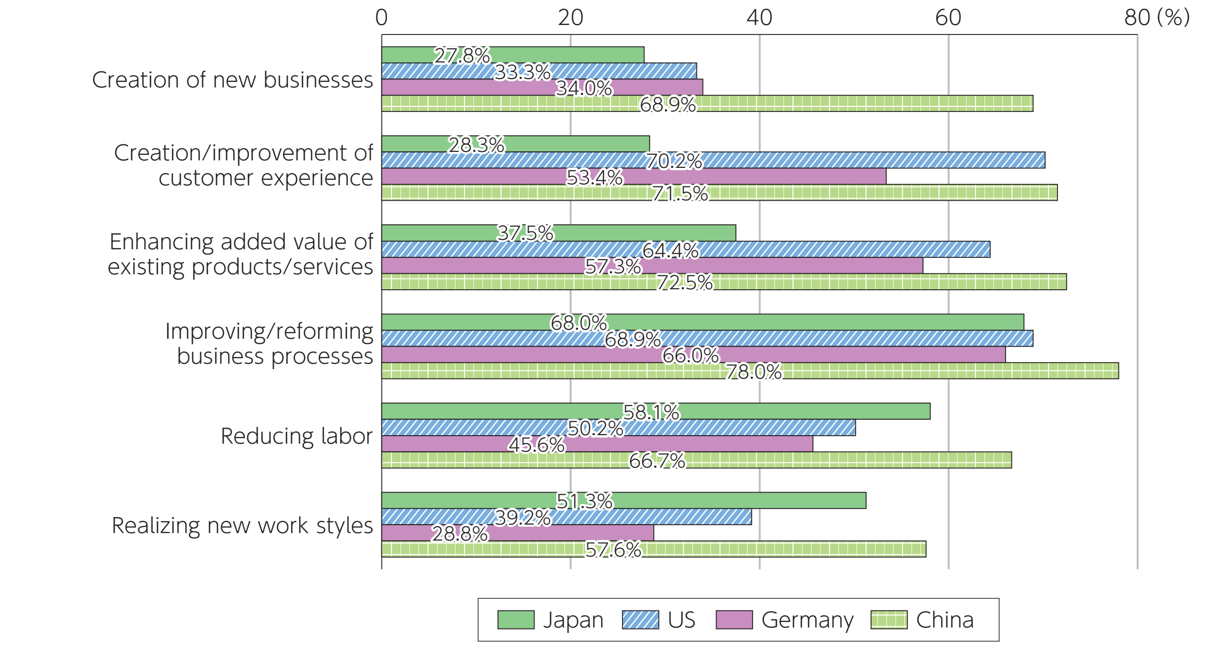
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

27. Status of digitalization (Japan: Comparison by company size)



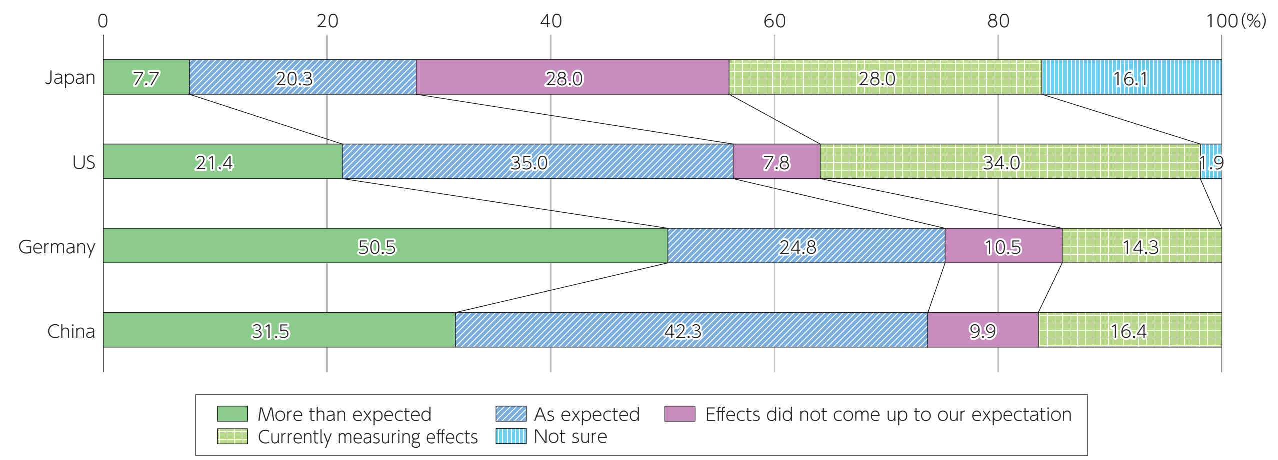
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

28. Initiatives to promote digitalization (comparison by country) (Figure4-11-2-2 in White Paper)



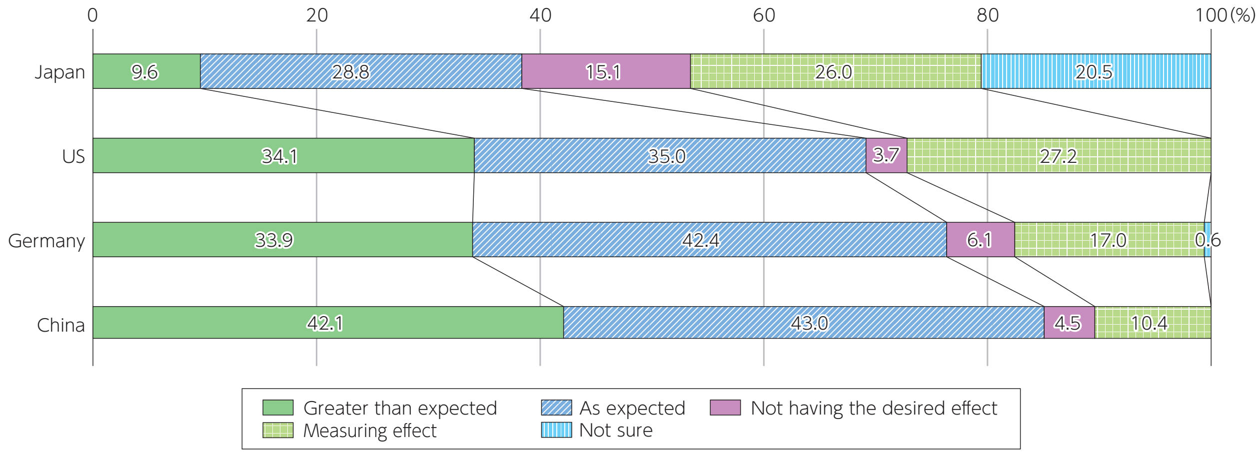
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

29. Results of digitalization in creating new business



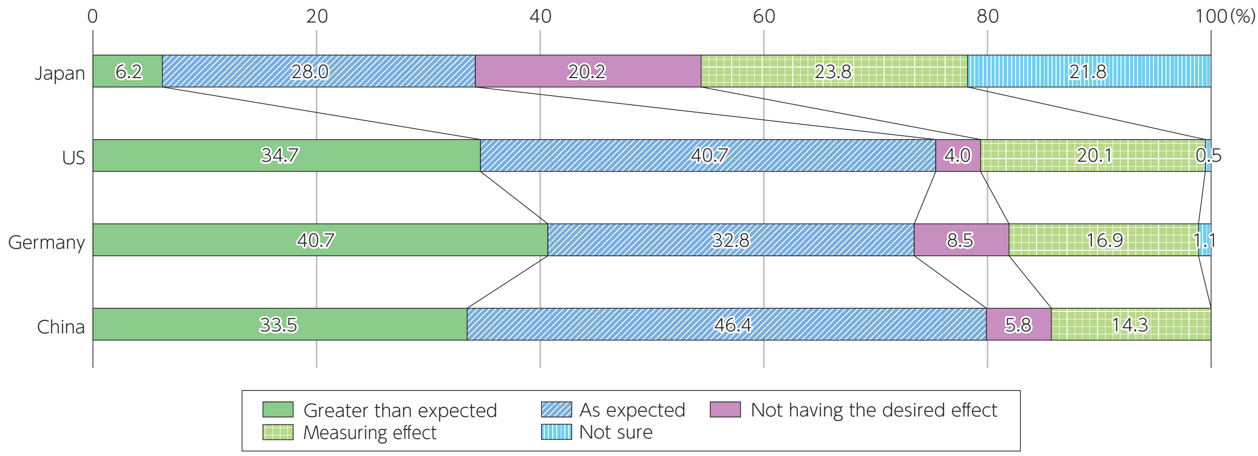
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital"

30. Results of digitalization in creating/improving customer experiences



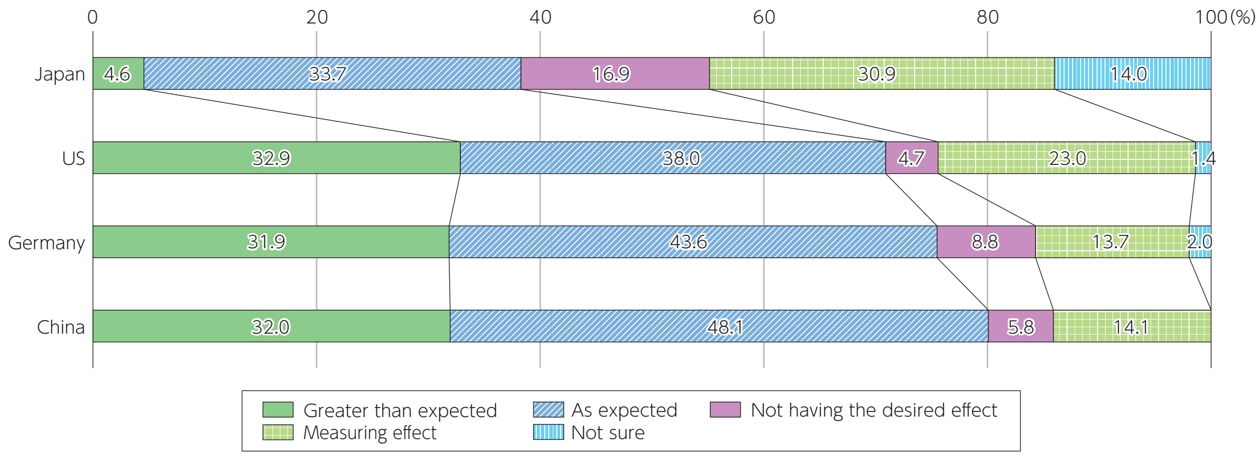
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

31. Results of digitalization in enhancing added value of existing products/services



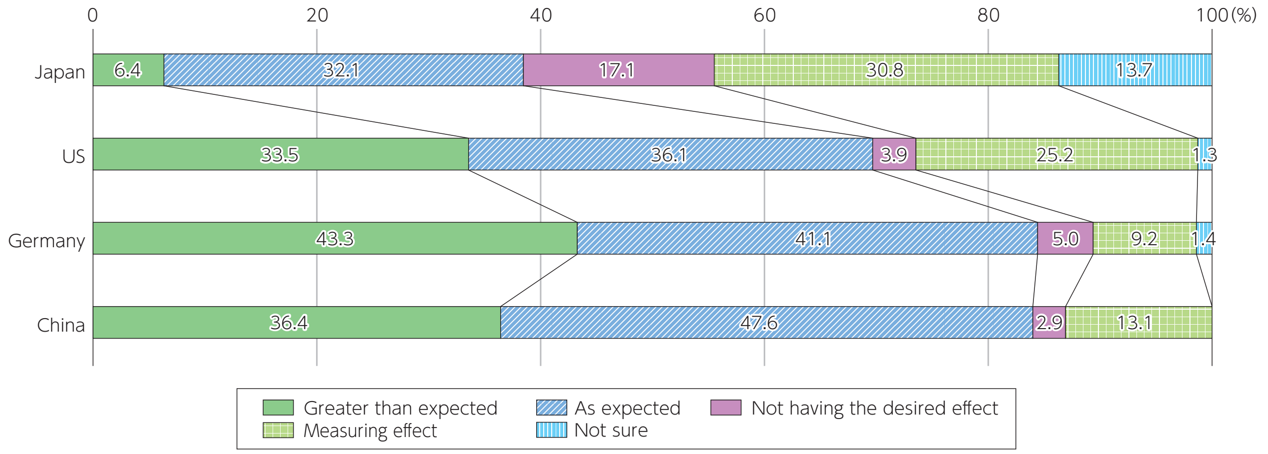
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

32. Results of digitalization in improving/reforming business processes



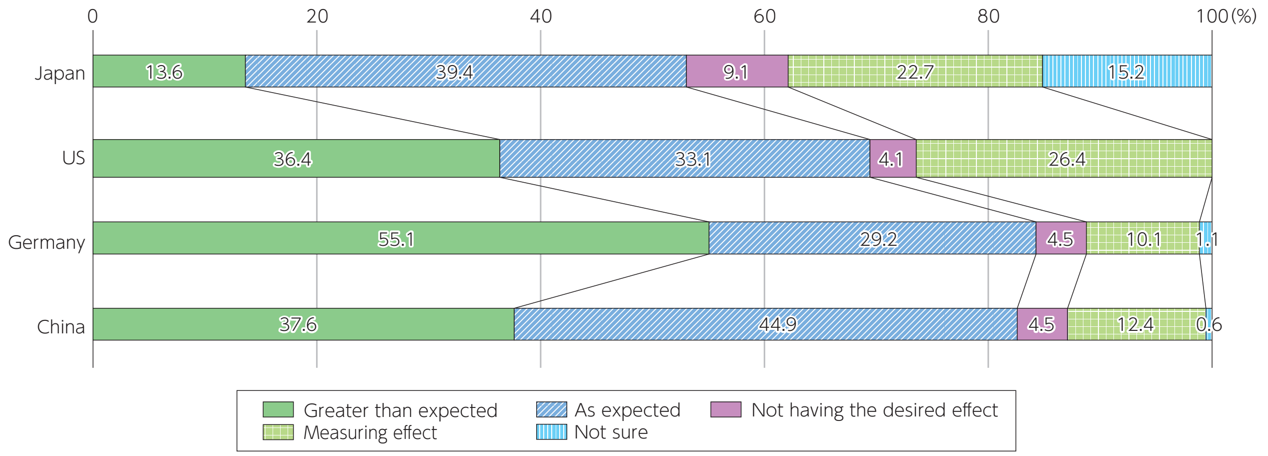
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

33. Results of digitalization in reducing labor



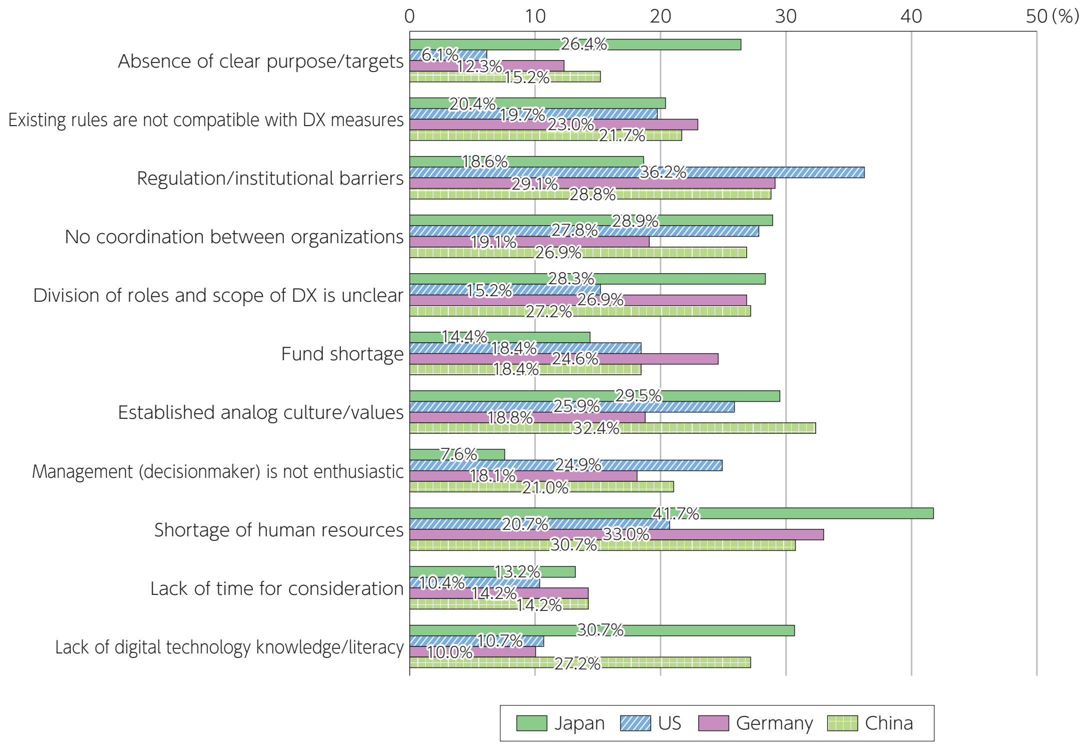
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

34. Results of digitalization in realizing new work styles



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

35. Challenges in promoting digitalization (comparison by country) (Figure4-11-2-3 in White Paper)

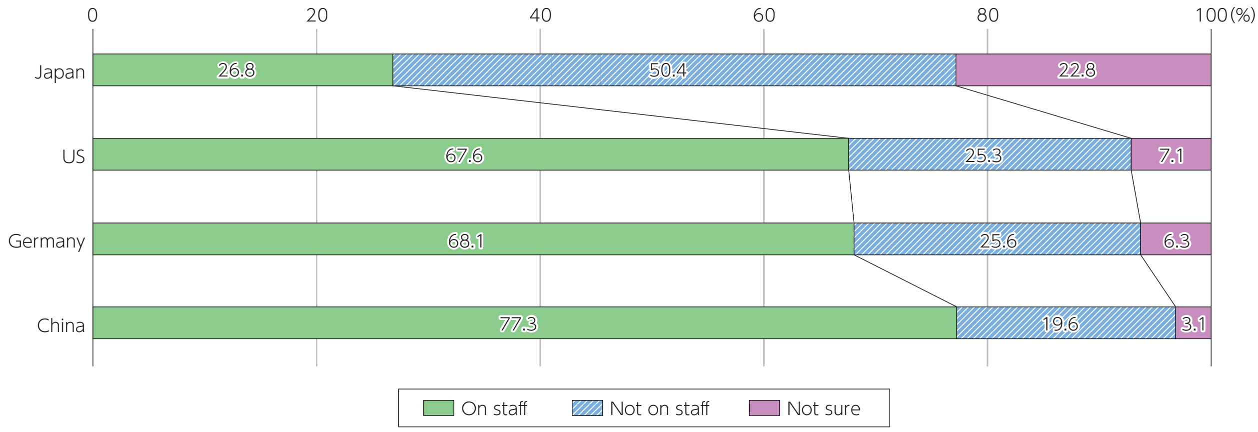


(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

36. Specialized digital human resources on staff (Figure4-11-2-4 in White Paper)

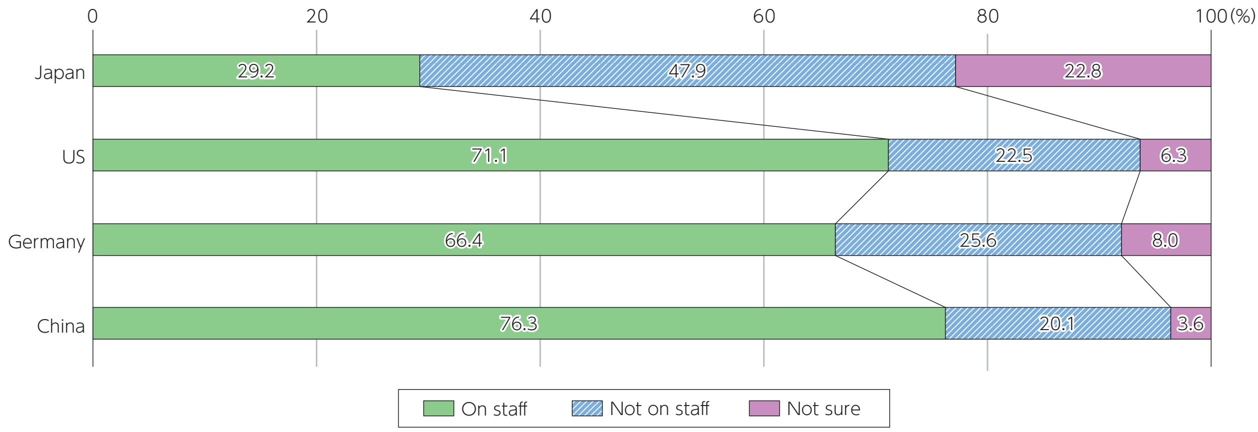
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

37. “AI/data analysis experts” in companies making use of personal data



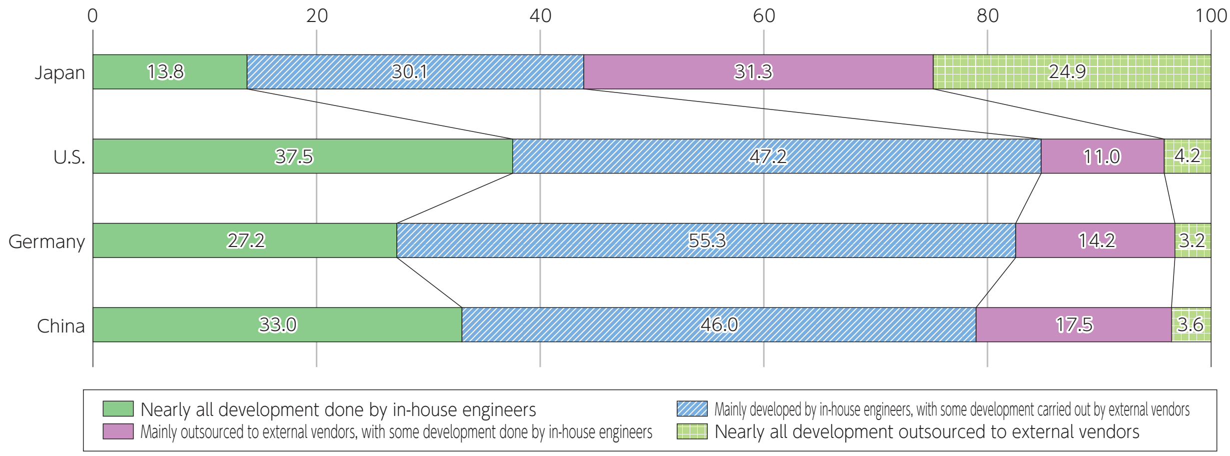
(Source) MIC (2023) “Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad”

38. “AI/data analysis experts” in companies making use of information other than personal data



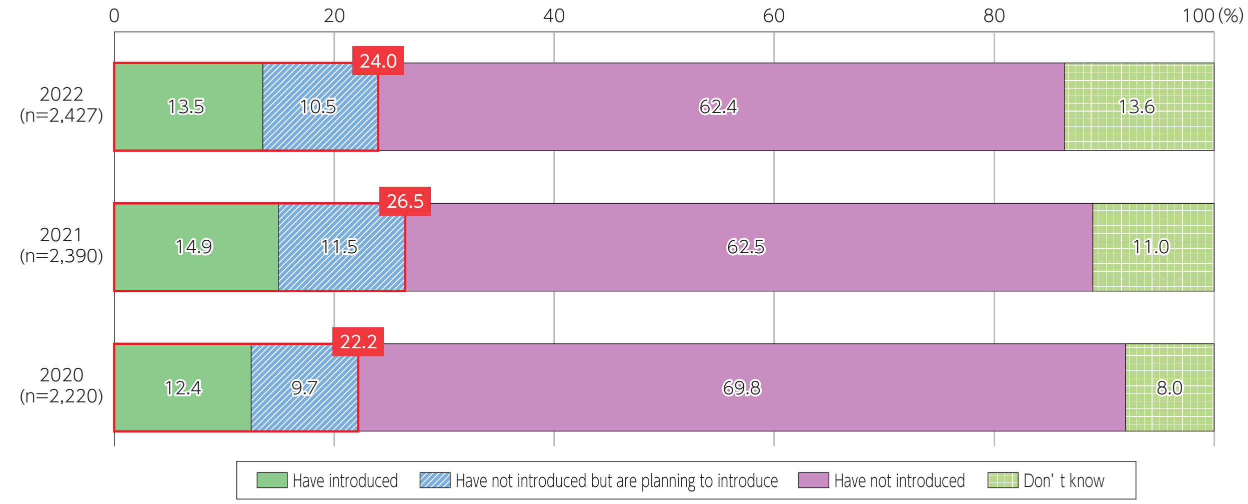
(Source) MIC (2023) “Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad”

39. In-house development of systems (comparison by country)



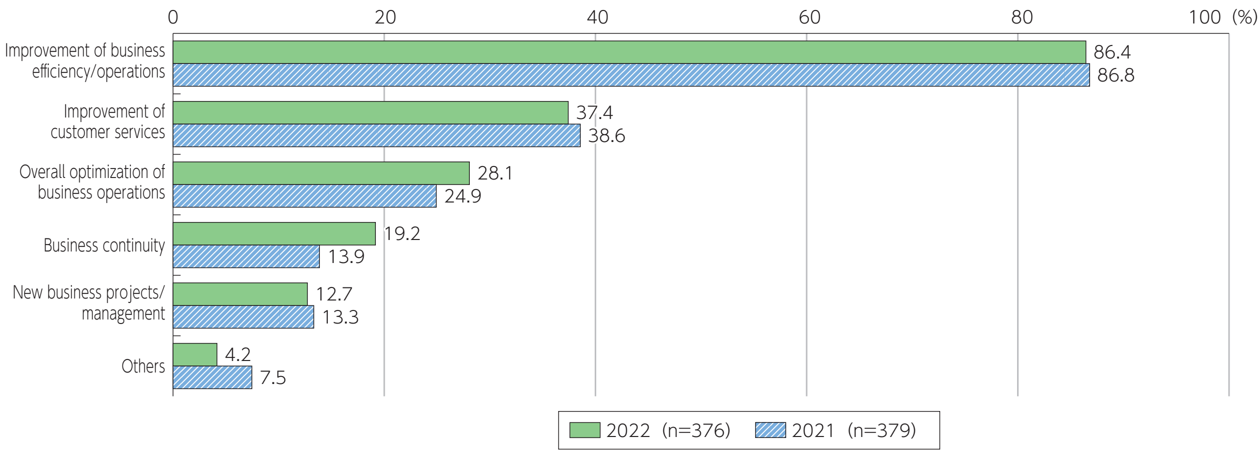
(Source) MIC (2023) “Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad”

40. Introduction of IoT, AI, and other systems and services in enterprises



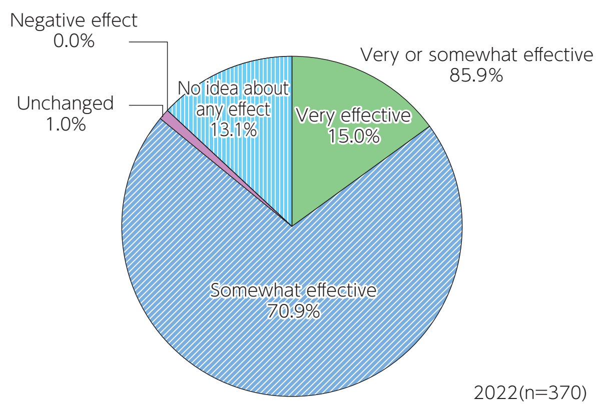
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

41. Purpose of enterprise collecting and analyzing data through IoT, AI, and other system services



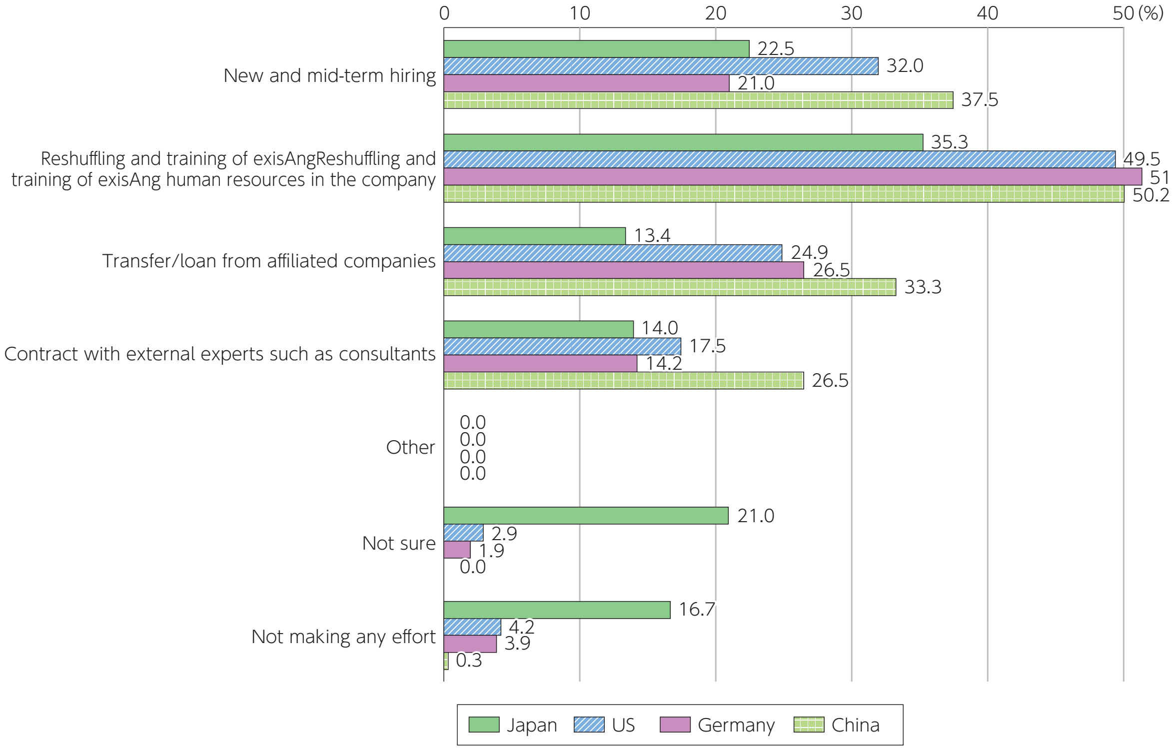
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

42. Results of introducing IoT, AI, and other systems and services in enterprises



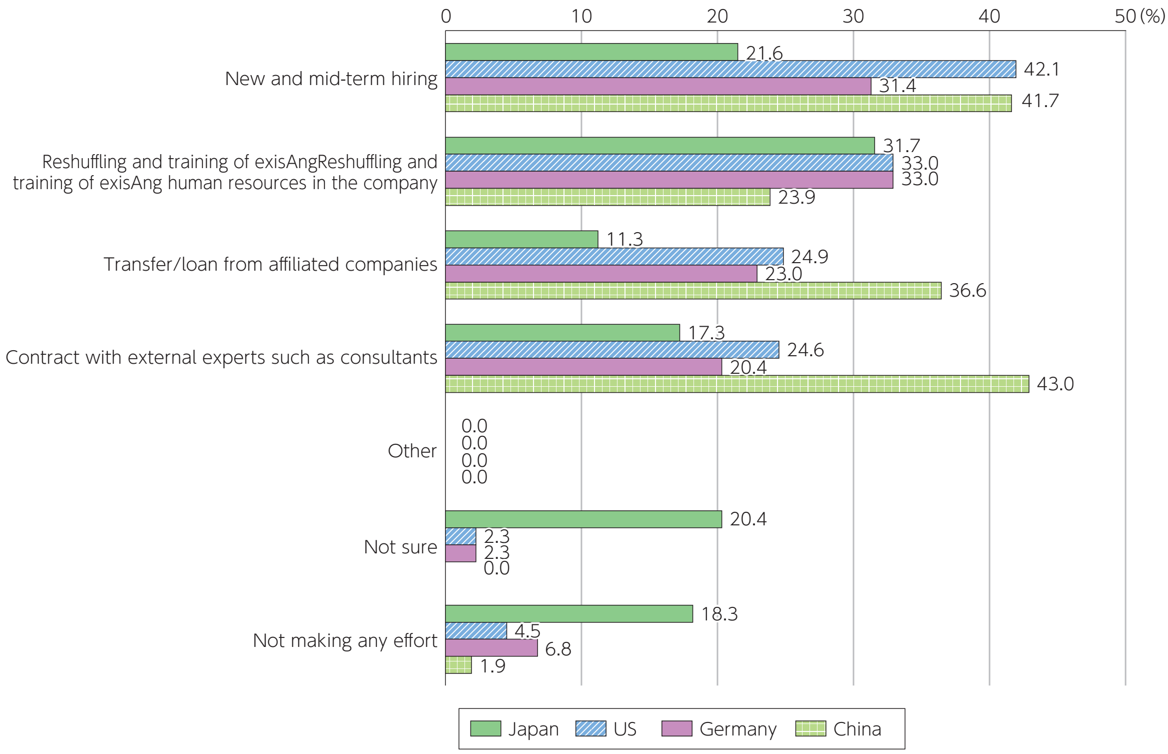
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

43. Initiatives to secure digital human resources (by country; individuals capable of integrating digital human resources with business division personnel to build systems for DX)



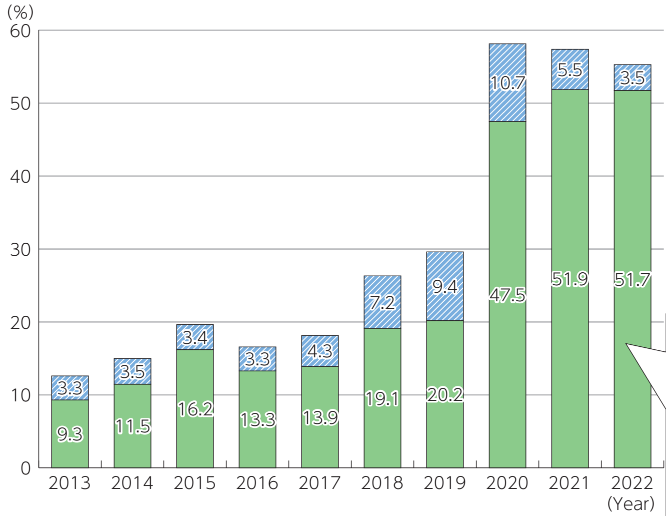
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

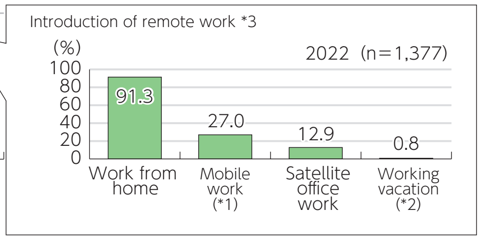
44. Initiatives to secure digital human resources (by country; AI/data analysis experts)



(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

45. Changes in introducing remote work
(Figure4-11-2-5 in White Paper)

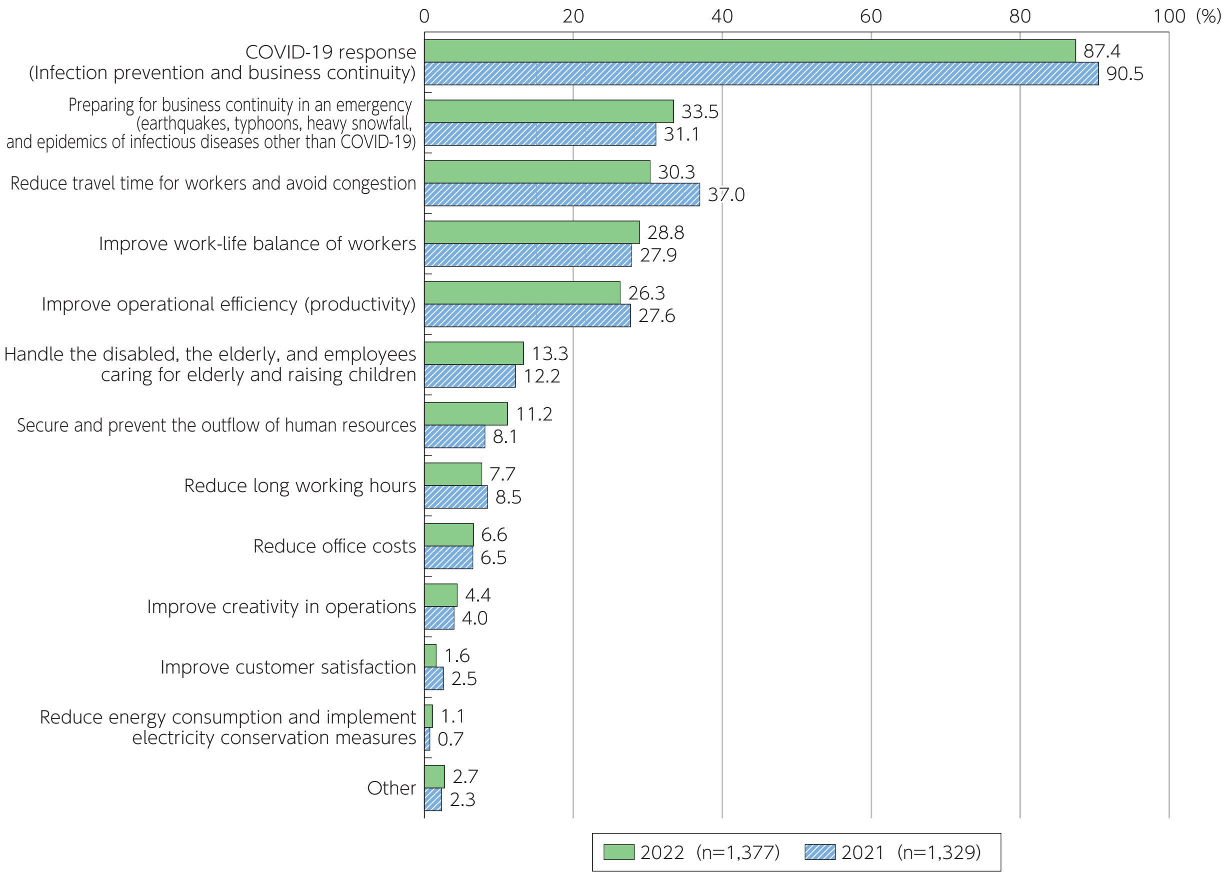




* 1 Working outside of the office for sales activities and other similar work, including work such as checking email and writing daily reports during commutes or at locations such as cafes.
* 2 Remote work performed in a location other than the usual workplace or the home, combined with personal time.
* 3 Total includes entities that provided no response to introduction type.

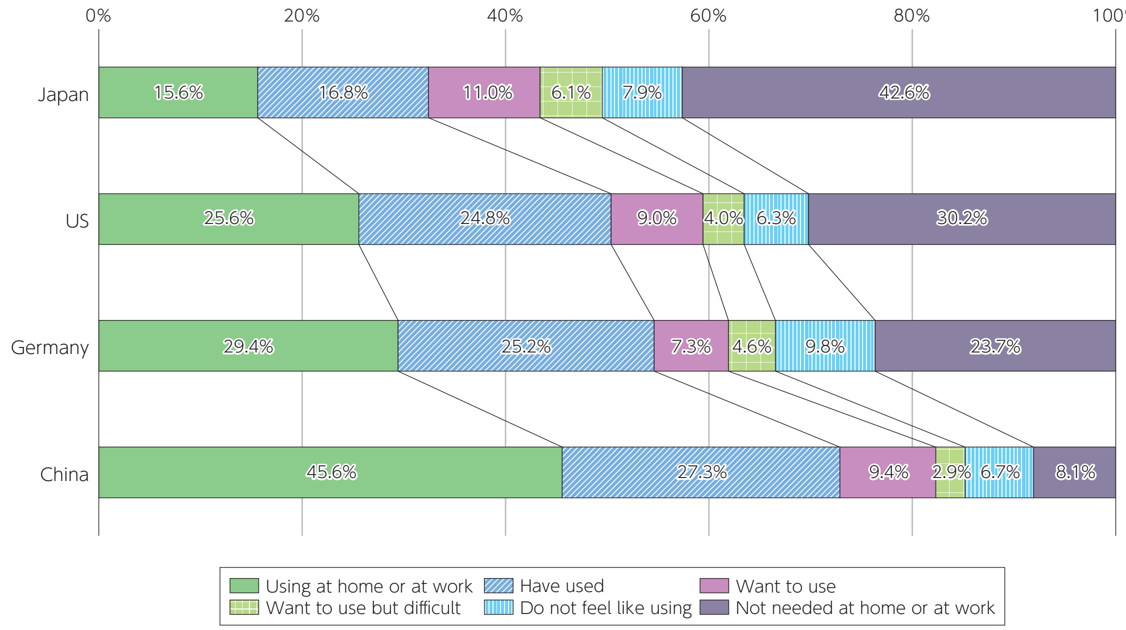
(Source) MIC "Communications Usage Trend Survey"

46. Purpose for introducing remote work (multiple answers allowed)



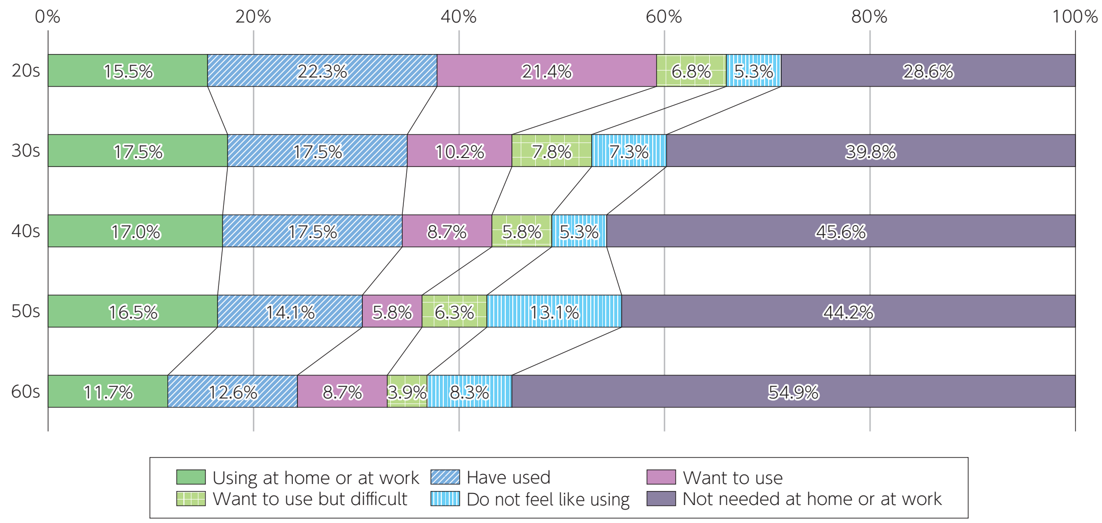
(Source) MIC "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

47. Usage of remote work and online meetings (international comparison) (Figure4-11-2-6 in White Paper)



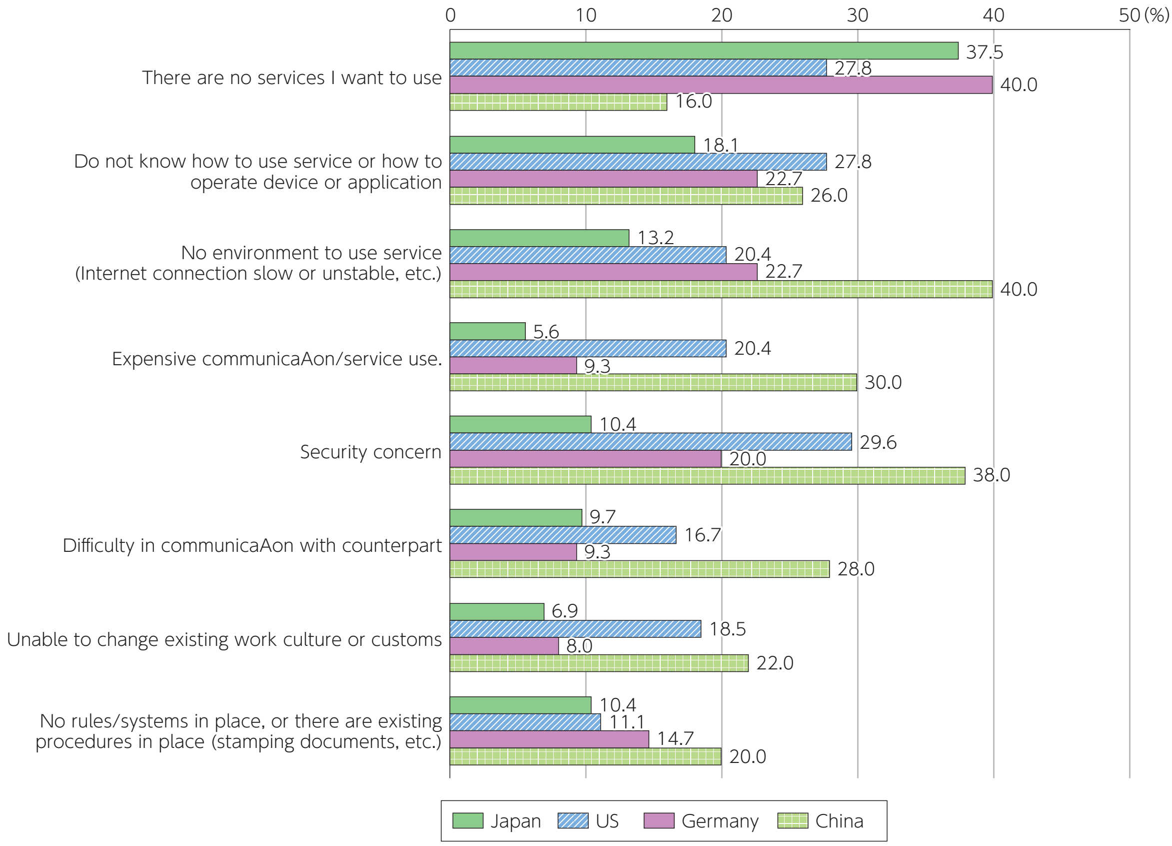
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

48. Usage of remote work and online meetings (Japan; by age) (Figure4-11-2-7 in White Paper)



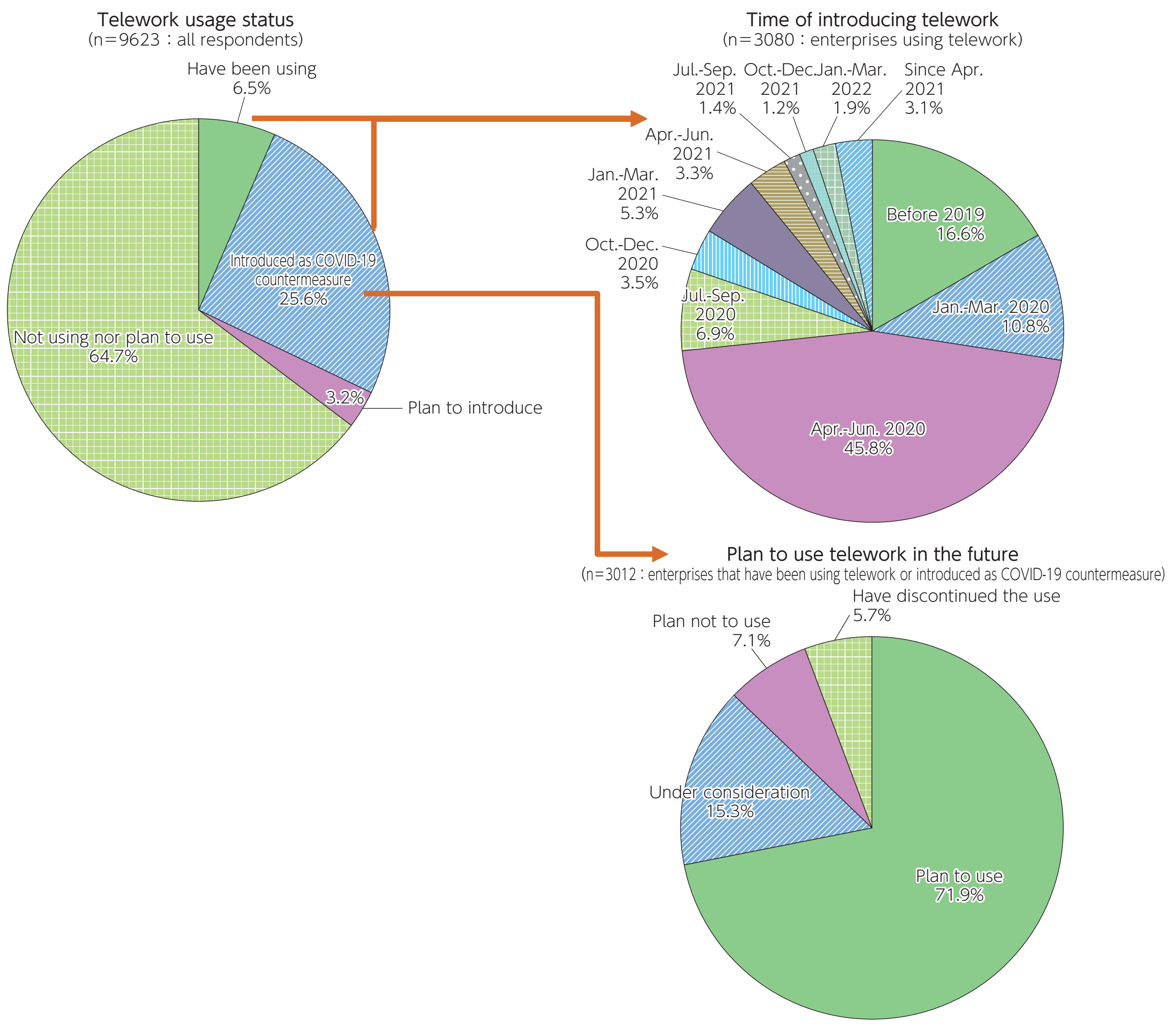
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

49. Reasons why remote work or online meetings are unavailable



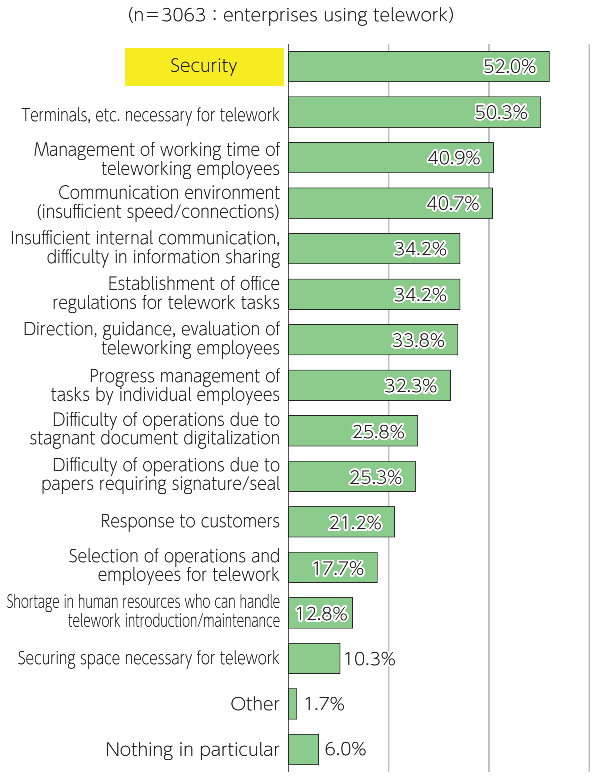
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

50. Telework usage status



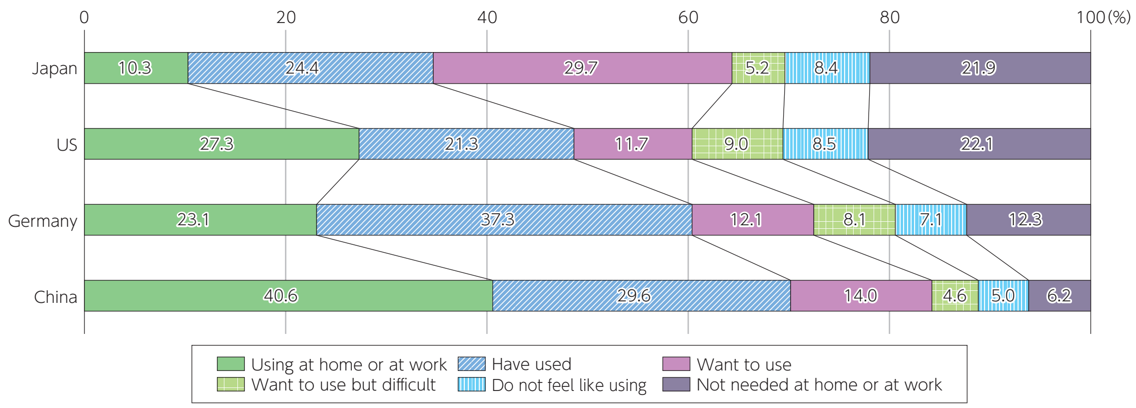
(Source) Prepared from MIC "Fiscal 2022 Result of Survey on Actual Condition of Telework Security"

51. Challenges for introducing telework (multiple answers)



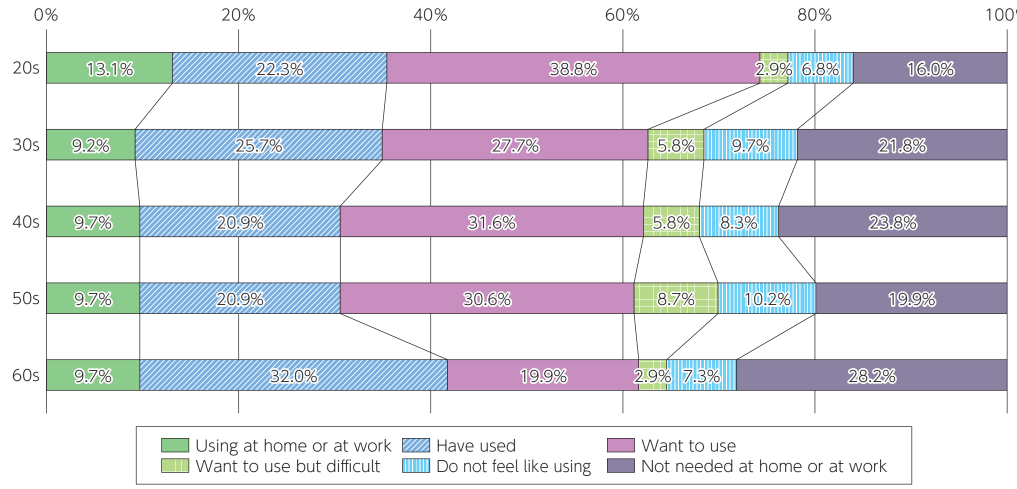
(Source) Prepared from MIC "Fiscal 2022 Result of Survey on Actual Condition of Telework Security"

52. Usage of digital administrative services (by country) (Figure4-11-3-1 in White Paper)



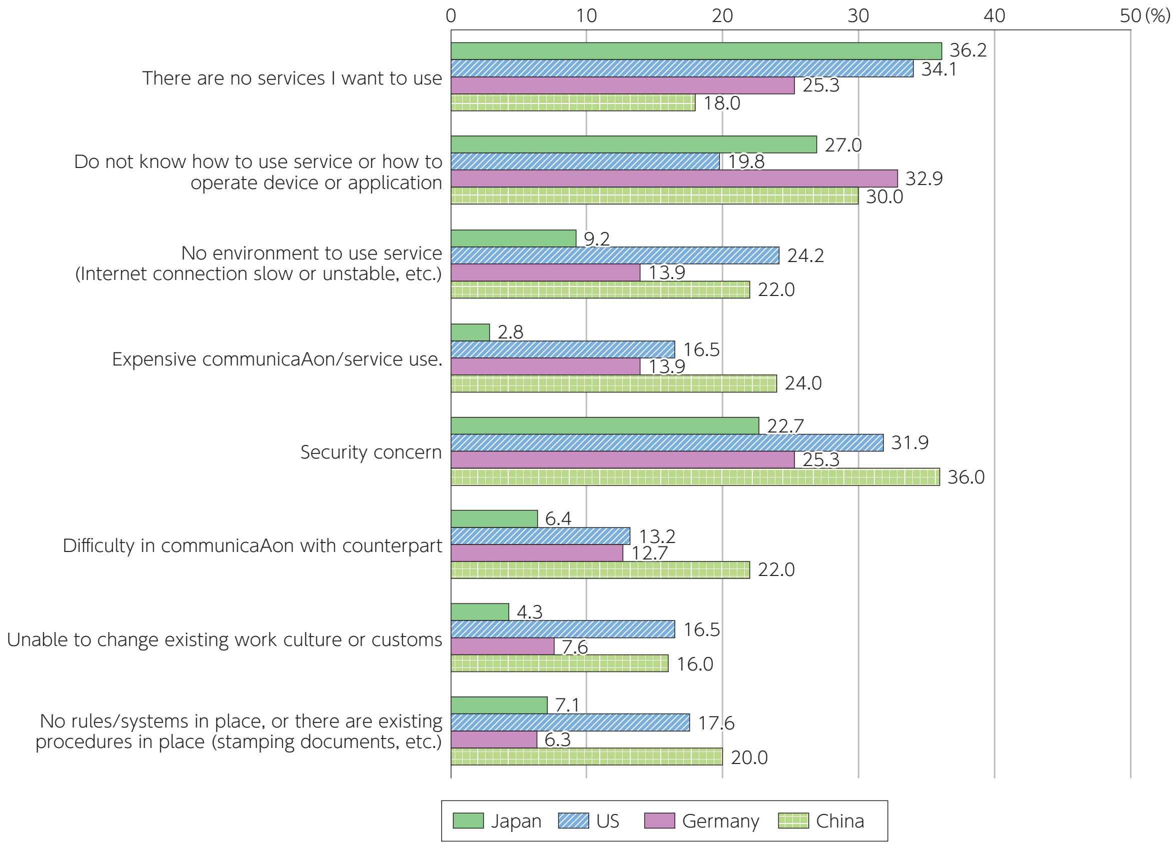
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

53. Usage of digital administrative services (Japan; by age) (Figure4-11-3-2 in White Paper)



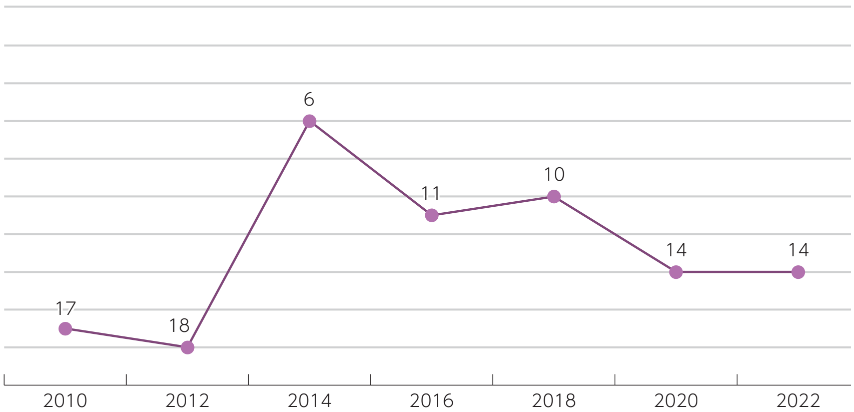
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

54. Reason why public digital services are unavailable (by country)



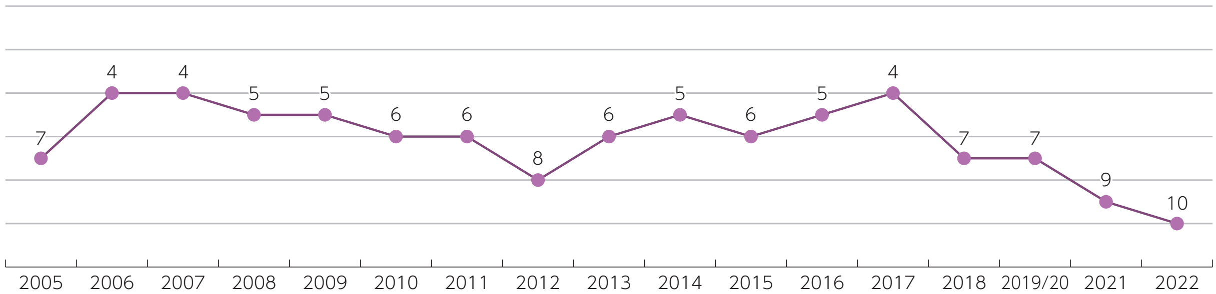
(Source) MIC (2023) "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

55. Changes in Japan's ranking in the UN (UNDESA) "World E-Government Ranking" (Figure4-11-3-3 in White Paper)



(Source) Changes in Japan's individual indicator scores in the UN (UNDESA) "World E-Government Ranking" (data collection)

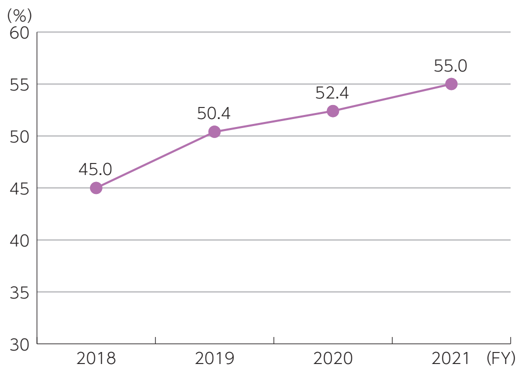
56. Changes to Japan's ranking in Waseda University's "World Digital Government Rankings"



(Source) Waseda University Institute of d-Government
https://idg-waseda.jp/ranking_jp.htm

57. Changes in online usage of 59 procedures local governments must prioritize taking online (Figure4-11-3-4 in White Paper)

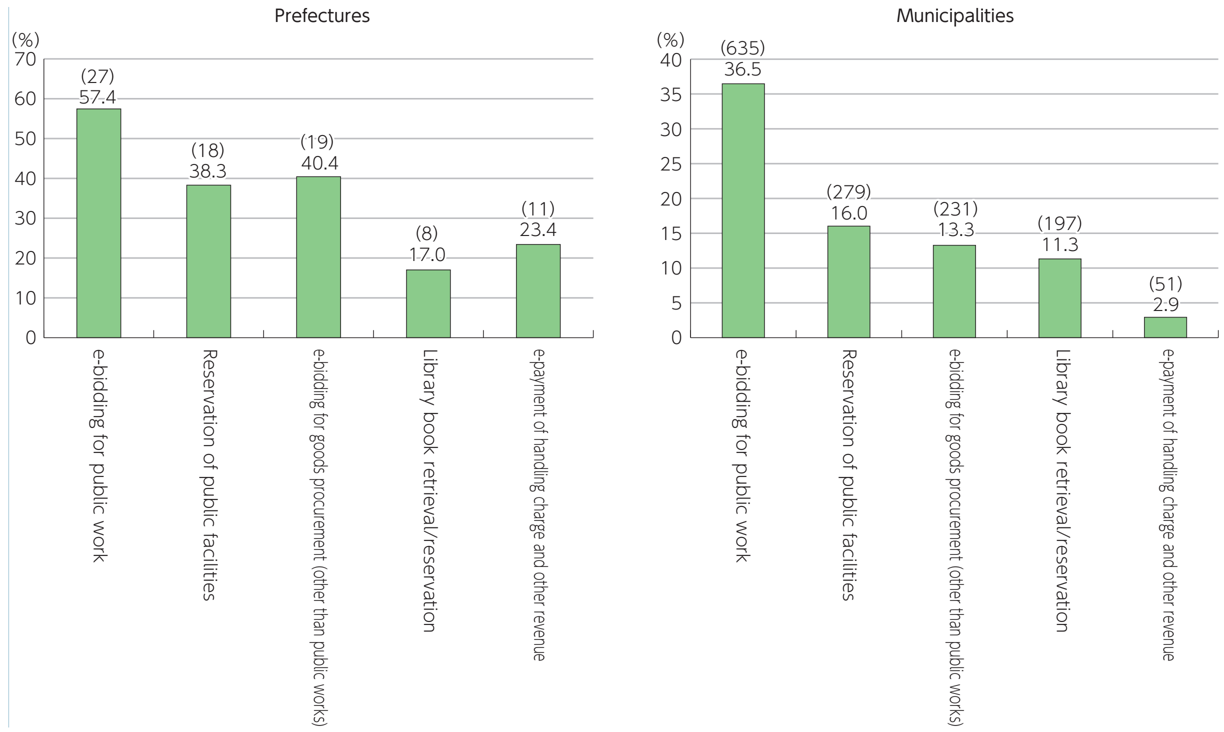
FY	Annual numver of all procedures (10,000)	Number of online use (10,000)	Online usage (%)
2018	47,749	21,507	45.0
2019	47,635	24,007	50.4
2020	47,287	24,781	52.4
2021	50,595	27,810	55.0



* 1 Online usage for fiscal 2020 and fiscal 2019 was calculated based on a resurvey of the 59 procedures that local governments should prioritize in taking procedures online as listed in the "Priority Policy Program for Realizing Digital Society" (approved by the Cabinet on June 7, 2022).
* 2 Online usage rate (%) = Number of procedures used online / Total number of procedures per year × 100
The total number of procedures per year is a national estimate based on the total number of procedures and the population of organizations that have already gone online for these procedures.
The number of procedures used online is estimated in the same way as the total number of procedures per year, in order to more precisely calculate online usage.

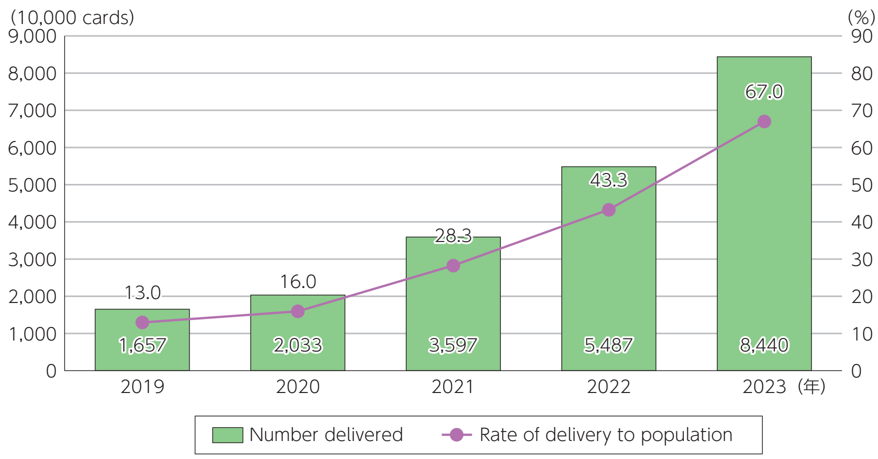
(Source) Based on MIC "Overview of Promotion of DX and Use of Information by Local Governments: Summary of Fiscal 2022 Survey on Promotion of Use of Administrative Information by Local Governments"

58. Joint use of various online systems (as of April 1, 2022)



(Source) Based on MIC "Overview of Promotion of DX and Use of Information by Local Governments: Summary of Fiscal 2022 Survey on Promotion of Use of Administrative Information by Local Governments"
https://www.soumu.go.jp/denshijiti/060213_02.html

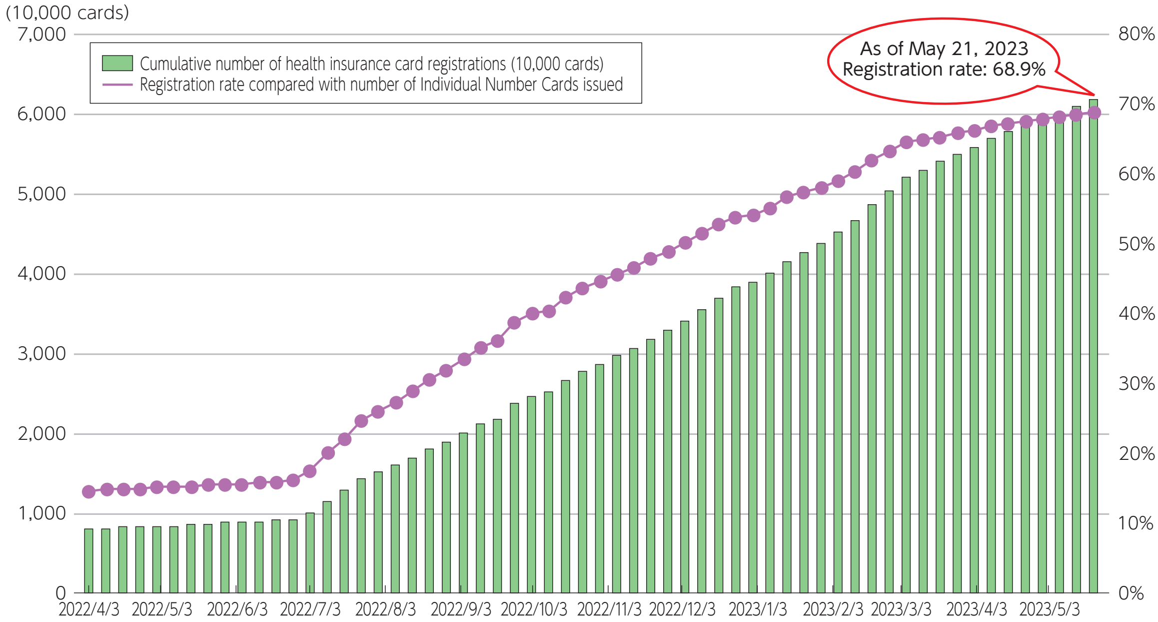
59. Individual Number Card delivery rate



* Number of tickets issued as of April 1 each year (as of March 31 for 2023)

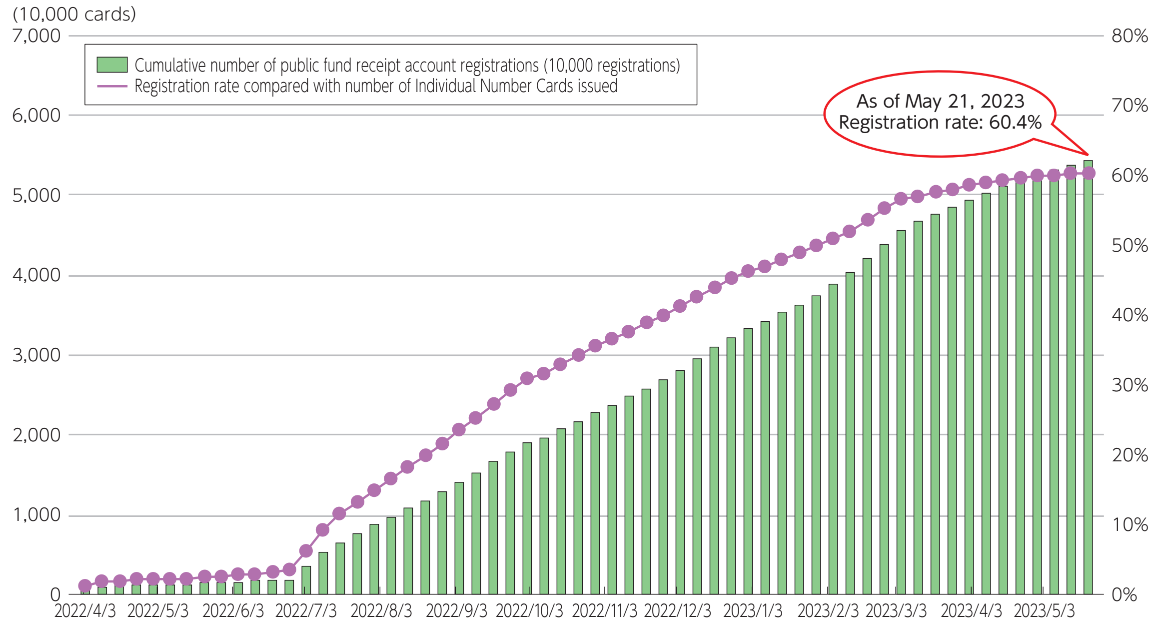
(Source) Prepared from MIC, "issuance status of Individual Number Card"

60. Changes in registrations of Individual Number Cards for use as health insurance cards



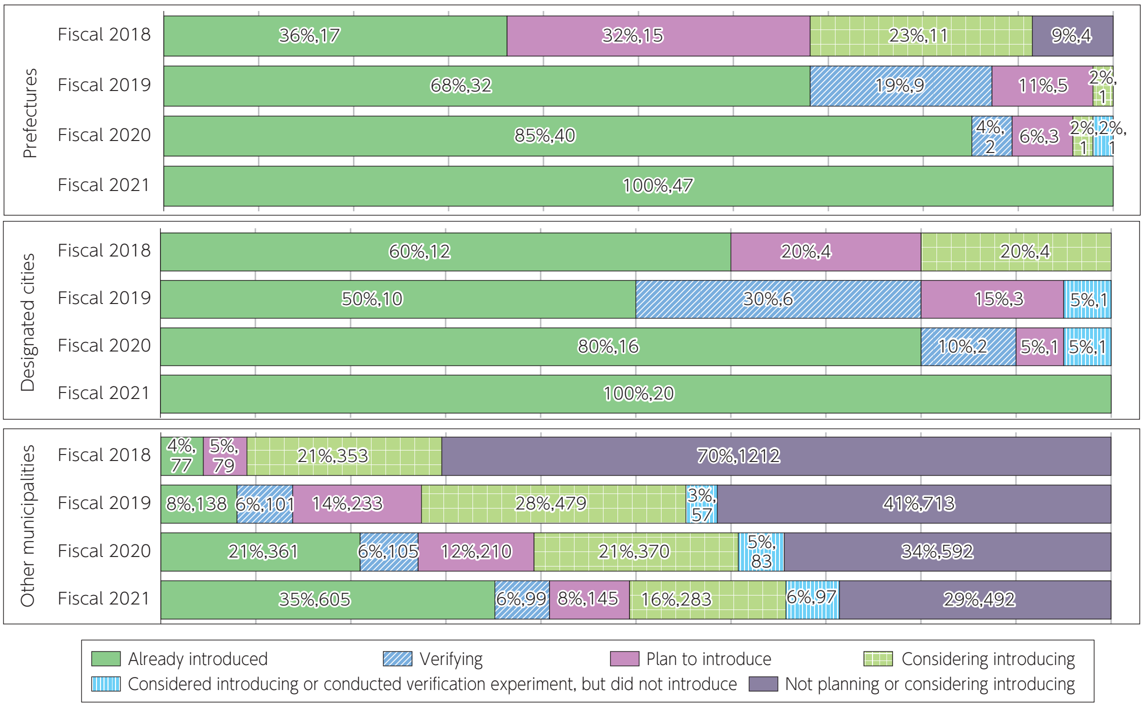
(Source) Based on Digital Agency "Policy Data Dashboard (Beta)" (data obtained May 30)
https://www.digital.go.jp/resources/govdashboard/

61. Changes in public fund receipt account registrations



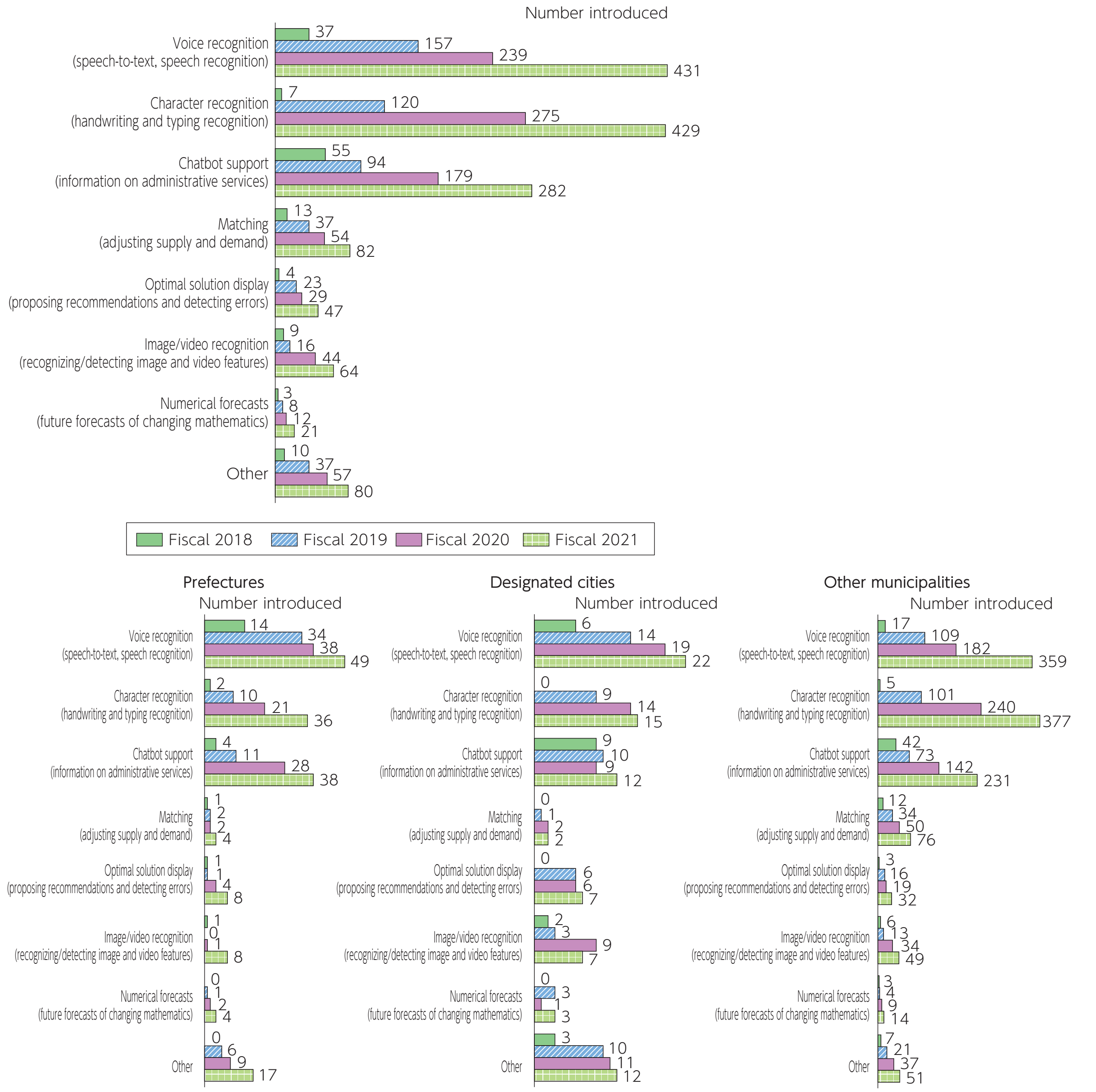
(Source) Based on Digital Agency "Policy Data Dashboard (Beta)" (data obtained May 30)
https://www.digital.go.jp/resources/govdashboard/

62. Introduction of AI in local governments (Figure4-11-3-5 in White Paper)



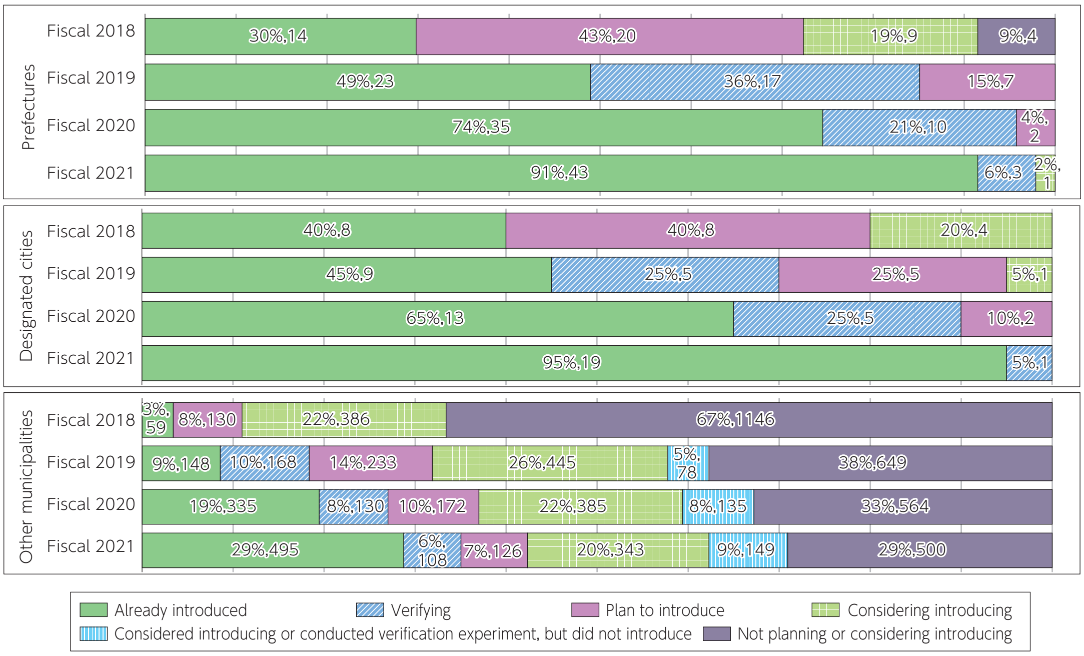
(Source) MIC "Promotion of AI/RPA Usage by Local Governments" (June 27, 2022)

63. Status of Introduction of AI in local governments (introduction by AI function)



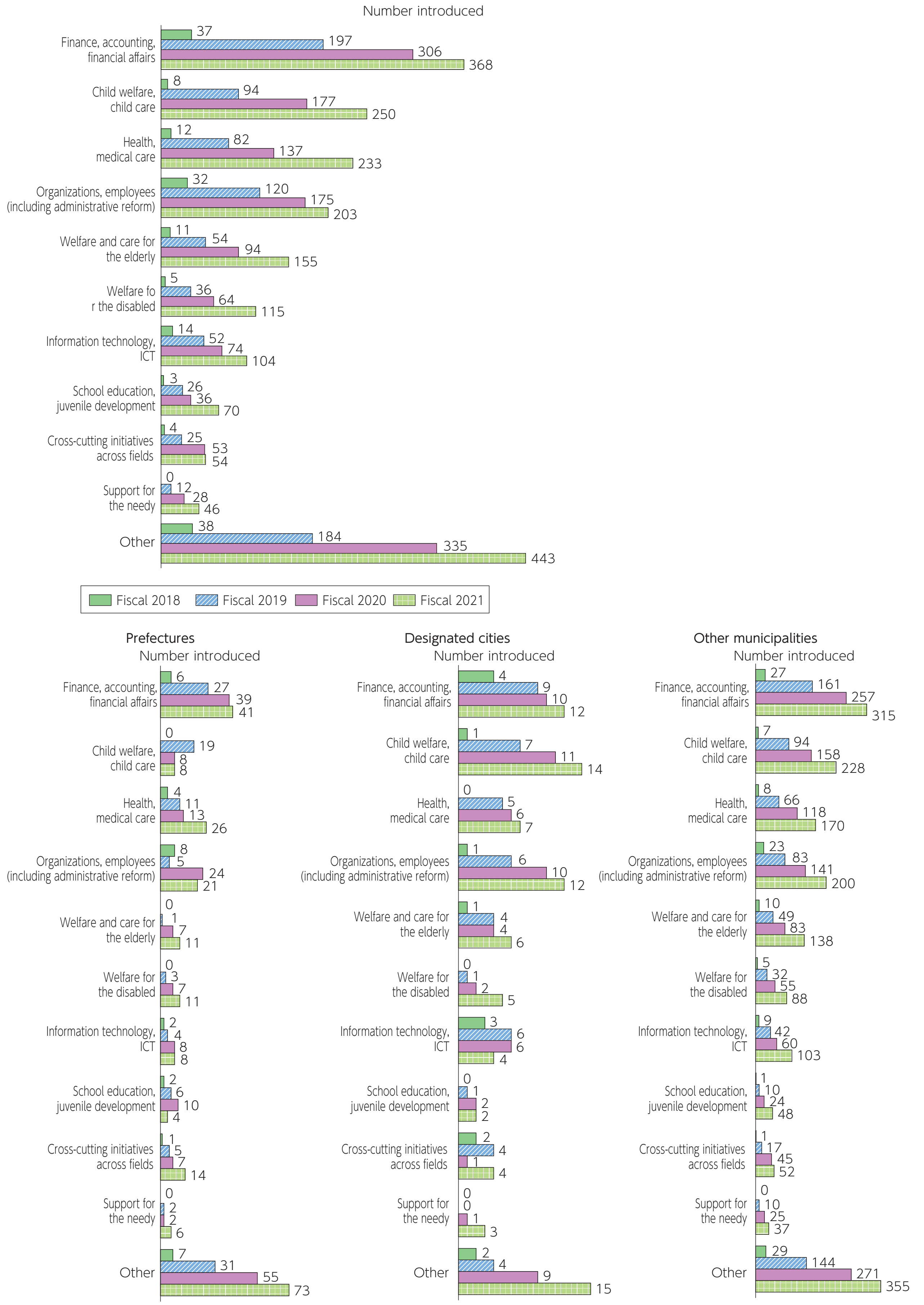
(Source) MIC "Promotion of AI/RPA Usage by Local Governments"
https://www.soumu.go.jp/main_content/000822108.pdf

64. Status of Introduction of RPA in local governments (Figure4-11-3-6 in White Paper)



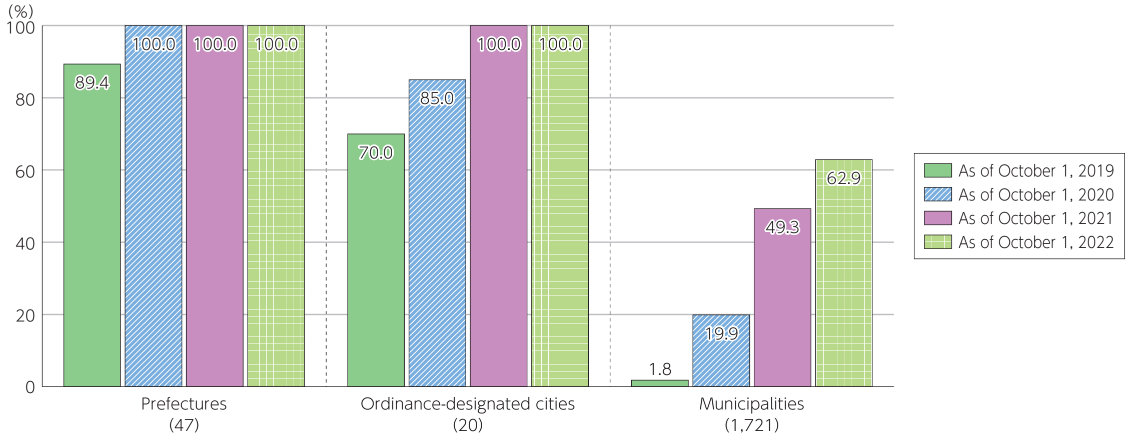
(Source) MIC "Promotion of AI/RPA Usage by Local Governments" (June 27, 2022)

65. Status of Introduction of RPA in local governments (status of introduction by RPA field)



(Source) MIC "Promotion of AI/RPA Usage by Local Governments"
https://www.soumu.go.jp/main_content/000822108.pdf

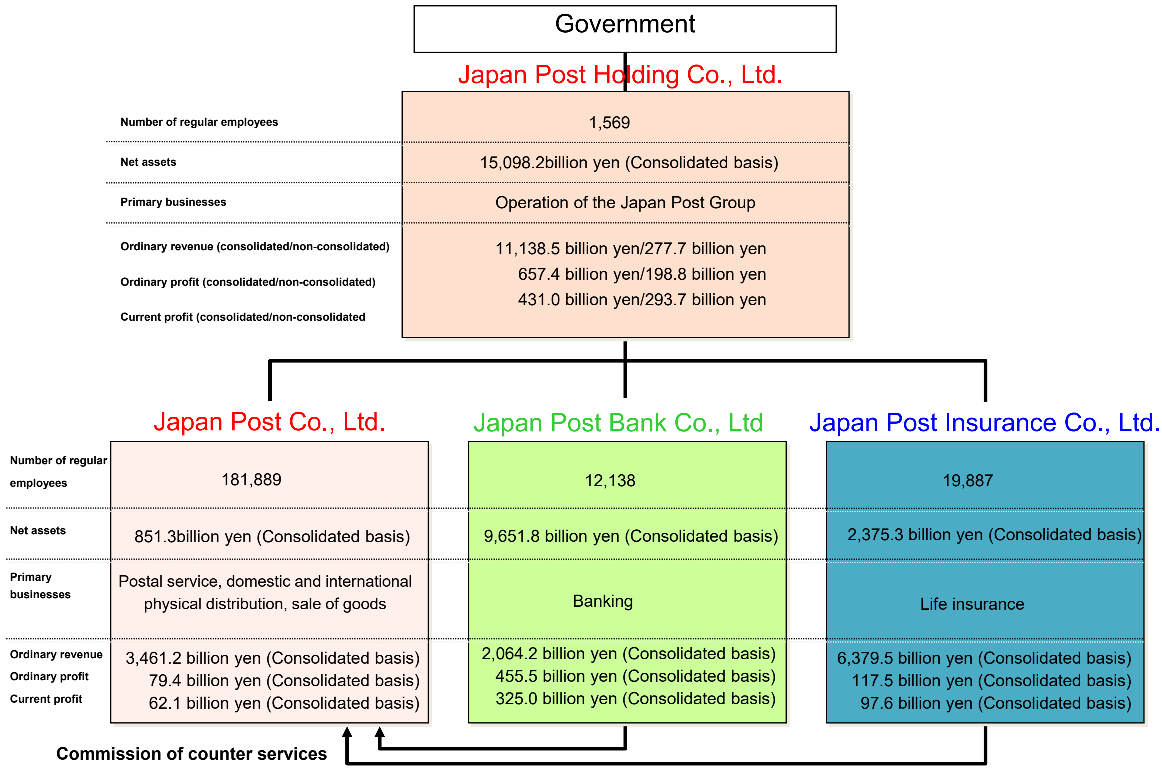
66. Status of introducing remote work by employees (Figure4-11-3-7 in White Paper)



(Source) Based on MIC "Survey on Remote Work Initiatives by Local Governments"

Section 12

1. Japan Post Group organization chart (Figure4-12-1-1 in White Paper)



* 1 Number of employees (regular employees) as of September 30, 2022.
* 2 The "current net profit" of each company is the current net profit attributable to parent company shareholders.

(Source) Based on financial results for the period ending March 2023 and disclosure reports (2022)

2. Japan Post Group management (Figure4-12-1-2 in White Paper)

(100 million yen)

Fiscal year	2017	2018	2019	2020	2021	2022
Ordinary revenue	129,203	127,749	119,501	117,204	112,647	111,385
Ordinary profit	9,161	8,306	8,644	9,141	9,914	6,574
Current profit	4,606	4,794	4,837	4,182	5,016	4,310

(Source) Based on Japan Post Holdings Co., Ltd. "Overview of Financial Results"

3. Changes in Japan Post's (consolidated) operating profit and loss (Figure4-12-1-3 in White Paper)

(100 million yen)

Fiscal year	2017	2018	2019	2020	2021	2022
Postal/physical distribution	419	1,213	1,475	1,237	1,022	328
Post office counter service	397	596	445	377	245	493
International physical distribution	102	103	△ 86	35	287	107
Japan Post (consolidated)	865	1,820	1,790	1,550	1,482	837

* The segment name was changed from "financial counter service" to "post office counter service" during the March 2022 term.

(Source) Based on Japan Post Holdings Co., Ltd. "Overview of Financial Results"

4. Postal service income and expenditures

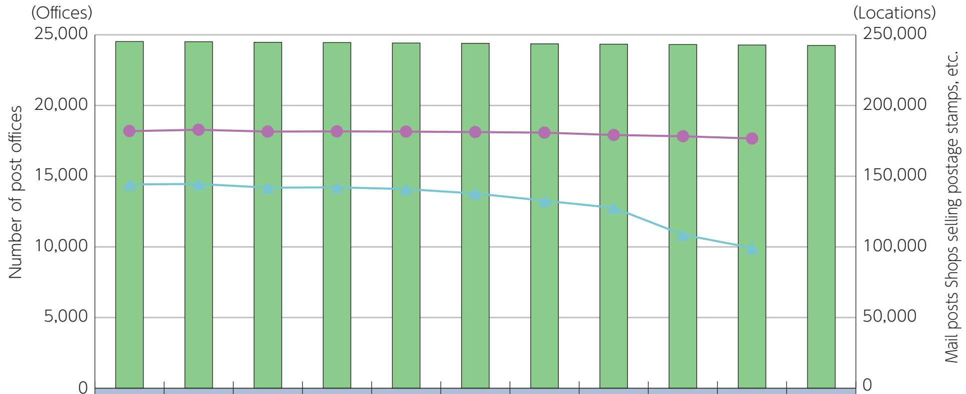
(100 million yen)

FY	2016	2017	2018	2019	2020	2021
Operating profit	128	242	455	376	240	78

* Balance of the postal service of Japan Post Co., Ltd.

(Source) Based on Japan Post Co., Ltd. "Postal Service Income and Expenditures"

5. Changes in the number of facilities related to postal services (Figure4-12-1-4 in White Paper)



(End of FY)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Post offices	24,525	24,511	24,470	24,452	24,421	24,395	24,367	24,341	24,311	24,284	24,251
Mail posts	181,895	182,839	181,521	181,692	181,523	181,221	180774	179,129	178,211	176,683	—
Shops selling postage stamps, etc. and places selling stamps	144,153	144,504	141,888	142,104	140,881	137,790	132613	127,633	108,624	99,244	—

* "Simple post office" refers to post offices operating based on a contract.
* "Currently closed post office" refers to post offices temporarily closed and suspending counter services.
* 28 of the 86 "directly managed post offices" of "currently closed post offices" are temporarily closed due to the impact of the Great East Japan Earthquake.
* 10 of the 520 "simple post offices" of "currently closed post offices" are temporarily closed due to the impact of the Great East Japan Earthquake.

(Source) "Japan Post Group Disclosure Report" Based on Japan Post "Information on the number of postal offices (open data)" website

6. Breakdown of the number of post offices (end of fiscal 2022)

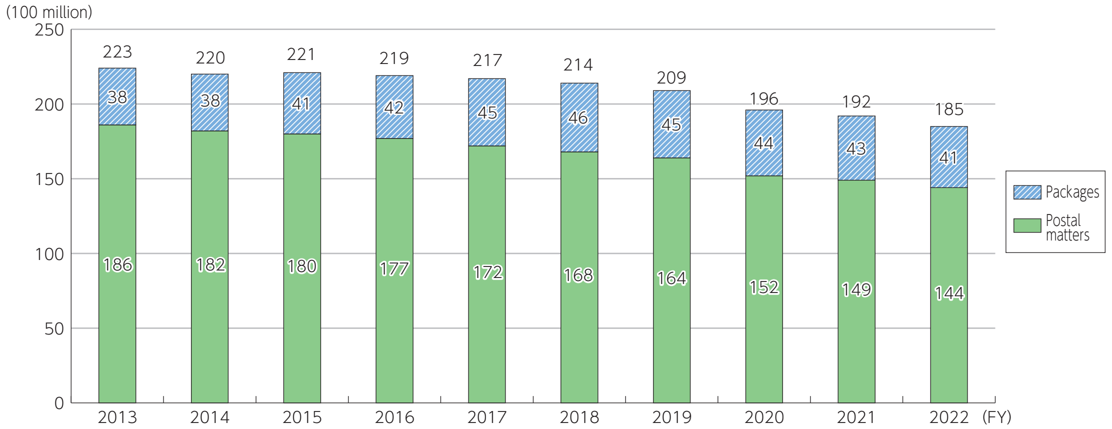
(Unit: offices)

Post offices in operation				Currently closed post offices				Total
Directly managed post offices		Simple post office	Subtotal	Directly managed post offices		Simple post office	Subtotal	
Post offices	Branch offices			Post offices	Branch offices			
20,049	7	3,589	23,645	85	1	520	606	24,251

* "Simple post office" refers to post offices operating based on a contract.
* "Currently closed post office" refers to post offices temporarily closed and suspending counter services.
* 28 of the 86 "directly managed post offices" of "currently closed post offices" are temporarily closed due to the impact of the Great East Japan Earthquake.
* 10 of the 520 "simple post offices" of "currently closed post offices" are temporarily closed due to the impact of the Great East Japan Earthquake.

(Source) Prepared from Japan Post Co., Ltd. Website, "Information on the number of postal offices (open data)"
https://www.post.japanpost.jp/notification/storeinformation/index02.html

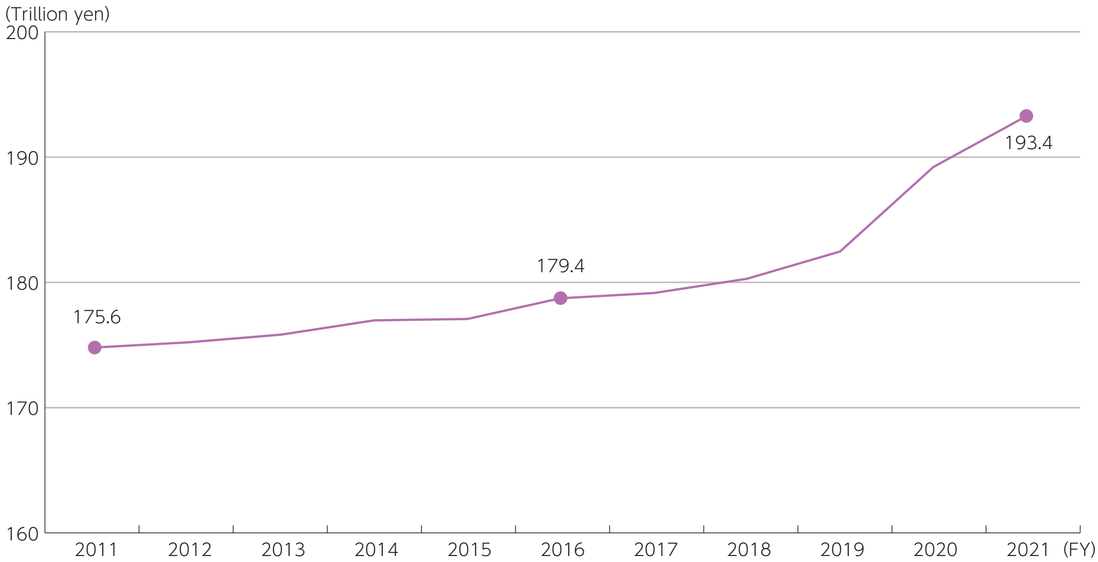
7. Changes in the total number of postal items accepted (Figure4-12-1-5 in White Paper)



* Following the privatization of postal services, Yu-Pack and Yu-Mail are now provided as packages as defined by the Trucking Business Act, and not as parcels as defined by the Postal Act.

(Source) Based on Japan Post "Number of Postal Items Accepted" material released each fiscal year

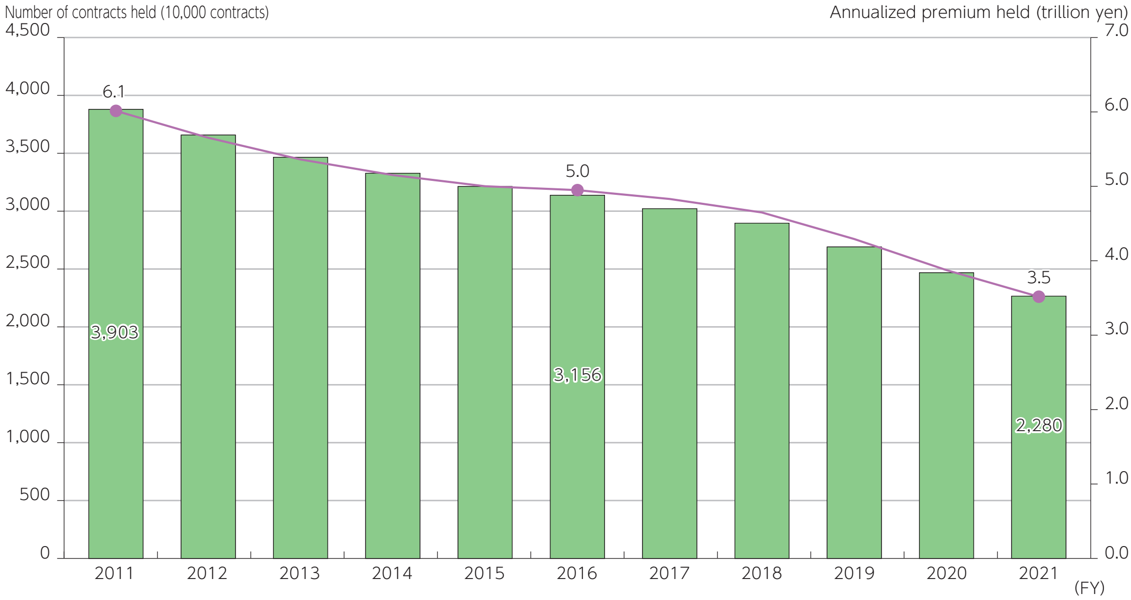
8. Changes in the balance of deposits of Japan Post Bank (Figure4-12-1-6 in White Paper)



* The figure is the sum of savings before and after postal service privatization.

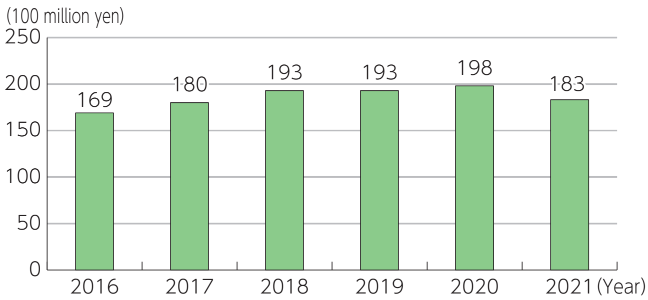
(Source) Based on Japan Post Bank Securities Report

9. Changes in the number of insurance contracts and annualized premiums for Japan Post Insurance (Figure4-12-1-7 in White Paper)



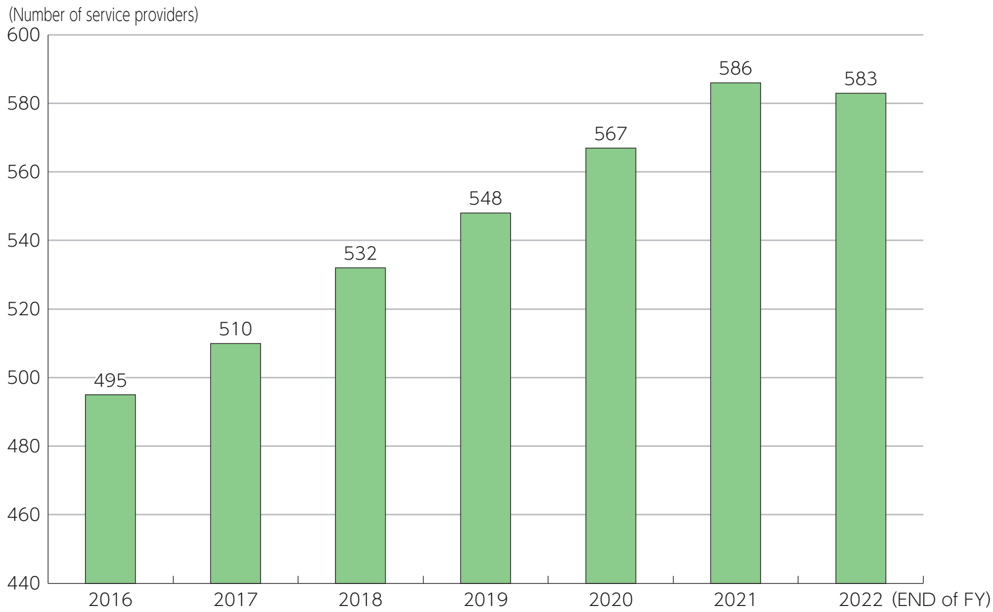
(Source) Based on Japan Post Insurance Securities Report

10. Changes in correspondence delivery service operator sales (Figure4-12-2-1 in White Paper)



11. Changes in the number of specified correspondence delivery service providers

(year)	2016	2017	2018	2019	2020	2021	2022
Number of service providers	495	510	532	548	567	586	583



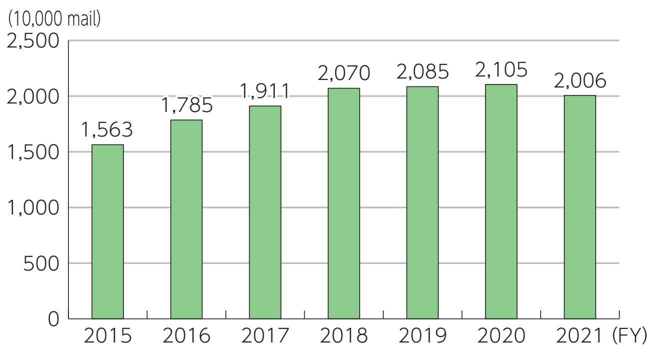
12. Changes in the number of business operators by type of service (specified correspondence delivery service)

"(Unit: business operators)

(End of FY)	2015	2016	2017	2018	2019	2020	2021	2022
Class 1 Service	412	436	449	467	482	500	519	521
Class 2 Service	112	113	112	110	108	107	104	98
Class 3 Service	245	262	268	283	291	298	308	302

* The numbers do not agree with the number of the businesses who entered the market because some of them provide more than two types of services.
- Class 1 Service: delivery of correspondence mail whose sum of the length, width and height is over 73cm or whose weight is over 4kg
- Class 2 Service: delivery of correspondence mail within 3 hours from the time of its receipt
- Class 3 Service: delivery of correspondence mail the postage of which exceed 800 yen in Japan

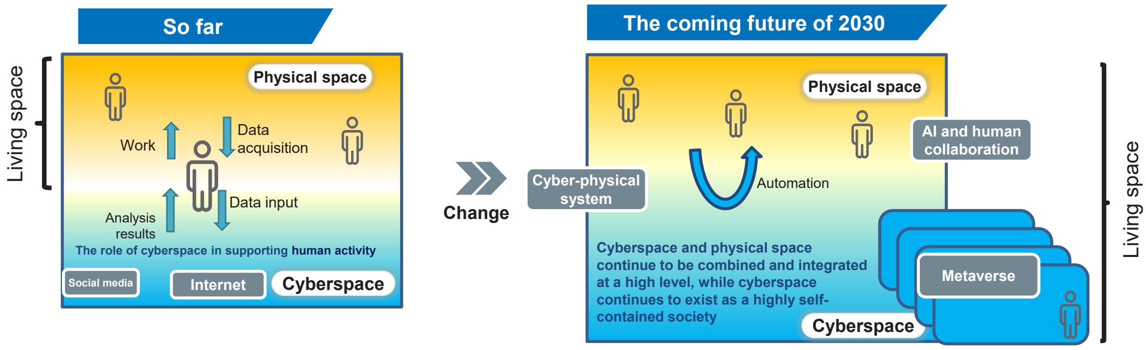
13. Changes in the number of correspondences accepted



Chapter 5

Policy Focus -1

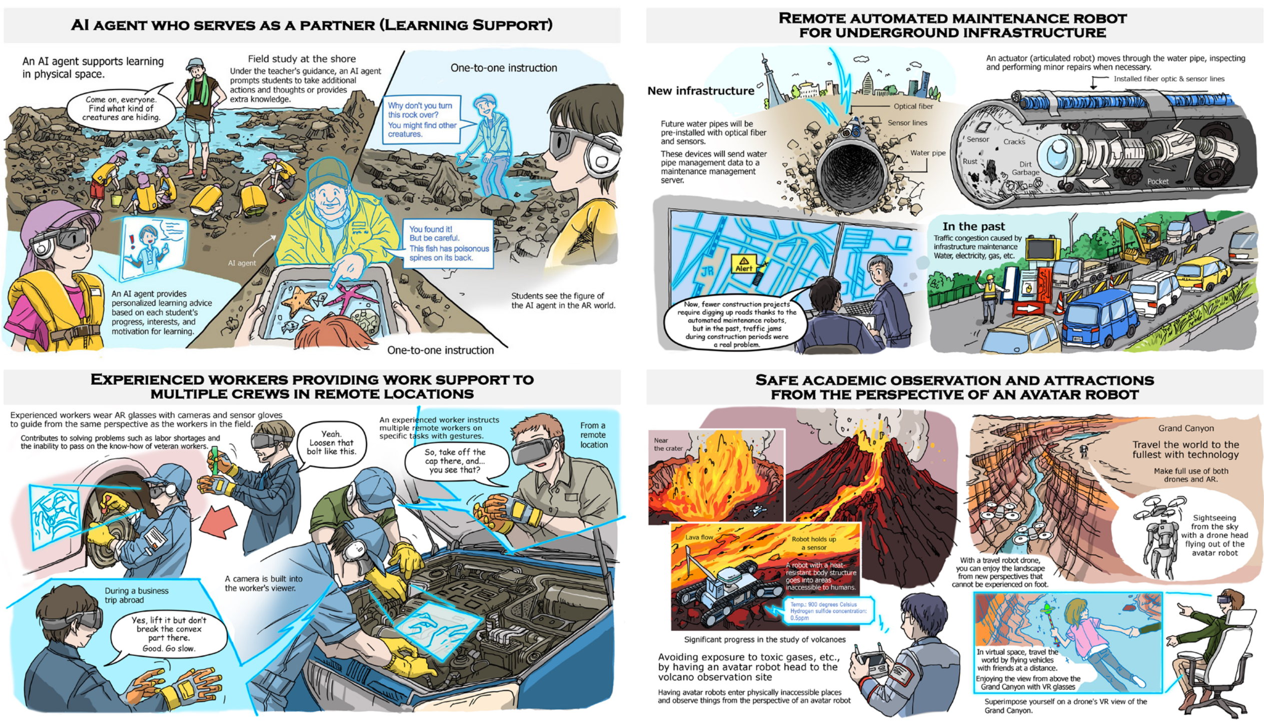
1. Direction Japan must take toward the coming future of 2030 (Figure1 in White Paper)



What Japan must do leading up to the coming future of 2030

What must be done to harness the future	What must be done to prepare for the future
• Propose how Japan should change from the perspective of Japanese providers and users, so that digital functions and capabilities can be maximized for the coming future of 2030	• Propose what Japan should do from the perspective of Japanese providers and users so that information and communications infrastructures can be safely provided, and so that various services can be enjoyed without concern, in preparation for the arrival of the coming future of 2030

2. Coming future of 2030



(Source) Final report on “Information and Communications Policy with a View to 2030”

3. Overview of the final report on "Information and Communications Policy with a View to 2030"

Issues facing Japan: Provider perspective | **What Japan must do**

Initiatives to harness the future

1. [1] Response to the rapid evolution of AI

- Learning data used for generative AI and foundation models developed and provided mainly in the U.S. is biased toward Anglo-American culture.

Realizing an environment for using generative AI in Japan

- Build AI (Japanese language AI foundation models) that reflects Japanese culture, etc.
- Review system among diverse stakeholders

2. Response to the promotion of business transformation and carbon neutrality

[2] Importance of actuators

- Actuators are needed to upgrade cyber-physical systems including providing feedback to physical space.

[3] Changing stakeholder needs and lagging business transformation

- There has been a delay in responding to changes in consumer values from ownership to use.
- Japan ranked 29th out of 63 countries/regions in the World Digital Competitiveness Ranking 2022.
- In 2021, Japan ranked 27th out of 38 OECD countries in labor productivity.
- Digital business transformation (DX) is inevitable. There is a delay in DX for SMEs.

[4] Rule formation in global markets

- It is said that Japan often wins in technology but loses in business.
- Overseas, apply an open and closed strategy that leverages the advantages of the domestic industry.
- In Europe and the U.S., ensure that industry and the government work together to form rules and acquire market share.

[5] Fostering startups that are innovation creators

- There are fewer unicorns than in other major countries. There are no "decacorns" in Japan valued at more than one trillion yen.
- In Japan, there are few M&As and investment by operating companies is low.
- In Europe and the U.S., late-stage investment accounts for the majority. In Japan, seed-stage investment is the norm. There is a lack of accelerator roles in the growth phase of global expansion.

[6] Competitive environment of the ICT industry

- Excess imports of ICT goods have increased, and the digital field is highly dependent on foreign countries.
- The U.S. government released a report recommending the promotion of AI innovation. Europe is promoting digital transition through the "Digital Europe Program."

Realization of cyber-physical systems that will be implemented globally

- The ICT industry is expected to be the driving force behind digital technologies.
- Create new businesses and strengthen international competitiveness in the ICT industry by actively supporting projects that aim to commercialize automation and carbon neutrality through upgrading cyber-physical systems using robots, etc.
- Accelerate innovation and promote regulatory verification in a unified manner, including opportunities to put ideas into practice and verify regulations.
- Conduct planning and development from a global perspective, form partnerships, and collaborate with overseas companies, etc., through such means as refraining from customizing products/services to Japanese specifications.
- Implement digital technologies across the entire supply chain, including local SMEs.

Involvement in active standardization and rule formation

- The public and private sectors must actively cooperate in international rule formation.
- Clarify a sense of purpose for standardization goals.
- In order to realize an ecosystem that transcends the boundaries of regions, industries, and business types, we must unify formats and protocols between systems and ensure interoperability of interfaces.

Collaboration between startups and large enterprises

- The government announced its "Five-Year Plan for the Development of Startups," and aims to invest 10 trillion yen, create 100,000 startups, and create 100 unicorns.
- Build a system in which operating companies with excellent technology, human resources, and the desire to quickly realize innovation cooperate with startups.

Issues facing Japan: Provider perspective | **What Japan must do**

Initiatives to harness the future

3. Response to environmental changes in information and communications infrastructures

[6] Competitive environment of the ICT industry

- There are signs of changes in the competitive environment of the ICT industry.
- The business environment surrounding big tech companies in the U.S. is also changing.

[7] Expectations for seamless networks

- Expectations are rising for dependable information and communications infrastructures with a high level of reliability, stability, and sophistication of user experience.
- The degree of freedom in the construction of networks is increasing, the number of stakeholders involved is increasing, and the distribution structure of communications services is become more diverse and complex.

Sophistication and active involvement of information and communications infrastructures

- Strengthening and accelerating initiatives for Beyond 5G (6G)
  - → Strengthen support for research and development aimed at social implementation and overseas expansion, focusing on technological fields where Japan has strengths. Ensure operational technology.
- Responding to the needs of the competitive environment and users, for information and communications infrastructures
  - → Consider future networks from the viewpoint of users.
  - → Realize a society in which human resources supporting information and communications infrastructures are ensured and respected.
- Ensuring information and communications infrastructures serving as social infrastructures
  - → The government must be actively involved in both support and regulation.
  - → It is important to realize that cyberspace is a global commons.
- Initiatives for new networks in 2030 and beyond
  - → In promoting Beyond 5G (6G), develop technologies that solve and overcome the challenges and limitations of current networks, and propose new architectures as needed.

Initiatives to prepare for the future

4. Creation of environments for the new social space of cyberspace

[8] The proper balance between privacy and the desire for exposure

- It may be easier to get log information in the metaverse than in physical space, which could cause privacy violations.
- The personal adjustment process (including balancing the desire for privacy with the desire for disclosure) is difficult in the cyberspace while it has been achieved in the physical space.

[9] Mixing of the metaverse with reality

- Rules applied within the metaverse vary from platform to platform.
- It is not possible to move freely between various platforms.
- It is not clear whether violations or invasions of privacy could occur within the metaverse, or even whether an avatar actually represents a real person.
- Rules in the metaverse need to be coordinated with legal systems in reality.

Realization of a democratic metaverse

- The international community must commonly recognize that the metaverse is an online public space where freedom of expression and privacy are protected, and that its operation must be conducted democratically.
- Continue to understand and verify the role of platform operators. International rule formation must be promoted in cooperation with the international community.
- Promote collaboration between the public and private sectors, ministries and agencies, and the international community to form rules for the metaverse, such as ensuring portability of avatars among metaverse platforms.
- An architecture that enables users to control the appropriate handling of data, including personal information protection in response to advances in digital technologies must be developed.

Issues facing Japan: Provider perspective

Initiatives to prepare for the future

3. Response to environmental changes in information and communications infrastructures

[10]-1 Safety and reliability of information and communications infrastructures

- It will be important to strengthen cybersecurity and create robust supply chains.
- There is a lack of awareness among management, a lack of investment in security, and a lack of security personnel.
- Management must consider the security level of the company's overseas offices and business partners.

[10]-2 Greening

- Communications traffic is expected to increase as ICT is increasingly utilized, and we will need to address the greening of information and communications infrastructures.

What Japan must do

Fundamental strengthening and greening of information and communications infrastructures

- We must consider how to procure servers, routers, and other devices. It will be important to consider economic rationality, including balancing costs.
- Efforts must be made to ensure the stable provision of services on key infrastructures, in accordance with the Economic Security Promotion Act.
- Establish core NICT sites so that telecom operators can take proactive measures, gather information, and conduct analysis.
- Build a multi-layered defense system through self-help, mutual assistance, and public assistance.
- Continue to promote the reformation of management awareness and the implementation of DX with cybersecurity for SMEs.
- Continue to strongly promote research and development of fully-optical network technology and photoelectric fusion technology to realize ultra-low power consumption.

Issues facing Japan: User perspective

Initiatives to harness the future

1. Response to the rapid evolution of AI

[1] Citizens lack the skills to use AI.

Initiatives to prepare for the future

2. Ensuring sound cyberspace environments

[11] Fragmentation of cyberspace, increase in amount and severity false information and misinformation

- The Internet is becoming increasingly fragmented due to state intervention, the concentration of data in big tech companies, filter bubbles, and echo chambers.
- The scale of false information and misinformation has increased, such as the attention economy and information warfare using false information and misinformation. Individuals with low literacy are more likely to spread false information and misinformation.

What Japan must do

Realizing an environment for using generative AI in Japan

- Enable citizens to acquire the ability to use AI skillfully

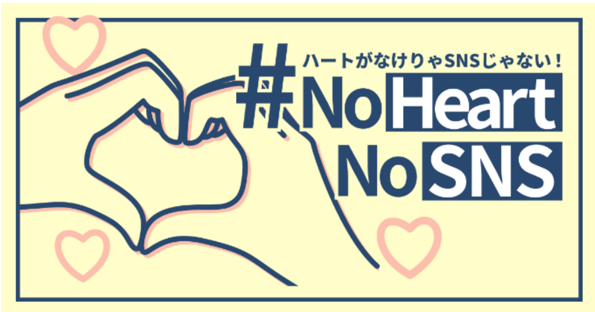
Private sector initiatives, and cooperation with the international community

- Consider national measures based on explanations including evidence from business operators, through the voluntary efforts by the private sector (appropriate measures such as disclosing standards and conditions for removing illegal and harmful information and advertisements by platform operators, ensuring transparency and accountability, fact-checking, etc.).
- Implement initiatives to improve literacy for all generations.
- The Internet should continue to be free, undivided, and global across borders.
- In order to build an Internet with freedom, responsibility, and trust, work with stakeholders to take society-wide efforts and strengthen cooperation on an international level.

(Source) Final report on "Information and Communications Policy with a View to 2030"

Section 2

1. "#NoHeartNoSNS (no social media without heart!)" related content (Figure5-2-5-1 in White Paper)

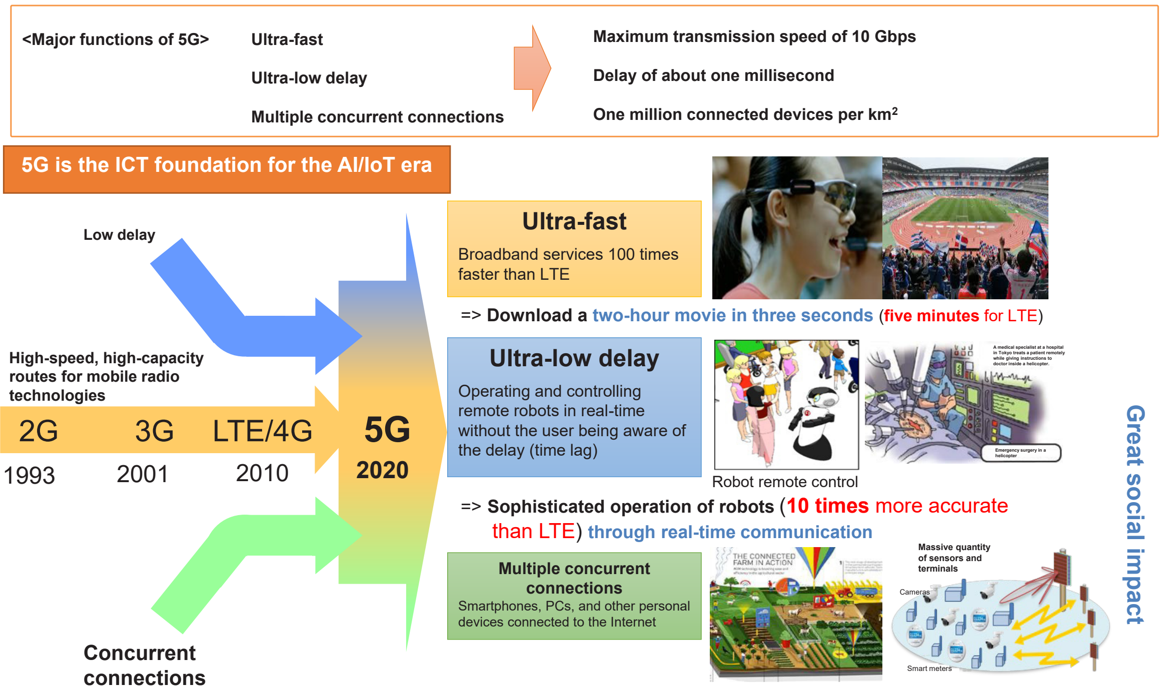


* Left: #NoHeartNoSNS (no social media without heart!) logo
* Right: "Eagle Talon #NoHeartNoSNS Operation" main visual

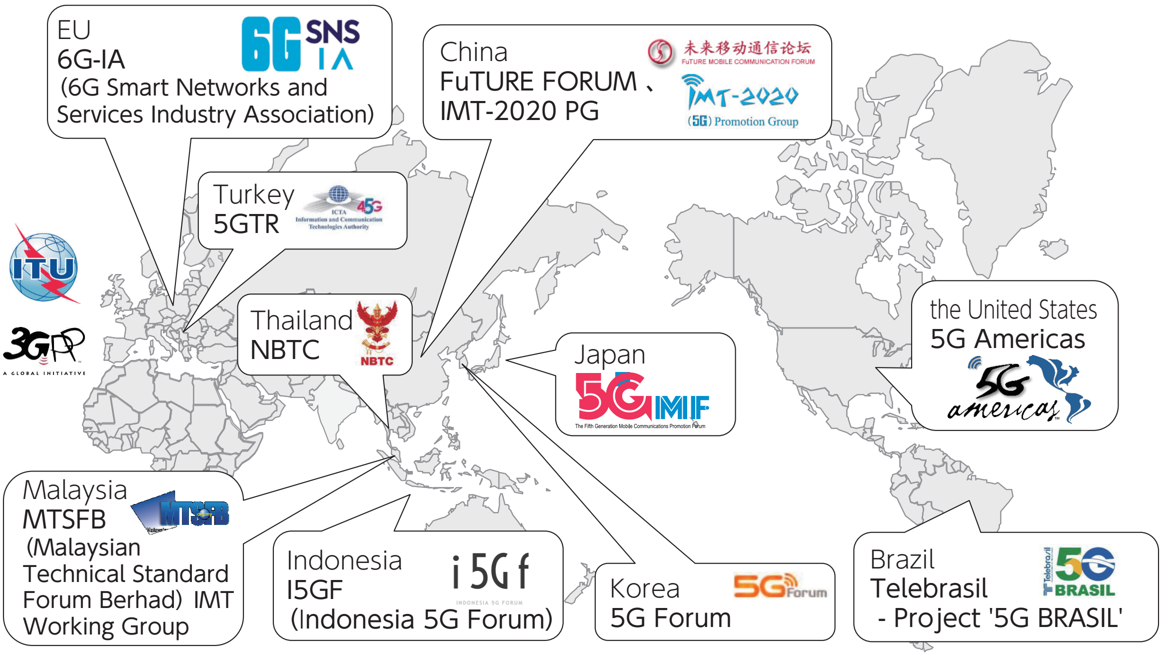
2. Filtering and anti-piracy videos for young people (Figure5-2-5-2 in White Paper)

Section 3

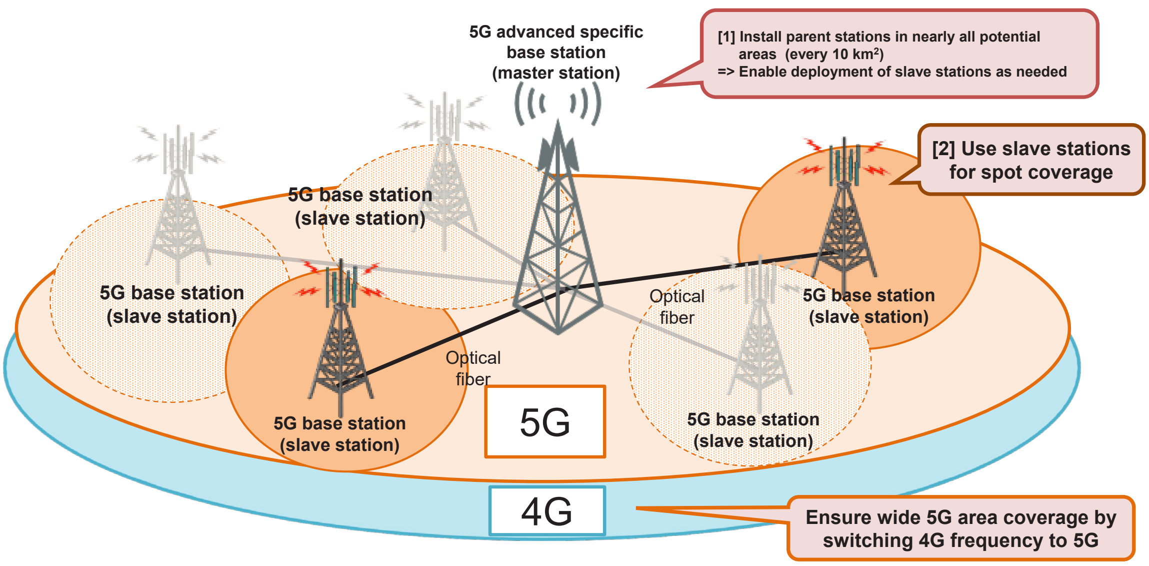
1. 5G features (Figure5-3-3-1 in White Paper)



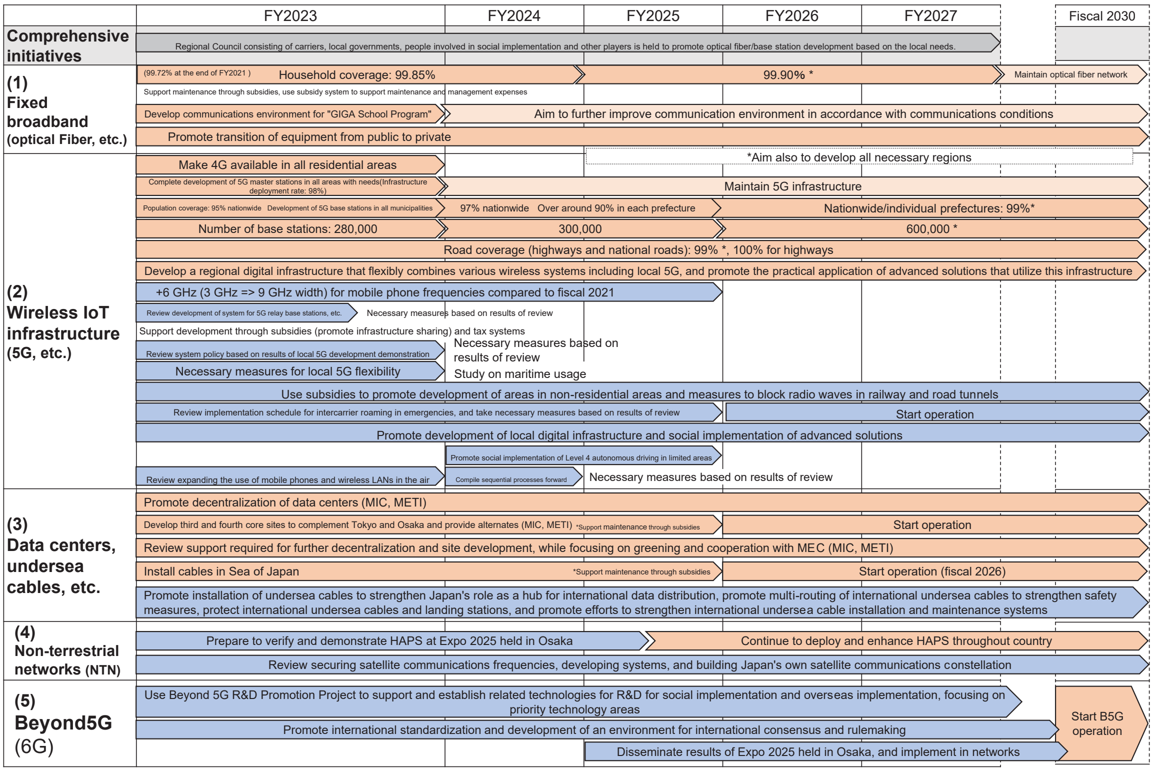
2. Organizations promoting 5G in each country/region (Figure5-3-3-2 in White Paper)



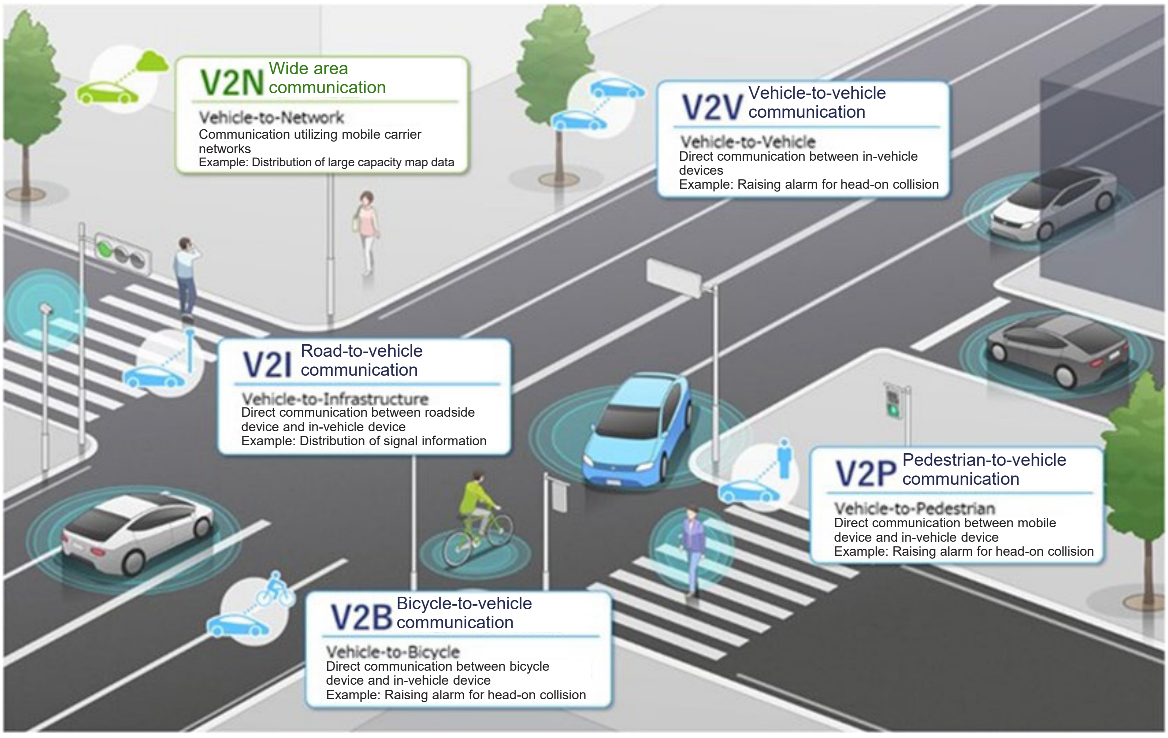
3. 5G development (Figure5-3-3-3 in White Paper)



4. Development of Digital Garden City Nation infrastructure (roadmap) (Figure5-3-3-4 in White Paper)



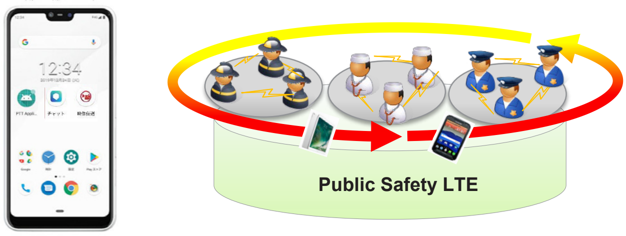
5. V2X communication (Figure5-3-4-1 in White Paper)



6. Implementation of Public Safety LTE (Figure5-3-4-2 in White Paper)

PS-LTE

- Can use mobile phone (LTE) technology to send and receive audio, images, and videos.
- Can use commercial mobile phone networks and general-purpose smartphone devices, and technical hurdles for interconnection between different institutions are low.



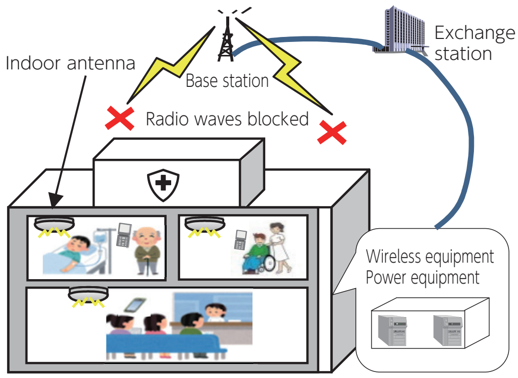
7. Project to block radio waves in medical facilities (Figure5-3-6-1 in White Paper)

[Burden breakdown]

Government	Medical institution	General incorporated association, etc.
1/3	1/6	1/2

*Does not apply to the portion of the burden other than that of the government, depending on the management status of the medical institution or organization.

Example (medical facility)



Section 4

1. Overview of report by the "Study Group on the Ideal Broadcasting System in the Digital Age" (published on August 5, 2022) (Figure5-4-2-1 in White Paper)

Major environmental changes surrounding broadcasting

- Broadband penetration and growth of video streaming services
- Shrinking TV audiences, and expansion of information space beyond broadcasting
- Accelerated population decline

Significance and role of broadcasting in the digital age

- Sharing of basic social information such as disaster information and community information
- Reliable spread of information backed by coverage and editing
- Ensuring information health in information spaces

Future of broadcasting around 2030

Reduction in the burden of equipment costs
Active use of broadband infrastructures and digital technologies

[1] Broadcast network infrastructure

- ○ "Joint use model" for small relay stations
  => **Flexible entry system, cost sharing by NHK, etc.**
- ○ Substitution of small relay stations, etc. by broadband, etc.
  => **Demonstration project**
- ○ Improved efficiency of master facilities (conversion to IP, cloud, etc.)
  => **Safety and reliability requirements**

Permeation of the value of broadcasting in Internet spaces

[2] Internet streaming of broadcast content

- ○ Permeation of the value of broadcast content in Internet spaces
- ○ Support for simultaneous distribution of broadcasts and other services
  => **Continued study**
- ○ Review of NHK's internet usage operations
  => **Continued study based on public demonstrations by NHK**

[3] Strengthening of the management base

- ○ Realization of a stable management environment
- ○ Focus on content production

=> **Review of the principle of centralized exclusion of mass media, and identification with broadcast programs in multiple regions**

Expansion of management options through flexible system reviews

2. Summary of the report by the Working Group on the Future Image of Satellite Broadcasting (Figure5-4-4-1 in White Paper)

Current state and challenges

- ○ After the start of the "new 4K8K satellite broadcasting" in December 2018, the number of receivers that can receive the broadcasting reached 10.3million in total. (*) However, there is a need for further promotion of improvement in reception environments, enhancement of 4K content and public relations targeting viewers. *As of the end of August 2021.
- ○ Some vacant spectrums are expected in BS dextrorotation in the future. In addition, there are still significant unused spectrums in BS and CS levorotation
- ○ Due to the spread of online video streaming and the impact of the COVID-19 pandemic, the business environment of broadcasters is increasingly severe. In this contest, there is a new task to reduce their burden of usage fee of infrastructure including satellite relay units.

Tasks to be tackled in the future

1. Popularization of the new 4K8Ksatellite broadcasting

(1) Improvement of the reception environment
Promote the following initiatives in industry-government collaboration

[1] Strengthen public relations regarding reception methods
- ○ Publicity considering the difference in reception environment between dextrorotation and levorotation
- ○ Publicity for utilization of services using cable television and optical communication link

[2] Support for facility modification
- ○ Project to improve the environment for reception of satellite broadcasting
- ○ Project to promote conversion of cable television networks to fiber optics

[3] Development of simple modification methods using new technologies
- ○ Use of plastic optical fiber (POF) and local 5G

(2) Enhancement of 4K contents
[1] It is essential to enhance both quality and quantity of pure 4K content
[2] Promote public relations with strong customer appeal

2. Promotion of effective use of frequencies

(1) Utilization of vacant spectrums of BS dextrorotation
[1] When certain vacant spectrums are secured in the future, the spectrum will be allocated to 4Kbroadcasting to spread the broadcasting
[2] Establish necessary systems for allocation
- ○ Revision of the basic broadcasting dissemination plans
- ○ Putting together an approach to cost allocation

(2) Utilization of unused levorotation spectrums
[1] Improve the reception environment steadily.
[2] Consider possibilities of use for new services other than 4K8K broadcasting
- ○ Verification of technical feasibility of using the HEVC method for 2K broadcasting

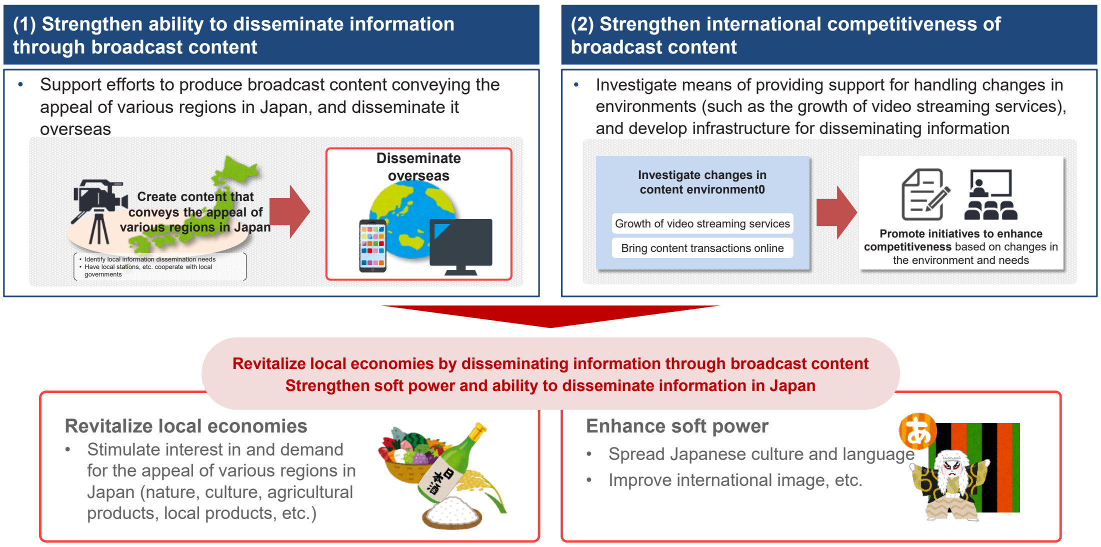
3. Response to changes in the business environment

(1) Reduction in burden of infrastructure usage fee
[1] Infrastructure operators (B-SAT and SKY Perfect JSAT) make efforts to lower the usage fee by reviewing their cost structure.
- ○ Streamlining of systems, minute examination of the operation costs
- ○ Joint operation /use of earth station equipment, etc.
- ○ Consideration of hybrid satellite procurement

[2] Setting up a place for opinion exchange of infrastructure operators, broadcasters, etc.

(2) Flexible platform operation
- ○ It is necessary for pay broadcast management business (SKY Perfect JSAT) to promptly and flexibly respond to changes in the market environment, which includes revision of th ePlatform Guideline.

3. Promotion of the overseas expansion of broadcast content (Figure5-4-5-1 in White Paper)



4. Project to enhance the disaster resistance through conversion of cable televisions to fiber optics toward establishment of 'New Normal' (Figure5-4-7-1 in White Paper)

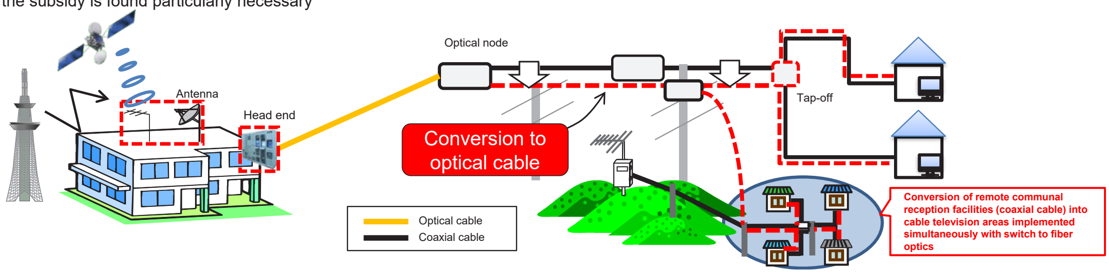
Project illustration

○ **Project operator**
Municipalities, municipality collaboration entities or a third sector (including entities that continue to fulfill the role pertaining to the provision of cable television services through transfer of the relevant facilities from these entities(Succeeding business operators))

○**Target regions**
Regions satisfying all of (1) to (3) below:
(1) Municipalities where cable television is positioned in their regional disaster prevention plan
(2) Regions with unfavorable conditions
(3) Municipalities with financial index 0.5 or lower and other regions where the subsidy is found particularly necessary

○**Subsidy rate**
(1) Municipalities or municipality collaboration entities (Succeeding business operators): 1/2
(2) Third sector (Succeeding business operators): 1/3

○**Subsidized costs (shown in red in the figure below)**
Optical fiber cable, transmitting/receiving facilities, antennas, etc.
*Includes transmission line equipment necessary for converting remote communal reception facilities (coaxial cable) into cable television areas implemented simultaneously with the switch to fiber optics (expanded from the R4 supplementary budget).



5. Projects to support broadcast network development (Figure5-4-7-2 in White Paper)

- In order to reliably provide disaster information, evacuation information, and other information essential for protecting the lives and property of citizens, the projects to support broadcast network development provide partial subsidies for the following maintenance costs, in order to <u>bring resilience to the broadcast networks that serve as important means of transmitting information locally in the event of a disaster</u>.
  [1] Emergency earthquake early warning equipment, such as spare transmitting station equipment and supplementary disaster response transmitting stations involved in new radio and television development
  [2] Redundant routes for cable television trunk lines

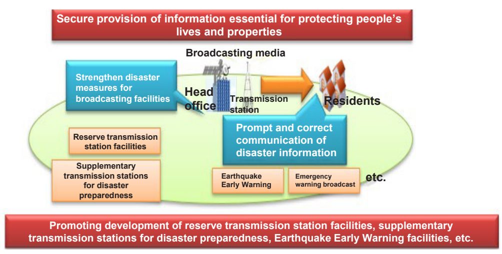
Subsidy rate

- Local governments (*) : 1/2
- Third sector(*), commercial broadcasters, (item [1] only): 1/3

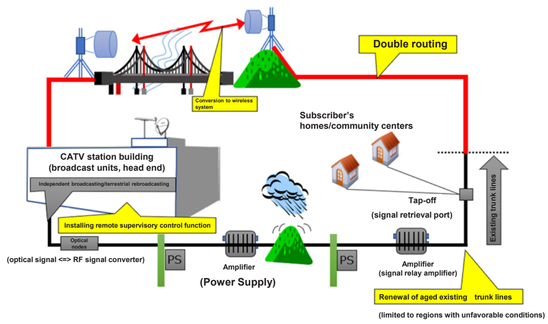
*Item [2] also includes entities that continue to fulfill the role pertaining to the provision of cable television services through transfer of the relevant facilities from these entities (succeeding business operators).

Project name/image

[1] Project to develop basic terrestrial broadcasting networks



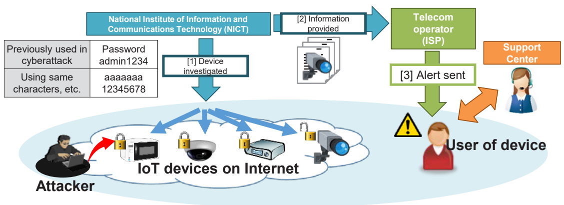
[2] Project to develop regional cable television networks



Section 5

1. Overview of NOTICE and NICTER alerts

[Overview of NOTICE alerts]

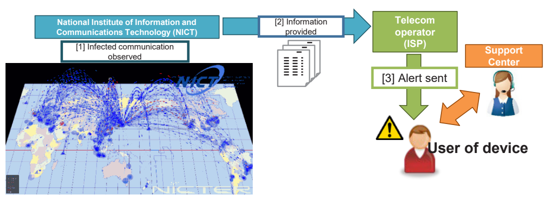


Investigated: IoT devices **that could be used for cyberattacks** due to inadequate password settings, etc.

[1] NICT identifies devices that could be used for cyberattacks by entering easily guessed passwords into IoT devices on the Internet, etc.
[2] ISP notified of information about the device.
[3] ISP identifies user of the device and alerts them.

[Overview of NICTER alerts*]

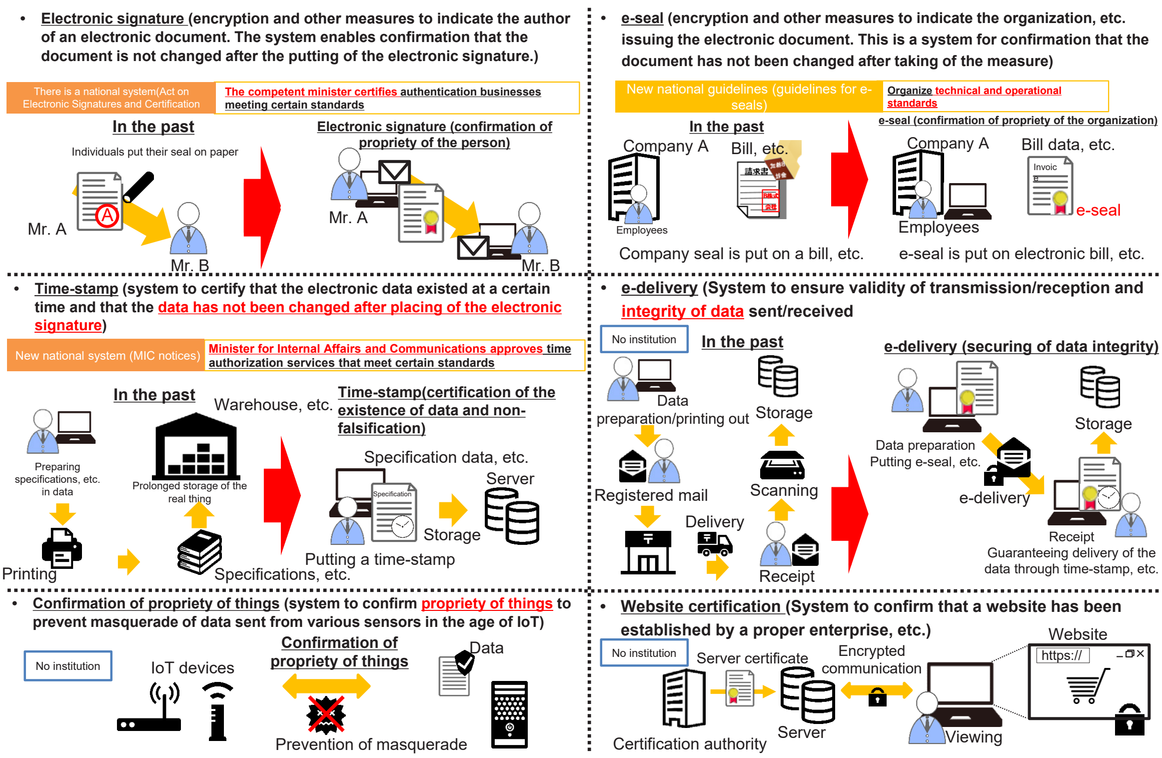
*Alert sent to users of IoT devices infected with malware



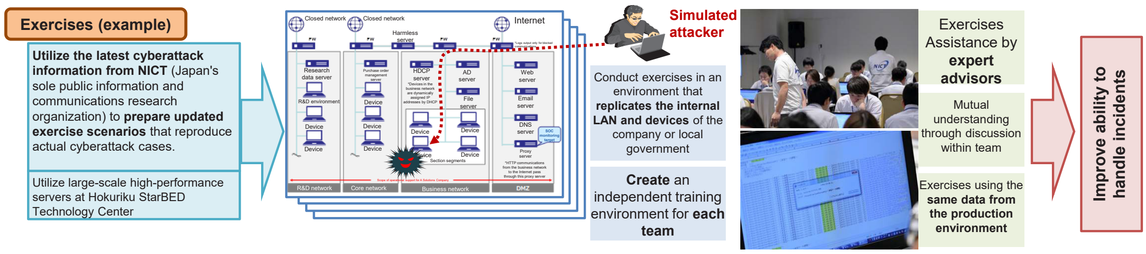
Investigated: IoT devices **already infected with malware** such as Mirai

[1] NICT identifies IoT devices infected with malware by analyzing communications sent to the Darknet*, as part of the "NICTER" project.
*IP addresses used by NICT for large-scale observation of cyberattacks
[2] ISP notified of information about the device.
[3] ISP identifies user of the device and alerts them

2. Trust services (Figure5-5-2-1 in White Paper)



3. Practical cyber defense exercises (CYDER: CYber Defense Exercise with Recurrence) (Figure5-5-3-1 in White Paper)

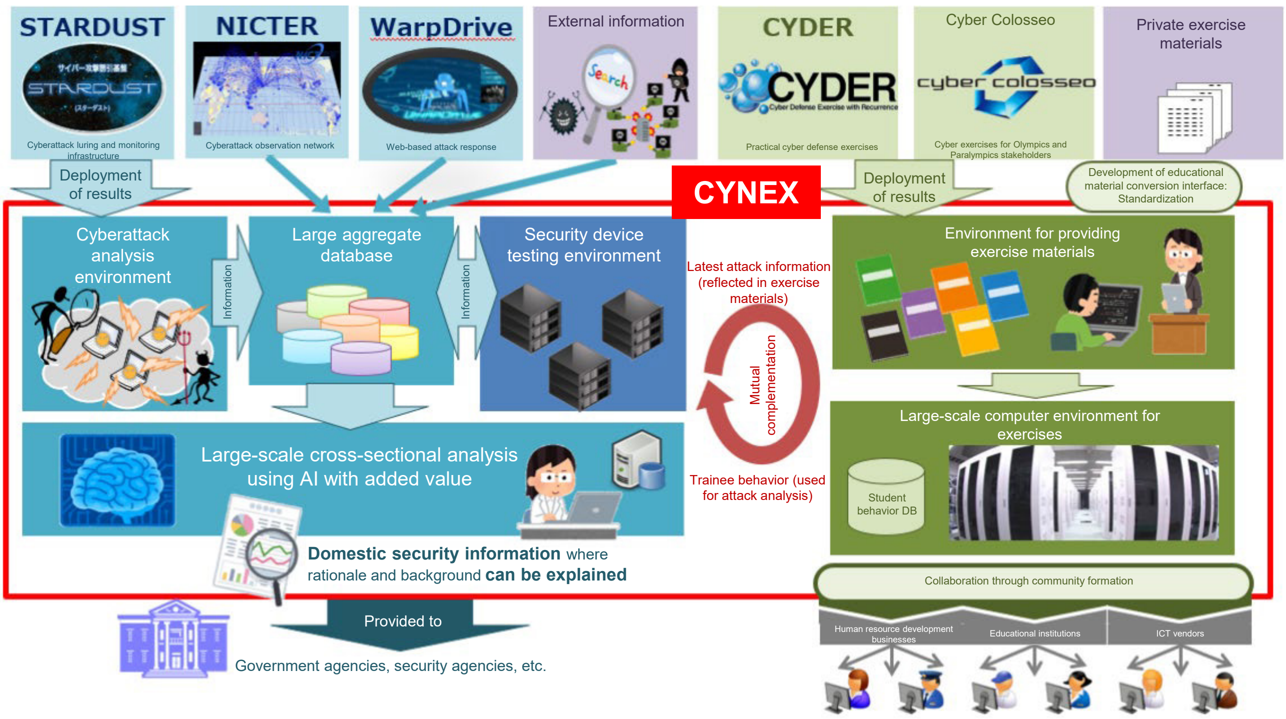


4. CYDER in fiscal 2022 (Figure5-5-3-2 in White Paper)

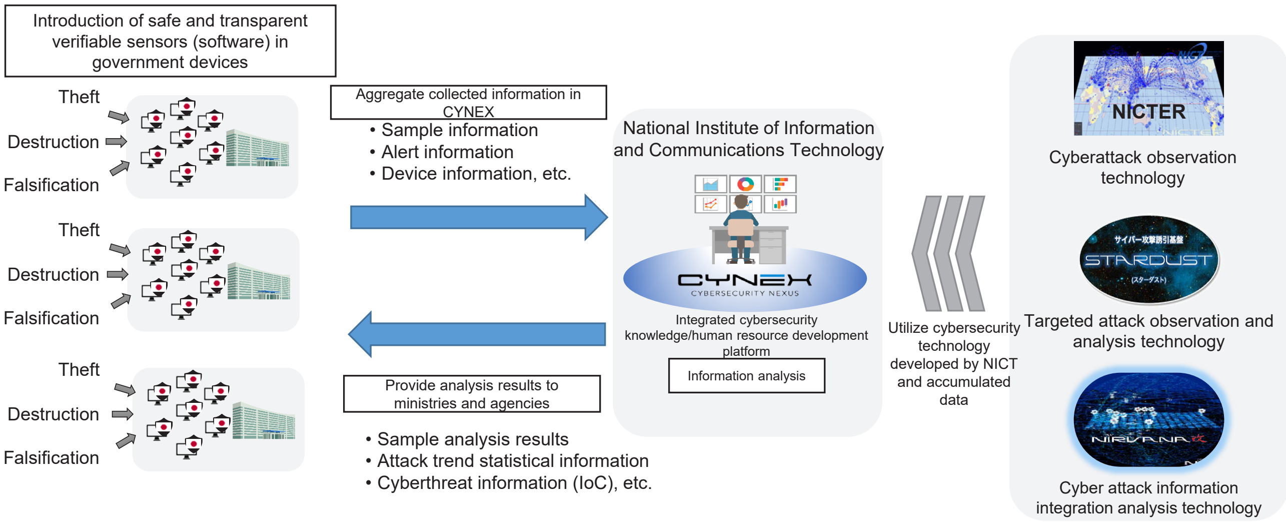
Course	Type of exercise	Level	Intended audience (topics covered)	Intended organizations	Location	Frequency	Period
A	Group exercises	Beginner	Individuals just beginning to work with systems (Procedure for responding to incidents)	All organizations	All prefectures, etc. *On-site and satellite lessons are also being tried	72 times	From July, to Feb. of the following year
B-1		Intermediat	System administrators and operators (Autonomous incident response and security management)	Local governments	11 regions nationwide	20 times	From Oct., to Jan. of the following year
B-2				Organizations other than local governments	Tokyo, Osaka, Nagoya, Tsukuba	13 times	Jan. to Feb. of the following year
C		Semi-advanced	Security specialists (Advanced security technology)	All organizations	Tokyo	3 times	From Oct., to Feb. of the following year

Course	Type of exercise	Level	Intended audience (topics covered)	Intended organizations	Location	Frequency	Period
Online Standard	Online exercises	Equivalent to beginner	Individuals just beginning to work with systems (Procedure for responding to incidents)	All organizations	(Participant workplaces, etc.)	As needed	5/24 to 7/19
Online Introduction		Introduction					1/17 to 2/24 of the following year

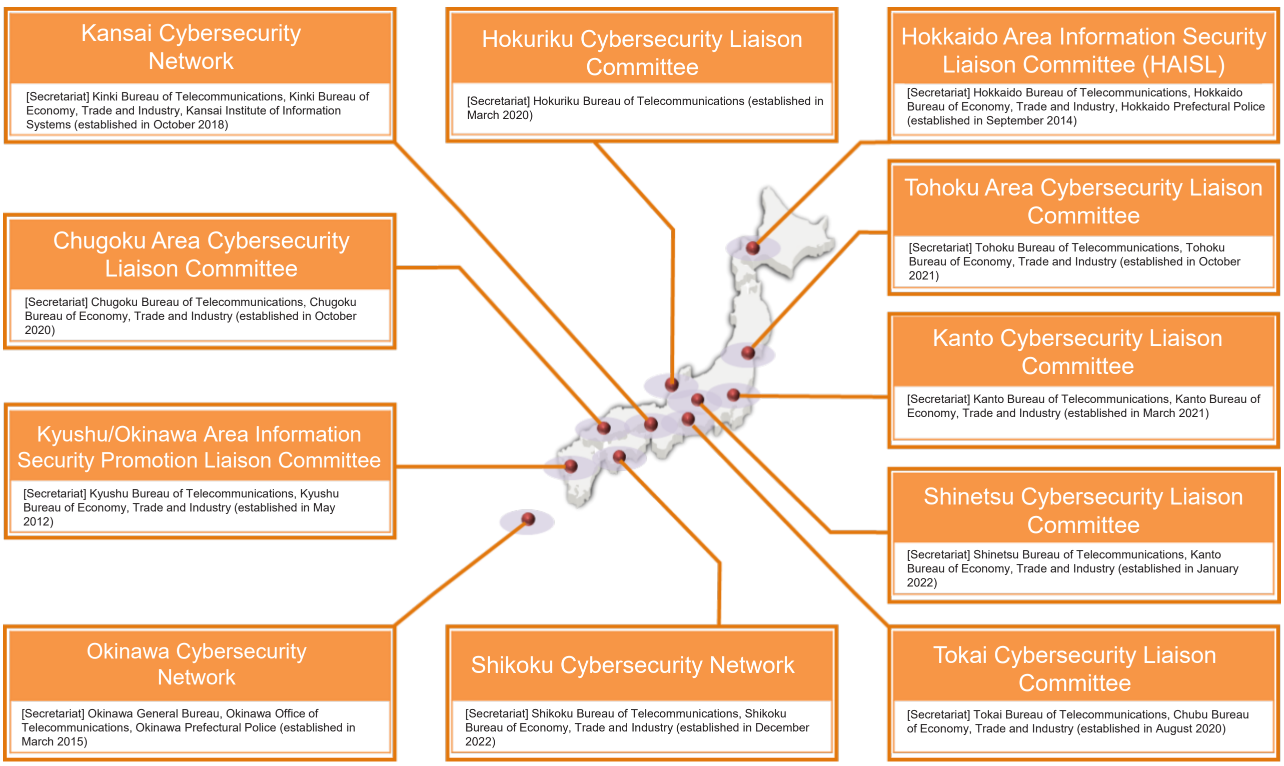
5. Integrated cybersecurity knowledge/human resource development platform (CYNEX)



6. Demonstration project for the collection and analysis of cybersecurity information using government device information (CYXROSS)



7. Regional security communities

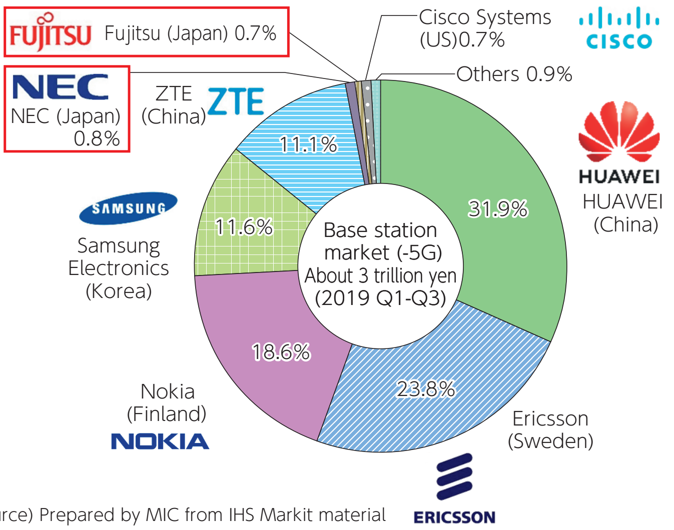


Section 7

1. International competitiveness in the communications infrastructure market (Figure5-7-2-1 in White Paper)

Market share of 5G base stations (in amount)

Five companies from China, Europe and Korea have 97% of the global share of portable base stations (in the 1st to 3rd quarters of 2019). <u>Share of Japanese companies is around 1.5%.</u>



(Source) Prepared by MIC from IHS Markit material

However, Japanese enterprises <u>have around 30% global share of electronic components</u> that are incorporated in smartphone, etc. <u>They may have potential competitiveness toward Beyond 5G.</u>

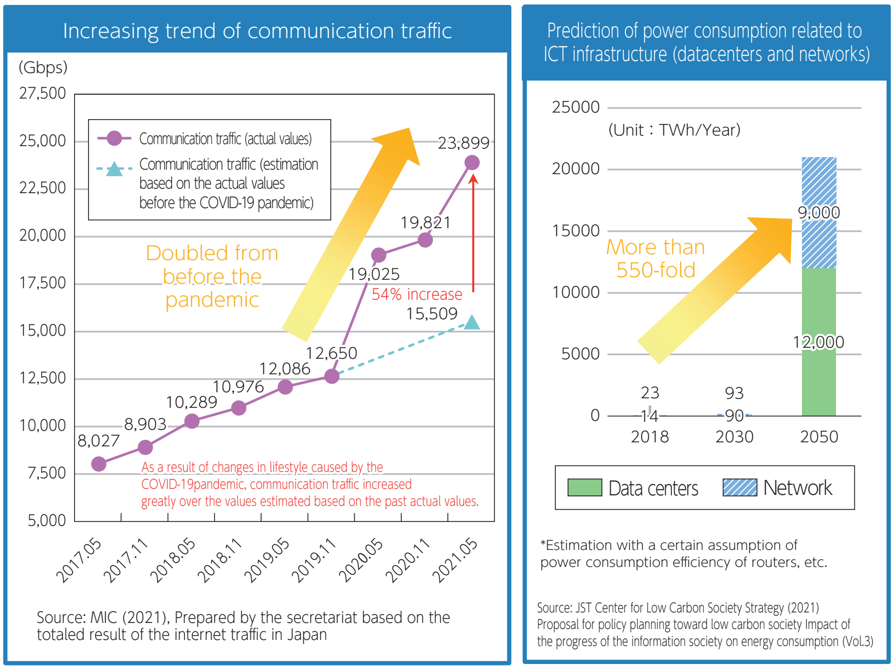
(Source)
JEITA Statistical Handbook 2022-2023

2. Beyond 5G (6G) R&D by the governments of other countries (Figure5-7-2-2 in White Paper)

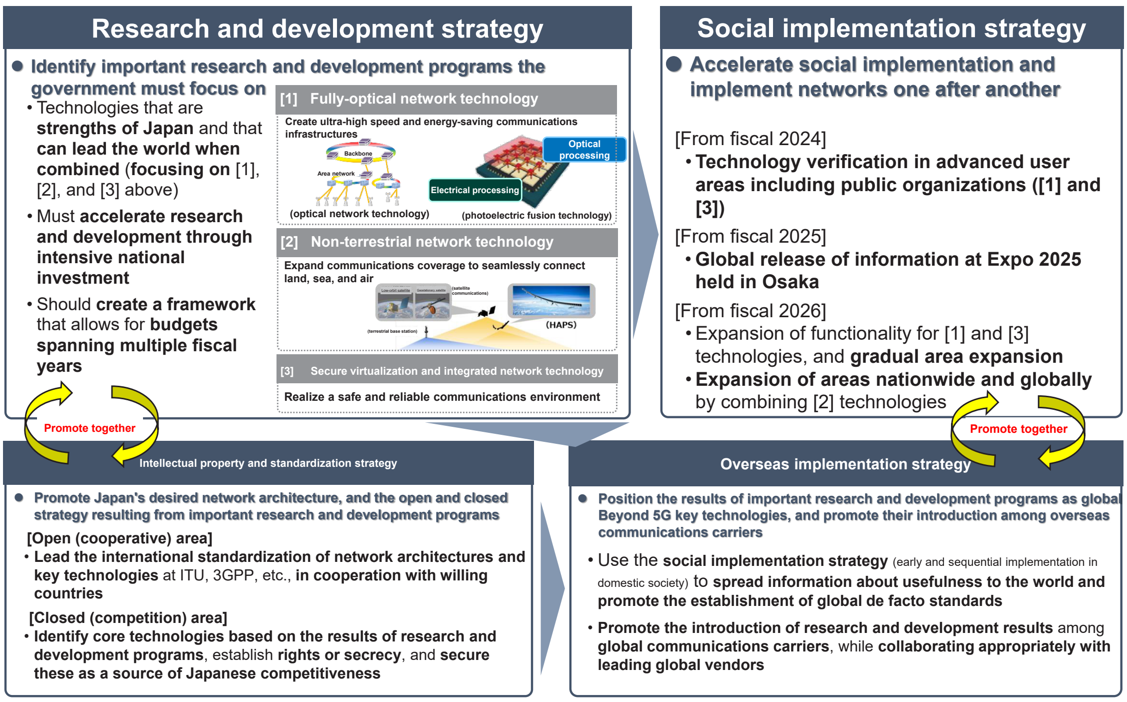
The United States	●The "CHIPS and Science Act of 2022," which provides $52.7 billion (about 7 trillion yen) in support for the production and research and development of semiconductors and **<u>$20 billion (about 3 trillion yen) in support for the development of AI, quantum computers, and advanced technologies such as next-generation communication standards (6G)</u>**, was enacted (August 2022)
Europe	**<u>EU, Germany and Finland governments invest 1.85 billion Euro (about 240 billion yen) in total in 6G R&D</u>** (as of March 2022)
EU	●EU decided <u>900 million Euro investment in 6G R&D in the next R&D program Horizon Europe</u> (2021-2027) (March 2021) ●SNS JU secured 2 billion euros (about 260 billion yen) in total from the public and private sectors, including the above 900 million euros (March 2022)
Germany	●<u>Decided to invest 700 million Euro in total in 6G technology</u> R&D (2021 to 2025) (April 2021).
Finland	●<u>Started 6Genesis Flagship Program</u> and budgeted <u>250 million Euro (about 33 billion yen) in eight years from 2019 to 2026</u> (May 2018)
Russia	●The Skolkovo Foundation announced a project to develop Russian 6G communications devices at the Skolkovo Institute of Science and Technology (Skoltech) and the Radio Research and Development Institute (NIIR), with an investment of **<u>30 billion rubles (approximately 64.4 billion yen) from 2023 to 2025</u>** (July 2022)
China	●Released **<u>a digital economy plan to enhance 6G R&D as part of the 14 th five-year plan</u>** (January 2022)
Korea	●Ministry of Science and ICT (MSIT) **<u>announced a 6G R&D action plan</u>**, including **<u>220 billion won (about 21 billion yen)investment by 2025</u>** (June 2021).

* The exchange rate at the time of publication was used for yen conversion.

3. Trends of communications traffic and energy consumption in the ICT field (Figure5-7-2-3 in White Paper)



4. Strategy to accelerate research and development and social implementation of Beyond 5G (6G) (Figure5-7-2-4 in White Paper)



5. Act Partially Amending the Act on the National Institute of Information and Communications Technology and Radio Act (Figure5-7-2-5 in White Paper)

Act Partially Amending the Act on the National Institute of Information and Communications Technology and Radio Act (Act No. 93 of 2022)

[Related to supplementary budget, enacted on December 2, 2022]

- In order to promote the creation of innovative information and communications technologies that will serve as the foundation for Japan's economic and social development in the future, NICT will establish a research and development fund.

*NICT: National Institute of Information and Communications Technology

1. Summary of revisions

(1) Revision to the Act on the National Institute of Information and Communications Technology

Stipulates that NICT establish a fund (ICT Research and Development Fund) to be allocated to cover costs required for research and development through public recruitment for the creation of innovative information and communications technologies.

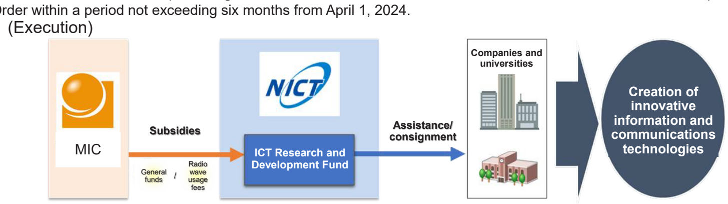
* Major revisions: Establishment of fund, separate accounting of fund operations, report to the Diet each fiscal year, abolition of the current time-limited fund

(2) Revision to the Radio Act

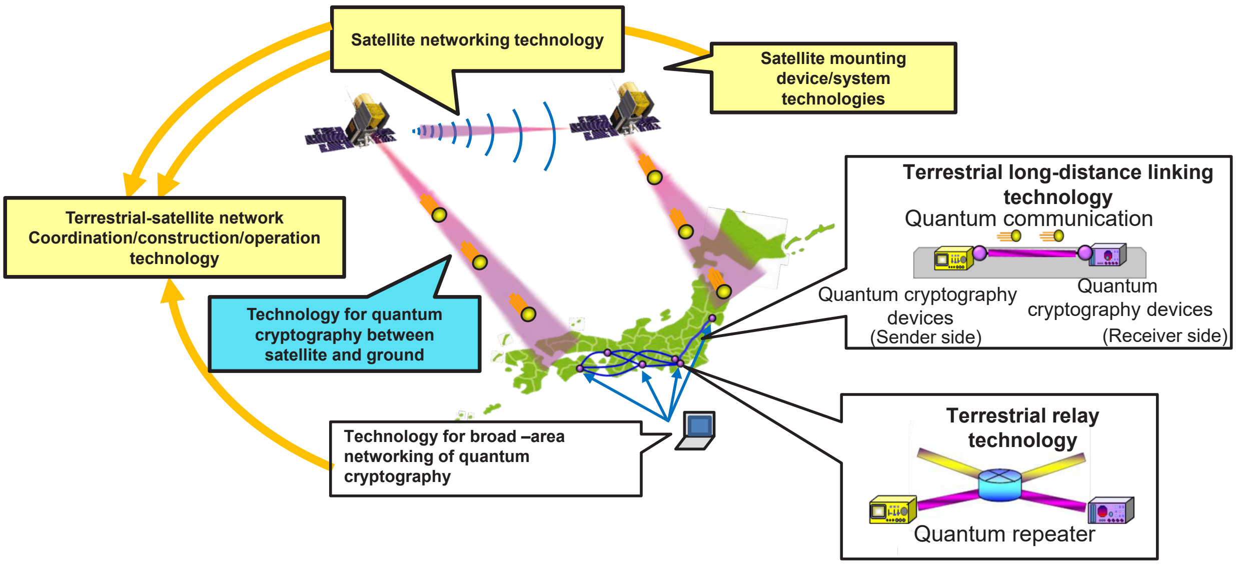
Clarifies that subsidies for research and development that contribute to the effective use of radio waves financed by radio wave usage fees may be allocated to the fund, and stipulates that the remaining amount of the fund and other usage of the fund be studied and publicized each fiscal year.

2. Effective date

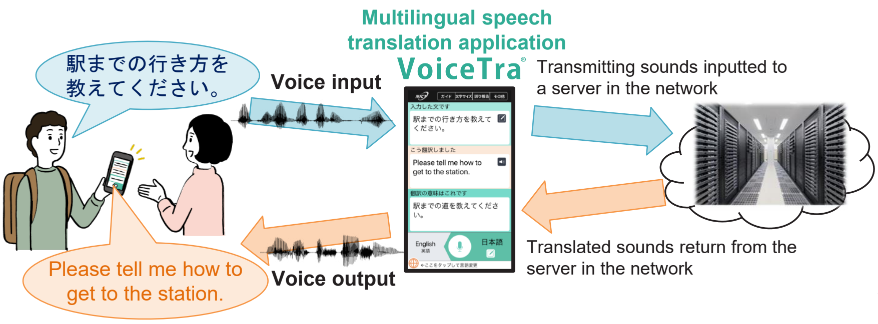
The date specified by Cabinet Order (December 19, 2022) within a period not exceeding one month from the date of official announcement (December 9, 2022).
Provided, however, that the revision pertaining to the abolition of the current time-limited fund shall be made on the date specified by Cabinet Order within a period not exceeding six months from April 1, 2024.



6. Global quantum cryptographic communications network



7. Multilingual translation technology



Priority language (at a practical level) 17 languages

Japanese	Spanish
English	Brazilian Portuguese
Chinese	Filipino
Korean	Arabic
Thai	Italian
Indonesian	German
Vietnamese	Hindi
Burmese	Russian
French	

- ✓ Nepali, Khmer, and Mongolian will be added to support foreigners visiting and residing in Japan.
- ✓ Ukrainian language will be added with the aim of handling Ukrainian refugees

8. Efforts to further advance multilingual translation technology

Mission

Eliminate language barriers in the world

—Evolution from "serial translation" to "simultaneous interpretation" and further progress in social implementation—

Vision

1 Realize global and stress-free exchange

- Further advance multilingual translation technology and its social implementation to eliminate "language barriers" in the world and realize a society where everybody freely exchanges with people around the world.

2 Strengthen business capabilities and realize a true convivial society

- Make AI capable of simultaneous interpretation at international conferences and business discussions to expand business opportunities of enterprises and promote overseas collaborations, etc.
- Eliminate language barriers in exchange with and daily life of foreigners visiting or staying in Japan who are expected to in crease across the country including rural areas.

3 Enhance Japan's presence

- Toward EXPO Osaka, Kansai in 2025, realize multilingual real -time talks and simultaneous interpretation between exhibitors and visitors of pavilions and lectures.
- Offer "Omotenashi" to people gathering from around the world to increase value and appeal of Japan in economic/social activities at home and abroad.

Target

***2020* Translation to support daily life and business (Conversation Level)**

***2025* Simultaneous translation that considers context, intention of the speaker, etc. (Discussion Level)**

- Highly accurate, prompt and practical simultaneous interpretation that considers the context (flow of conversation/sentence), intention of the speaker, surrounding conditions, cultural background and other factors
- Expand the priority languages for the multilingual translation technology based on the "Comprehensive Measures for Acceptance and Coexistence of Foreign Nationals"

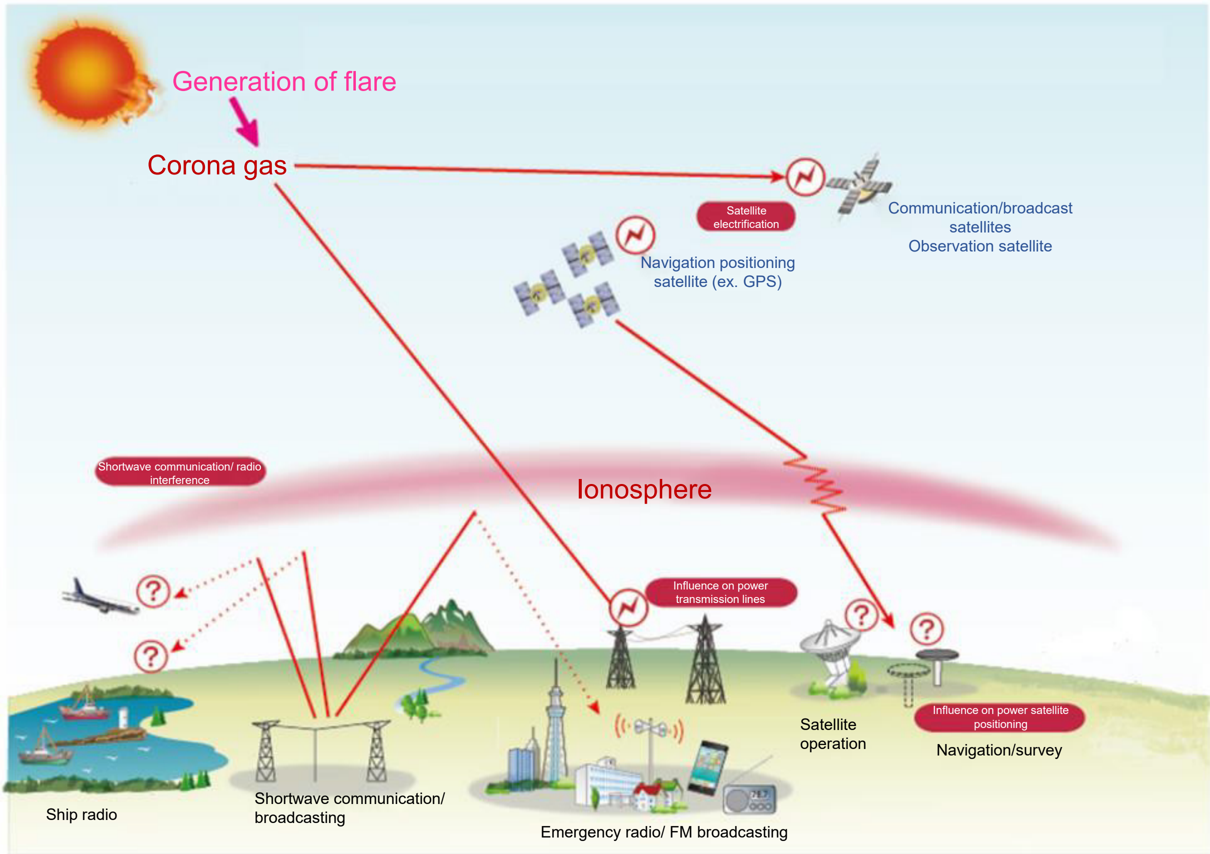
***2030* Simultaneous interpretation capable of severe negotiations (Negotiation Level)**

Action

Share a roadmap to achieve the goals toward 2025 and promote specific actions in an industry-academia-government cooperation.

Project 1	Research and development of innovative multilingual translation technology for simultaneous interpretation by AI
Project 2	Develop the world's top level AI research base to support advanced natural language processing technology.
Project 3	Social implementation of simultaneous interpretation system toward 2025 EXPO in Japan

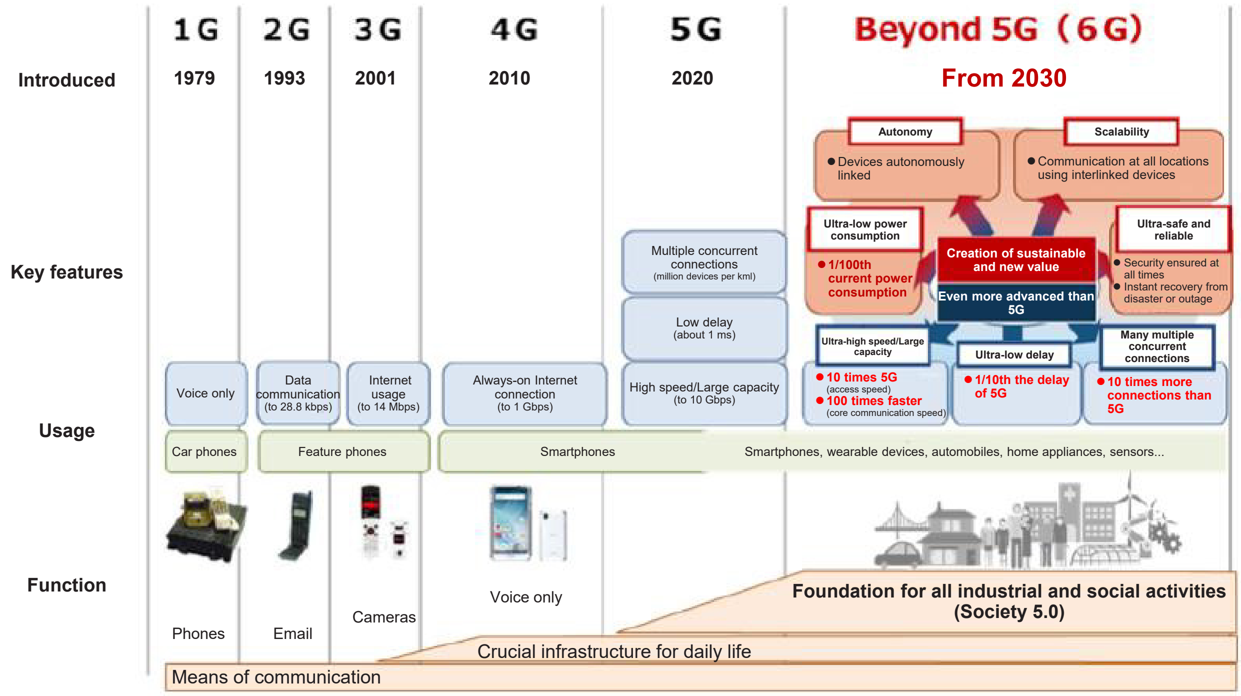
9. Impact of solar flares on the Earth



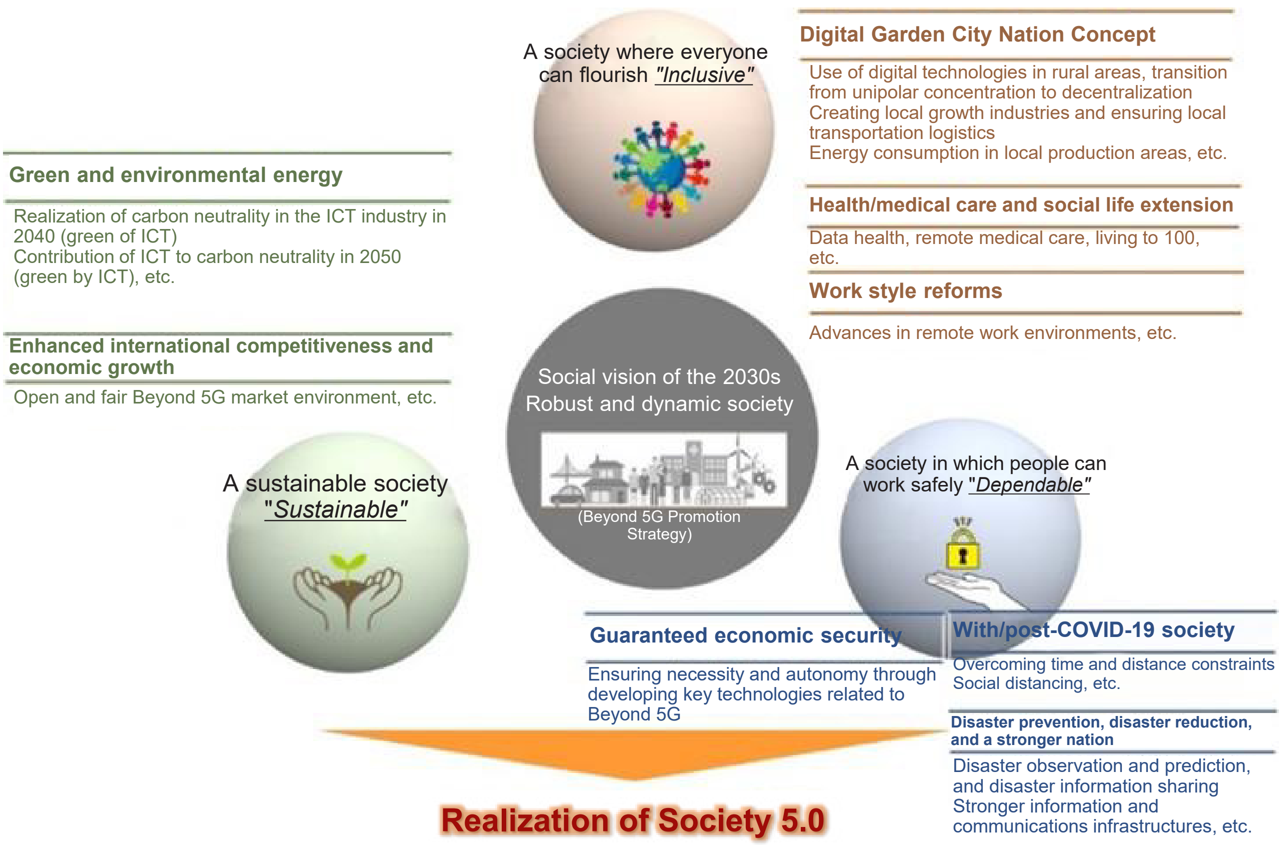
(Source) MIC, Material of the Study Group on the Advancement of Space Weather Forecasting (the 1st session)

Policy Focus -2

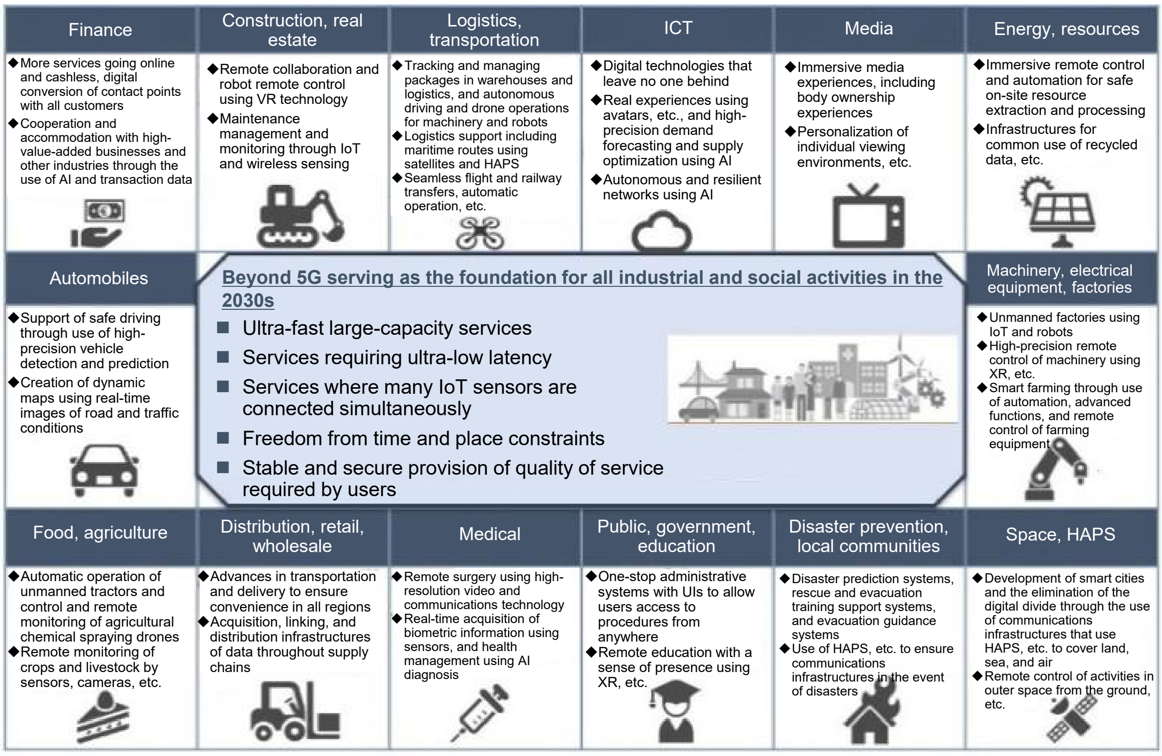
1. Beyond 5G (6G) features



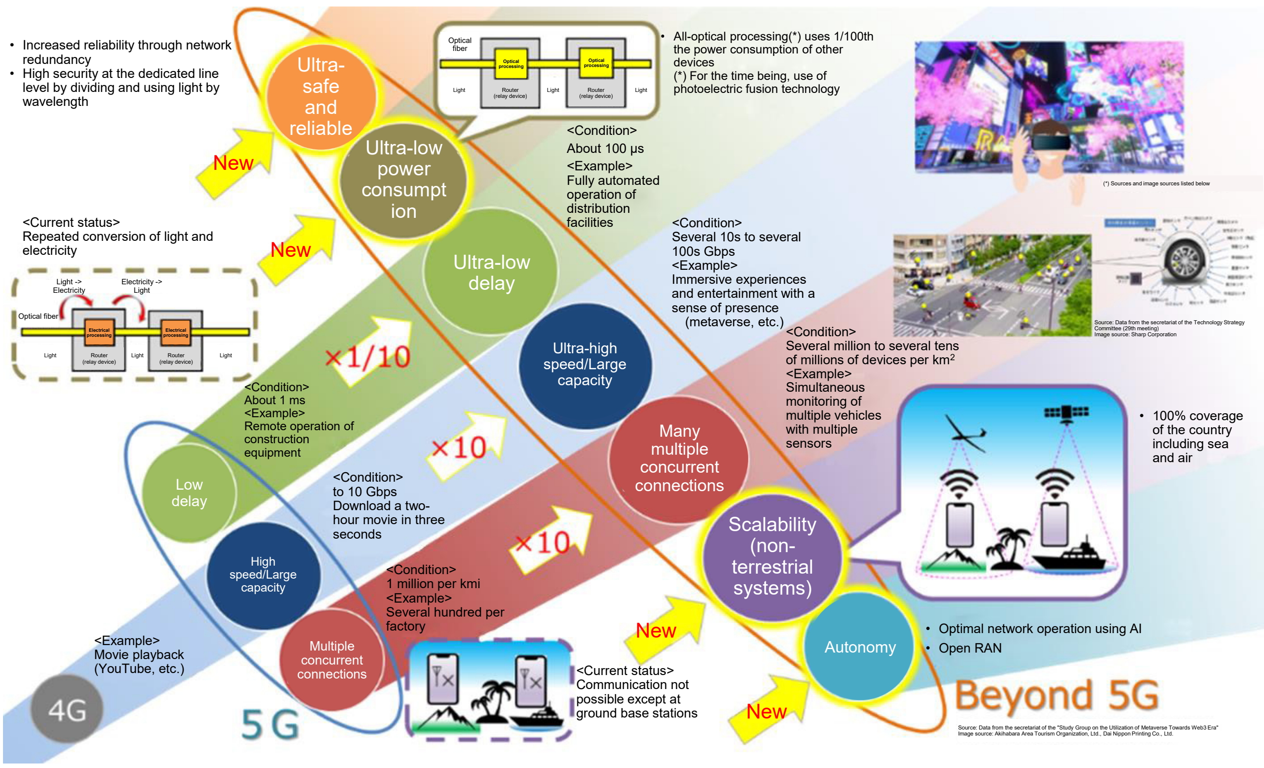
2. Society of the 2030s realized through Beyond 5G (6G) (Figure1 in White Paper)



3. Beyond 5G (6G) use cases (Figure2 in White Paper)



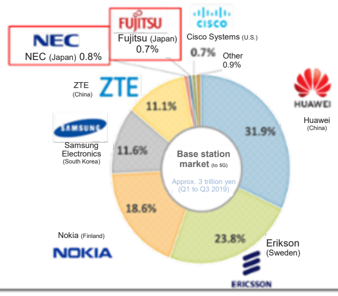
4. Features and use scenes realized by Beyond 5G (6G) (Figure3 in White Paper)



5. Major challenges for Beyond 5G (6G) (Figure4 in White Paper)

(Issue 1) Intense international competition

- Japanese vendors lag behind others in the global 5G communications infrastructure market (but have potential competitiveness in electronic components)
- **Foreign countries are aggressively expanding research and development investment to take the lead in 6G, and are rapidly developing research plans and other concrete measures**



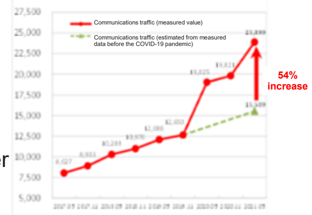
Accounts for about 30% of the global market share for electronic components embedded in smartphones and other devices, and has the potential to compete in Beyond 5G.

Source:
JEITA Statistical Handbook 2022-2023

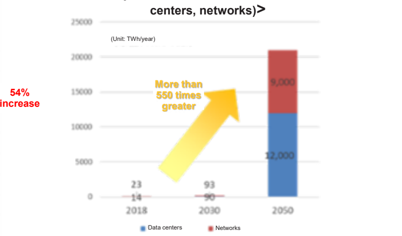
(Issue 2) Power consumption for information and communications

- Changes in lifestyle and expansion of information processing **greatly increase traffic and power consumption in communications networks**
- **Further increases are expected**, and it will be **difficult for Japan to achieve its international commitment to carbon neutrality**, without further technological innovation

<Changes in communications traffic in Japan>



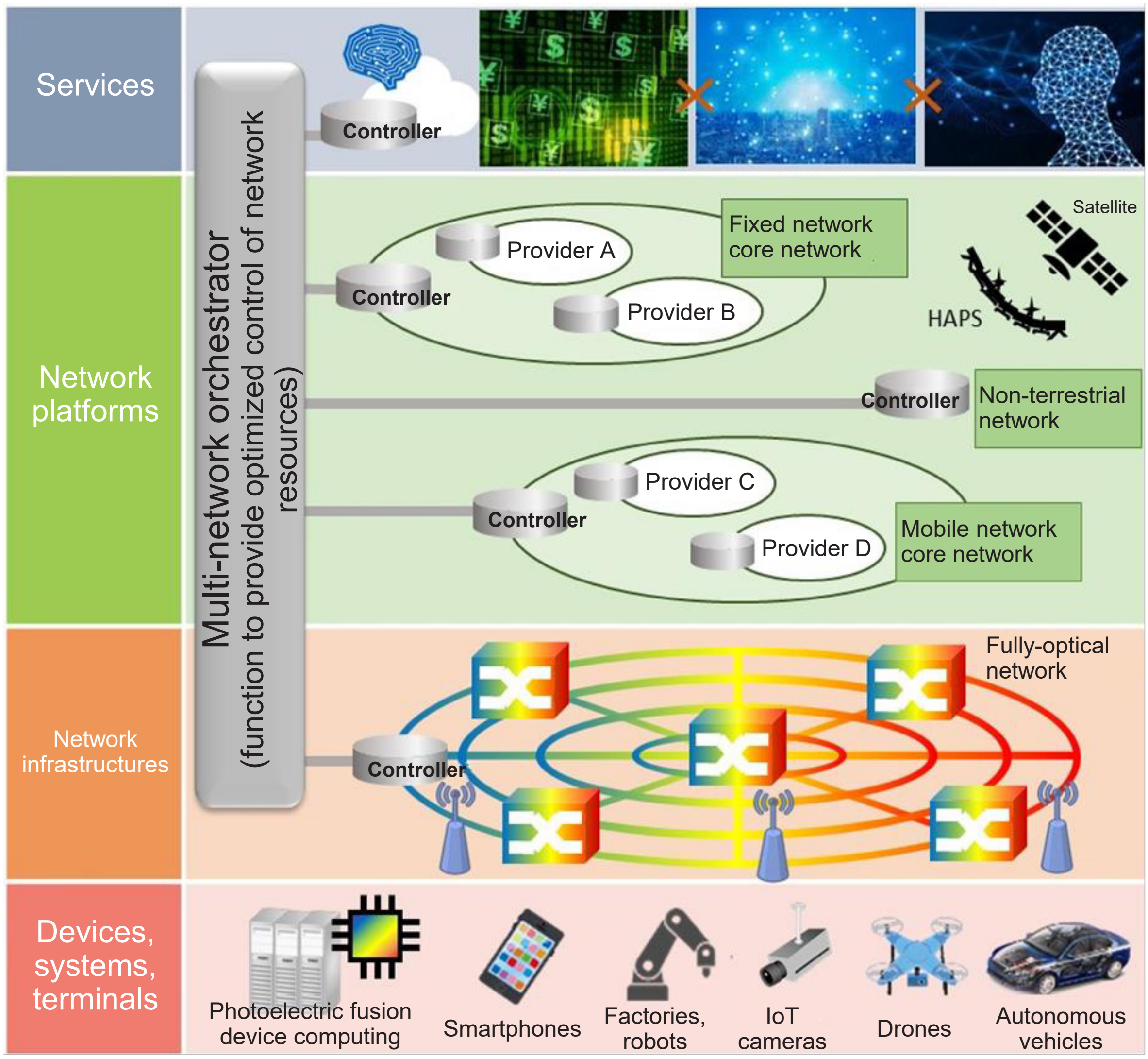
<Power consumption forecast for ICT infrastructures (data centers, networks)>



(Issue 3) Promotion of digital technologies as a national strategy

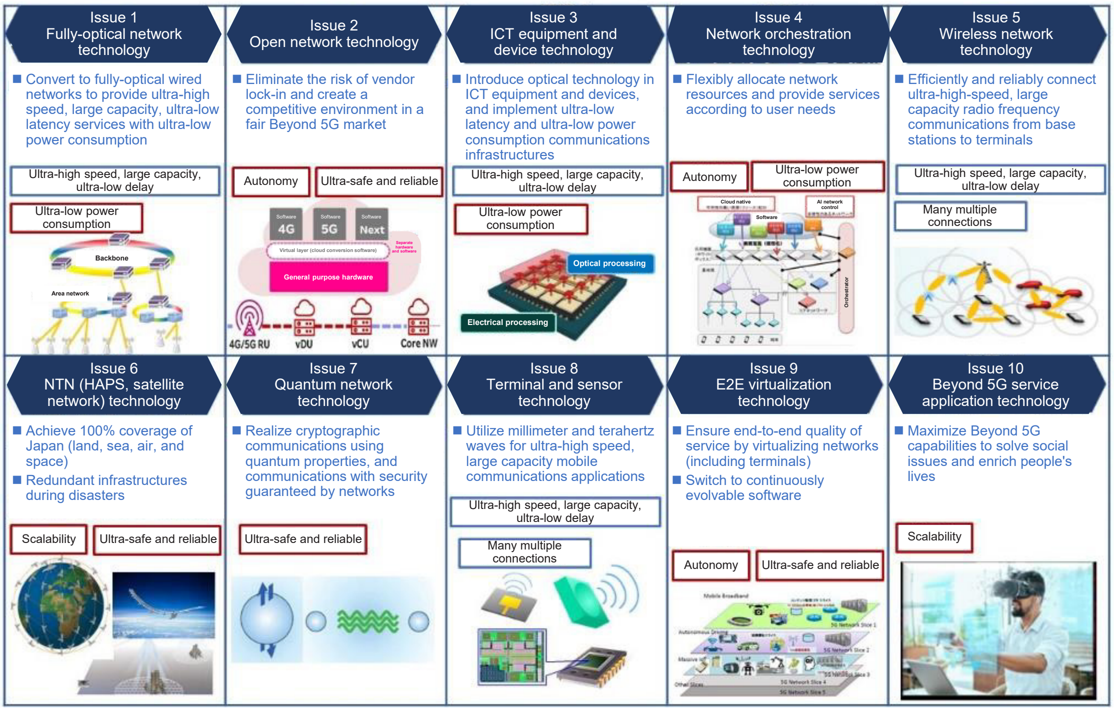
- Aim for a **switch to digital where everyone can play an active role and no one is left behind (Digital Garden City Nation Concept, etc.)**

6. The ideal Beyond 5G (6G) network



(Source) Information and Communications Council, Summary of the interim report on the "Information and Communications Technology Strategy for Beyond 5G"

7. 10 Beyond 5G (6G) research and development issues for industry, academia, and government (Figure5 in White Paper)



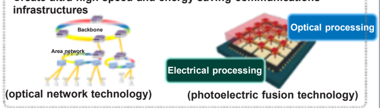
8. Strategy to accelerate research and development and social implementation of Beyond 5G (6G)

Research and development strategy

- **Identify important research and development programs the government must focus on**
  - Technologies that are **strengths of Japan** and that **can lead the world when combined** (**focusing on** [1], [2], and [3] above)
  - Must **accelerate research and development through intensive national investment**
  - Should **create a framework** that allows for **budgets spanning multiple fiscal years**

[1] Fully-optical network technology

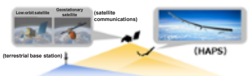
Create ultra-high speed and energy-saving communications infrastructures



(optical network technology) (photoelectric fusion technology)

[2] Non-terrestrial network technology

Expand communications coverage to seamlessly connect land, sea, and air



[3] Secure virtualization and integrated network technology

Realize a safe and reliable communications environment

Promote together

Social implementation strategy

- **Accelerate social implementation and implement networks one after another**

[From fiscal 2024]
- **Technology verification in advanced user areas including public organizations ([1] and [3])**

[From fiscal 2025]
- **Global release of information at Expo 2025 held in Osaka**

[From fiscal 2026]
- Expansion of functionality for [1] and [3] technologies, and **gradual area expansion**
- **Expansion of areas nationwide and globally** by combining [2] technologies

Promote together

Intellectual property and standardization strategy

- **Promote Japan's desired network architecture, and the open and closed strategy resulting from important research and development programs**

[Open (cooperative) area]
- **Lead the international standardization of network architectures and key technologies** at ITU, 3GPP, etc., **in cooperation with willing countries**

[Closed (competition) area]
- **Identify core technologies based on the results of research and development programs**, establish **rights or secrecy**, and **secure these as a source of Japanese competitiveness**

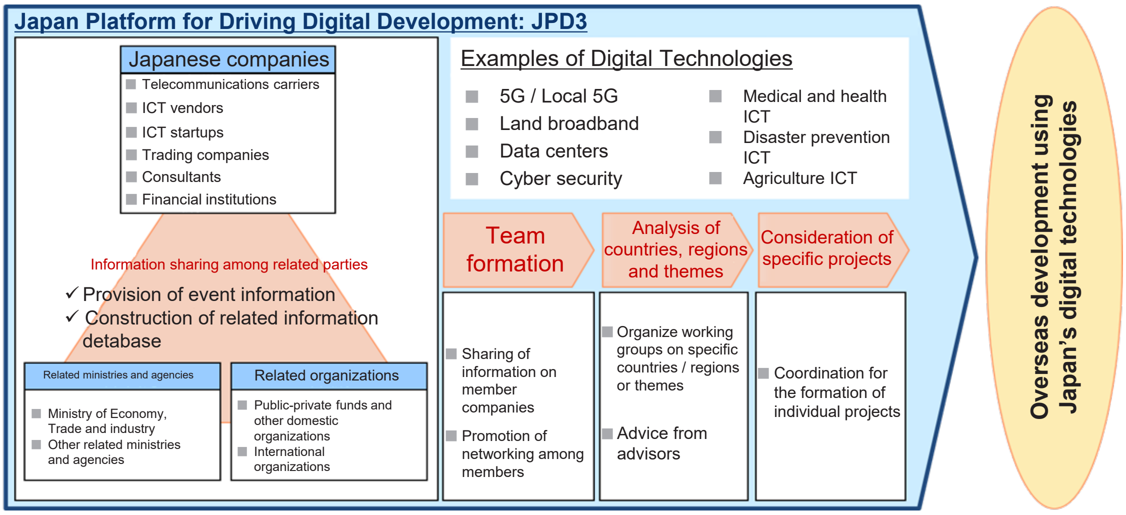
Overseas implementation strategy

- **Position the results of important research and development programs as global Beyond 5G key technologies, and promote their introduction among overseas communications carriers**

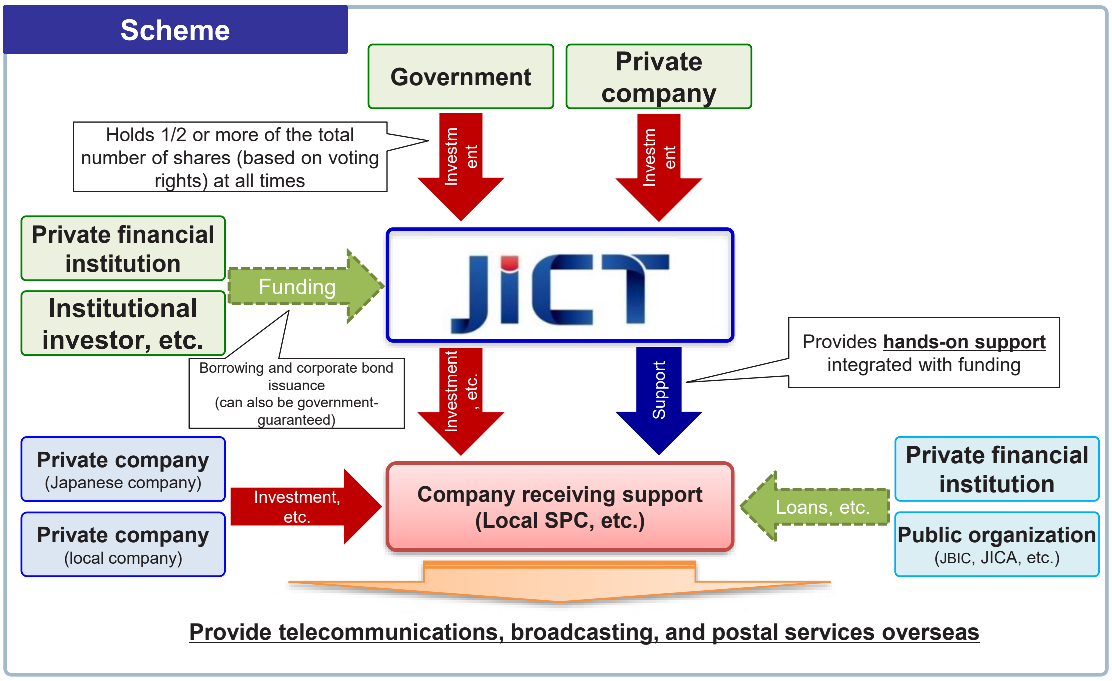
- Use the **social implementation strategy** (early and sequential implementation in domestic society) to **spread information about usefulness to the world and promote the establishment of global de facto standards**
- **Promote the introduction of research and development results** among **global communications carriers**, while **collaborating appropriately with leading global vendors**

Section 8

1. Japan Platform for Driving Digital Development (Figure5-8-2-1 in White Paper)



2. Support through the Fund Corporation for the Overseas Development of Japan's ICT and Postal Services (JICT) (Figure5-8-2-2 in White Paper)



3. Examples of overseas implementation of ICT (Figure5-8-2-3 in White Paper)

Specific cases

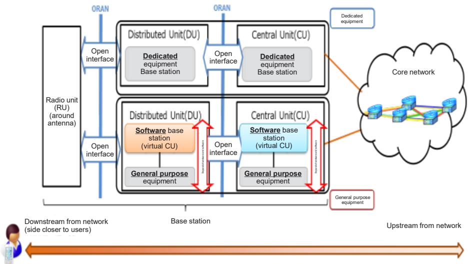
Digital infrastructures

Optical undersea cables

- One of the three major companies is Japanese.
- Undersea cable (main line) between the U.S. and Singapore connected to Palau, during a combined effort by Japan, the U.S., and Australia. The order for this work was received by a Japanese company.

5G including Open RAN

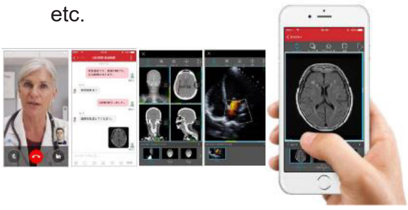
- Currently developing Open RAN devices for open and secure networking.
- Conducted demonstrations mainly in developing countries in Asia and South America.



Digital usage

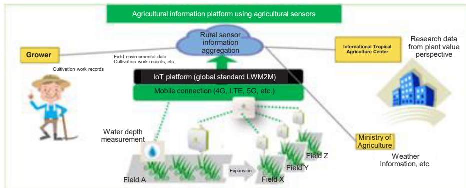
ICT for remote medical care

- Demonstrated medical ICT using mobile and cloud technologies to realize early disease detection and preventive medical care.
- Orders received from Chile, Brazil, etc.



ICT to improve agriculture

- Demonstrated ICT utilization models to promote agricultural efficiency, mainly in Central and South America and Africa.
- Orders received from Colombia, etc.



4. History of G7/G20 ICT/digital discussions (overview) (Figure5-8-5-1 in White Paper)

Progress in the switch to digital, and the dawn of the IoT era
Promotion of UN SDGs

Realization of digital society and Society 5.0
Achievement of SDGs

2016

Development and spread of IoT, emergence of AI

Development and spread of AI, switch to digital in all fields

G7 ICT Ministers' Meeting in Takamatsu, Kagawa
April 2016
Charter for the Digitally Connected World

Free flow of information
International discussion on AI
Inclusive growth (SDGs)

[2019 G20 (Tsukuba, Ibaraki)]
[1] Contribute toward achieving SDGs through the switch to digital
[2] Promote the free flow and use of data
[3] Formulate AI principles and present a vision of AI society
[4] Ensure security in the digital economy

[Discussions at G7]

G7 ICT and Industry Ministerial Meeting
(Italy) Sept. 2017
Development vision for human-centered AI

G7 Employment and Innovation Ministerial Meeting
(Canada) March 2018
Common vision for AI development

G7 Digital Technology Ministers' Meeting
(France) May 2019
International collaboration on AI
Handling harmful information online
Free flow of information

G7 Science and Technology Ministers' Meeting
(U.S.) May 2020
Cooperation on launching GPAI

G7 Digital and Tech Ministers' Meeting
(UK) April 2021
Diversification of ICT infrastructures
Digital technology standards
DFFT roadmap
Digital competition
Internet safety

G7 Digital and Tech Ministers' Meeting
(Germany) April 2022
Switch to digital and environments
Standardization
Data
Competition
eSafety

G7 Digital and Tech Ministers' Meeting
(Japan) April 2023

[Discussions at G20]

G20 Hangzhou Summit
Digital Economy Task Force
(China) *Sept.* 2016

G20 Digital Economy Ministers Meeting
(Germany) April 2017

G20 Digital Economy Ministers Meeting
(Argentina) Aug. 2018

G20 Ibaraki-Tsukuba Ministerial Meeting on Trade and Digital Economy
June 2019

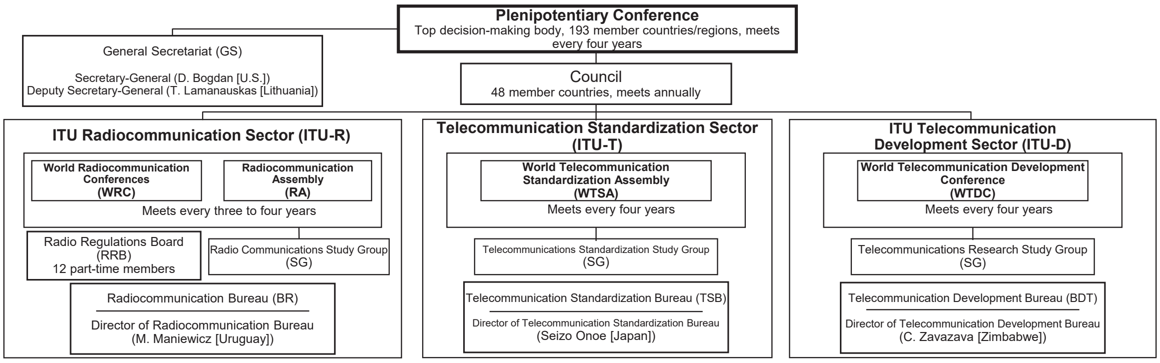
G20 Digital Economy Ministers Meeting
(Saudi Arabia) July 2020

Meeting of G20 Digital Ministers
(Italy) *Aug.* 2021

G20 Digital Economy Ministers Meeting
(Indonesia) July 2022

G20 Digital Economy Ministers Meeting
(India) *Aug.* 2023

5. International Telecommunication Union (ITU) organization (Figure5-8-5-2 in White Paper)



6. Global Digital Connectivity Partnership (GDCP) (Figure5-8-6-1 in White Paper)

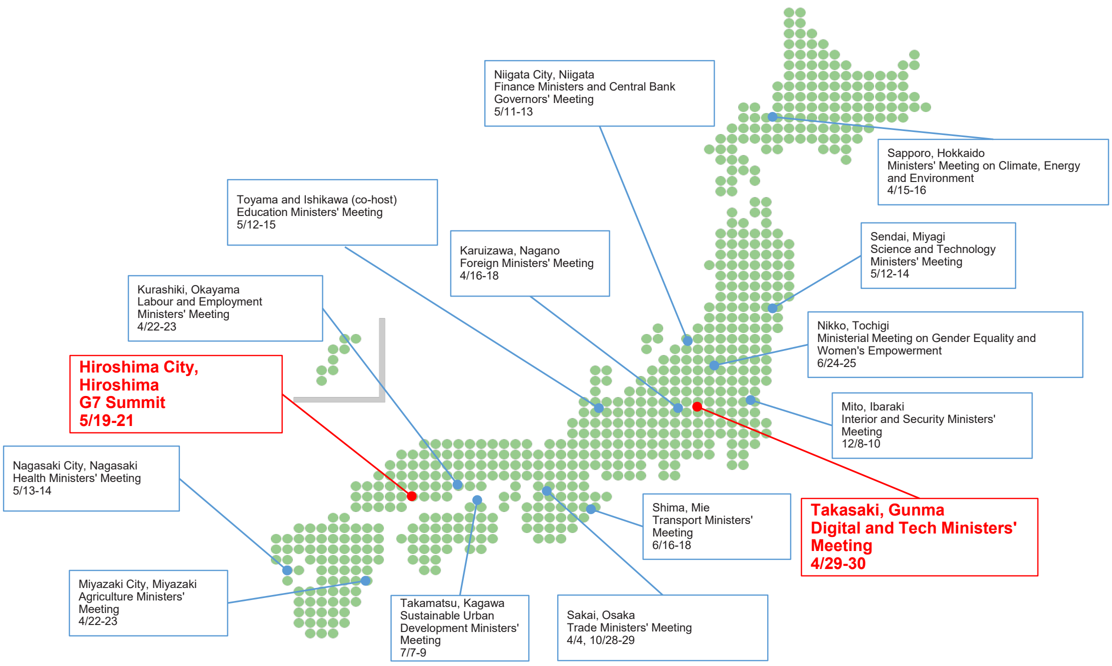
GDCP concept

Toward secure connectivity and vibrant digital economies with cooperation of Japan and the United States, GDCP promotes: [1] cooperation in third countries, [2] multilateral collaboration and [3] bilateral collaboration with a view to global development (especially 5G and Beyond 5G)

Cooperation in third countries	Cooperation for ICT infrastructure development and human resource development in third countries (with focus on the Indo-Pacific, but including other regions)
Multilateral collaboration	Enhanced collaboration in multilateral frameworks including ITU, G7/G20, OECD and APEC
Bilateral collaboration	Investments in R&D environments for 5G and Beyond5G (6G)

Policy Focus -3

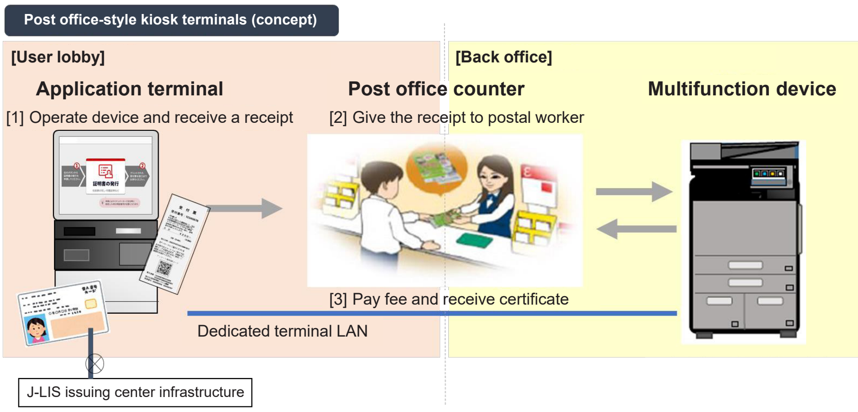
1. G7 Summit and related ministerial meetings (Figure1 in White Paper)



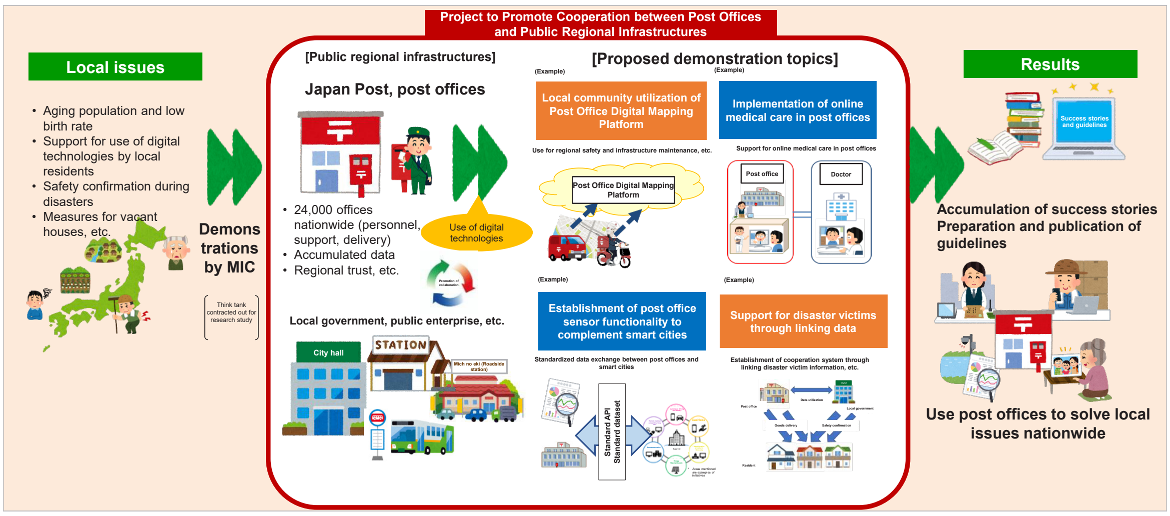
2. G7 Digital and Tech Ministers' Meeting in Takasaki, Gunma (Figure2 in White Paper)

Section 9

1. Post office-style kiosk terminal (Figure5-9-2-1 in White Paper)



2. Project to Promote Cooperation between Post Offices and Public Regional Infrastructures (Figure5-9-2-2 in White Paper)



3. Regional demonstrations (Figure5-9-2-3 in White Paper)

Linking Individual Number Cards and transportation-related IC cards at post offices (Maebashi, Gunma)

Public use of post office drones in hilly and mountainous areas (trial delivery of emergency relief supplies during disaster) (Kumano, Mie)

Shopping services at post office counters (Yatsushiro, Kumamoto)

(Source) Lower center image: Created by ACSL Ltd. with Google Earth (Map data © 2022 Google)

Appendix

Additional notes

Annotation 1: Contracting of survey research on the advancement of ICT infrastructure and distribution of digital data and information

Overview of general public questionnaire survey

This survey of the general public was conducted to understand their usage of platform services and their thoughts on providing personal data to platform services; how they interact with information on the Internet such as disinformation, misinformation, and targeted advertising; and their awareness and intention to use new services such as Beyond 5G/6G, Web3, and generative AI. An overview of the survey is provided below.

<table>
<tr><th>Item</th><th>Overview</th></tr>
<tr><td>Survey method</td><td>Internet questionnaire survey</td></tr>
<tr><td>Survey period</td><td>Early February to late February 2023</td></tr>
<tr><td>Target area</td><td>Japan, U.S., Germany, and China</td></tr>
<tr><td>Selection method</td><td>Selected by age group (20s, 30s, 40s, 50s, 60s and older) and gender (male and female) from among questionnaire survey company monitors.</td></tr>
<tr><td>Valid responses</td><td>A total of 1,000 samples were collected in each country, with 100 each by age (20, 30, 40, 50, 60s and older) and sex (male and female).
The number collected in each country is as follows.
<Japan, U.S., Germany, China>
<table>
<tr><th>Age</th><th>Male</th><th>Female</th></tr>
<tr><td>20-29</td><td>100</td><td>100</td></tr>
<tr><td>30-39</td><td>100</td><td>100</td></tr>
<tr><td>40-49</td><td>100</td><td>100</td></tr>
<tr><td>50-59</td><td>100</td><td>100</td></tr>
<tr><td>60-</td><td>100</td><td>100</td></tr>
<tr><td rowspan="2">Total</td><td>500</td><td>500</td></tr>
<tr><td colspan="2">1,000</td></tr>
</table>
</td></tr>
<tr><td>Main survey items</td><td>[1] Basic attributes (sex, age, occupation, regional characteristics, annual household income)
[2] Platform service usage (usage device, usage level, PF service usage status, social login)
[3] Use of data with platform providers (awareness of provision and utilization of personal data, concerns about provision, provision conditions, targeted advertising and use of services, device tracking functions, status of countermeasures, etc.)
[4] How to interact with information on the Internet (how news is acquired, thoughts on how information is collected, understanding of online service characteristics and personalization, precautions to be taken when posting, trusted online sites, awareness of how personal data is used, impression of targeted advertising, whether the benefits of providing data are considered important)
[5] Awareness and usage of emerging services such as 5G/B5G (awareness of related terms such as 5G/B5G, Web 3.0, and generative AI; intention to use various services</td></tr>
<tr><td>Notes</td><td>The survey targeted monitors registered with the questionnaire survey company. Factors such as the small number of registered monitors may have biased the characteristics of the subjects and their responses, depending on the country, gender, or age group</td></tr>
</table>

Annotation 2: Survey on trends in digital usage in Japan and overseas

(1) Overview of questionnaire survey

a Private life

This survey of the general public in Japan, the U.S., Germany, and China was conducted to ascertain the state of digital utilization in working styles, private services, and public services.

Item	Overview
Selection method	Internet questionnaire survey
Survey period	December 2022 to January 2023
Target	Selected without age bias from among questionnaire survey company monitors
Survey Valid responses	(see table below)
Main survey items	• Basic attributes (age) • Usage of digital services for work, such as remote work • Usage of interactive entertainment services in virtual space • Usage of digital administrative services • Expectations and concerns about the switch to digital for various services • Literacy in and thoughts on digital usage

	20s	30s	40s	50s	60s	Total
Japan	206	206	206	206	206	1030
U.S.	104	104	104	104	104	520
Germany	104	104	104	104	104	520
China	104	104	104	104	104	520
Total	518	518	518	518	518	2590

* Individuals under 20 and over 70 were excluded from this questionnaire

b Company activities

This survey of companies in Japan, the U.S., Germany, and China on digital usage, was conducted from the perspectives of technology/data, organizations, and human resources.

Item	Overview
Selection method	Internet questionnaire survey
Survey period	December 2022 to January 2023
Target	Individuals whose job title is section chief or higher were selected from among questionnaire survey company monitors who work for companies with 10 or more employees and who have permanent addresses in each country.
Survey Valid responses	(see table below)
Main survey items	• Basic attributes (industry, number of employees) • Data and technology used in efforts to switch to digital • Effects of efforts to switch to digital • Organized efforts to promote the switch to digital • Shortage of digital human resources and efforts to secure them • Challenges in promoting the switch to digital

	Large enterprises	Small-to-medium-sized enterprises	Total
Japan	379	136	515
U.S.	190	119	309
Germany	221	88	309
China	279	30	309
Total	1069	373	1442

* Based on the SMEA definition of small-to-medium-sized enterprises[1] and the results of a survey commissioned last fiscal year,[2] companies with 300 or more employees were classified as “large enterprises” and those with fewer than 300 employees were classified as “small-to-medium-sized enterprises” in the following categories: “manufacturing,” “construction,” “electricity, gas, heat supply, and water supply,” “finance and insurance,” “real estate and leasing,” “transportation and postal services,” and “information and communications.” Companies with 100 or more employees were classified as “large enterprises” and those with fewer than 100 employees were classified as “small-to-medium-sized enterprises” in the following categories: “wholesale and retail” and “service and other.”

[1] “Definition of SMEs and Small Entrepreneurs” (SMEA) https://www.chusho.meti.go.jp/soshiki/teigi.html

[2] “Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad” (MIC, 2022)
https://www.soumu.go.jp/johotsusintokei/linkdata/r04_03_houkoku.pdf

(2) Analysis of digital usage trends in Japan and overseas

a Private life

(1) From the results of questionnaire (a), the state of digital utilization in working styles, private services, and public services in each country was ascertained, and the characteristics of digital utilization in Japan and associated issues were extracted by comparing with other countries.

b Company activities

(1) From the results of the questionnaire (b), the state of digitalization efforts by enterprises in each country was ascertained from the viewpoint of technology, data, organizations, and human resources, and the characteristics and issues with digital utilization in Japanese companies were extracted by comparing with other countries.

Annotation 3: Survey on Economic Analysis of ICT (Scope of the information and communications industry of Japan)

Scope of the information and communications industry of Japan

Scope of the information and communications industry		Sectors of the Input-Output Table of the Information Communications Industry
1. Telecommunications		
	Fixed-line telecommunications Mobile telecommunications	Fixed-line telecommunications Mobile telecommunications
	Services associated with telecommunications	Services associated with telecommunications
2. Broadcasting		
	Public broadcasting	Public broadcasting
	Private broadcasting	Private television/multiplex broadcasting Private radio broadcasting Private satellite broadcasting
	Cable broadcasting	Cable television broadcasting Cable radio broadcasting
3. Information services		
	Software	Software
	Information processing/provision services	Information processing service Information provision service
4. Internet-related Services		
	Internet-related Services	Internet-related Services
5. Video picture, sound information, character information production		
	Video picture, sound information, character information production	Video picture, sound information, character information production (excluding news providers)
	Newspapers	Newspapers
	Publishers	Publishers
	News providers	News providers
6. ICT-related manufacturing		
	Computer and peripheral device manufacturing	Personal computer
		Computers (excluding personal computers)
		Peripheral devices of computer
	Cable communication equipment and appliance manufacturing	Cable communication equipment
	Wireless communication equipment and appliance manufacturing	Mobile phones
		Wireless communication equipment (excluding mobile phones)
	Other telecommunication equipment and appliance manufacturing	Other telecommunication equipment
	Flat panel/electron tube manufacturing	Flat panels/electron tubes
	Semiconductor element manufacturing	Semiconductor elements
	Integrated circuit manufacturing	Integrated circuits
	Liquid crystal panel manufacturing	Liquid crystal panels
	Other electronic component manufacturing	Other electronic components
	Radio and television receiver / video equipment manufacturing	Radio and television receivers
		Video equipment and digital cameras
	Communication cable manufacturing	Communication cables and optical fiber cables
	Office and business equipment manufacturing	Office and business equipment
	Electrical audio equipment and appliance manufacturing	Electrical audio equipment and appliances
	Information recording media manufacturing	Information recording media
7. ICT-related services		
	ICT equipment leasing business	Computer and related equipment leasing Office and business equipment leasing (excluding computers) Communication equipment and appliance leasing
	Advertising business	Advertising
	Printing, publishing, binding business	Printing, publishing, binding
	Film and theatre business	Film, theatre and entertainment places
8. IT-related construction		
	Telecom facilities construction	Telecom facilities construction
9. Research		
	Research	Research

Annotation 4: List of domestic production of 77 sector

ICT goods/services		General goods/services	
1	Fixed-line telecommunications	44	Agriculture, forestry and fisheries
2	Mobile telecommunications	45	Mining
3	Services associated with telecommunications	46	Food and beverage
4	Public broadcasting	47	Textile products
5	Private television/multiplex broadcasting	48	Pulp, paper and wood products
6	Private radio broadcasting	49	Chemicals
7	Private satellite broadcasting	50	Petroleum and coal products
8	Cable television broadcasting	51	Plastic and rubber products
9	Cable radio broadcasting	52	Ceramics, stone and clay products
10	Software	53	Steel
11	Information processing service	54	Non-ferrous metals
12	Information provision service	55	Metal products
13	Internet-related Services	56	General-purpose machinery
14	Newspapers	57	Miscellaneous manufacturing products
15	Publishers	58	Production machinery
16	News providers	59	Business-oriented machinery
17	Video picture, sound information, character information production (excluding news providers)	60	Electric machine
18	Personal computer	61	Transportation machine
19	Computers (excluding personal computers)	62	Construction
20	Peripheral devices of computer	63	Electric power, gas and heat supply
21	Cable communication equipment	64	Water
22	Mobile phones	65	Waste treatment
23	Wireless communication equipment (excluding mobile phones)	66	Commerce
24	Other telecommunication equipment	67	Finance and insurance
25	Semiconductor elements	68	Real estate
26	Integrated circuits	69	Transportation and postal services
27	Liquid crystal panels	70	Public administration
28	Flat panels/electron tubes	71	Education
29	Other electronic components	72	Medical care and welfare
30	Radio and television receivers	73	Membership-based associations, n.e.c.
31	Video equipment and digital cameras	74	Business service
32	Communication cables and optical fiber cables	75	Personal service
33	Office and business equipment	76	Office supplies
34	Electrical audio equipment and appliances	77	Not elsewhere classified
35	Information recording media		
36	Computer and related equipment leasing		
37	Office and business equipment leasing (excluding computers)		
38	Communication equipment and appliance leasing		
39	Advertising		
40	Printing, publishing, binding		
41	Film, theatre and entertainment places		
42	Telecom facilities construction		
43	Research		

References

Chapter 1

- MIC “Study Group on the Utilization of Metaverse Towards Web3 Era” materials

Chapter 2

- Ericsson “Ericsson Mobility Visualizer”
- Japan External Trade Organization (JETRO) (Aug. 2, 2022) “The data environment is now (worldwide) - A look at cross-border data flows, investment and trade rules”
- MIC (2020) “Survey Research on Consumer Awareness of the Data Distribution Environment”
- MIC (2023) “Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad”
- Medical Data Vision Co., Ltd. “AWS Utilization Cases of MDV with Largest RWD in Japan”
- SANDVNE “PHENOMENA (THE GLOBAL INTERNET PHENOMENA REPORT JANUARY 2023)”
- Statista “Most popular multi-platform web properties in the United States in July 2022, based on number of unique visitors”
- Security.org “The Data Big Tech Companies Have On You”
- Data provided by Statista
- Fair Trade Commission “Antimonopoly Act Approach Involving Abuse of Superior Status in Transactions between Digital Platform Operators and Consumers Providing Personal Information”
- Cabinet Secretariat, Headquarters for Digital Market Competition Secretariat “Digital Market Competition Conference” materials
- MIC (2023) “Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information”
- PwC Japan “Support for China's Cybersecurity Law, Data Security Law, and Personal Information Protection Law”
- JETRO “The New Act on the Protection of Personal Information Is to Be Enforced Starting November 1”
- Fujio Toriumi and Tatsuhiko Yamamoto (2022) “How to Face the Digital Space: Realizing Informational Health” (Nikkei Premium Series)
- Fujio Toriumi and Tatsuhiko Yamamoto (2022) “Toward a Sound Speech Platform - Digital Diet Statement Ver. 1.0”
- Cass R. Sunstein (2001) “Is the Internet the Enemy of Democracy?”
- MIC “Platform Service Study Group” materials
- MIC “Fiscal 2021 Survey on Disinformation Awareness in Japan and Other Countries”
- Shinichi Yamaguchi (2023) MIC “General Policy Committee” materials
- Shinichi Yamaguchi (2023) MIC “Platform Service Study Group” materials
- GLOCOM Innovation-Nippon Report (April 2022) “Understanding the Reality of False Information and Misinformation in Japan and Examining Social Countermeasures — Empirical Analysis of False Information and Misinformation Regarding Politics and Coronavirus Vaccines, etc.”
- MIC “Report on the Survey on the Current Status and Issues of Measures for Improving Media Information Literacy”
- NII (2023) “SYNTHETIQ VISION Used to Detect Deepfake Images - The First Practical Application in Japan to Automatically Determine the Authenticity of Fake Facial Images”
- McAfee Japan (2020) “McAfee Launches Deepfakes Lab to Eliminate Election Fakes”
- Microsoft “New Steps to Combat Misinformation”
- Originator Profile Collaborative Innovation Partnership (2023) “New Members Join Originator Profile Collaborative Innovation Partnership”
- UK Government (2022) “Guide to the Online Safety Bill”
- G7 “Digital Minister's Declaration” (2022)
- G7 “Resilient Democracies Statement” (2022)
- G7 “Digital and Tech Ministers' Declaration” (2023)
- OECD “Declaration on a 'Trusted, Sustainable and Inclusive Digital Future'” (2022)

Chapter 3

- MIC “Study Group on the Utilization of Metaverse Towards Web3 Era” materials
- MIC “Information and Communications Technology Strategy for Beyond 5G” (summary of interim report)
- METI “Industrial Structure Council, Economic and Industrial Policy Innovation Committee” materials
- Chiba Institute of Technology (2022) “Chiba Institute of Technology First in Japan to Use NFTs to Issue Certificate of Academic History at - Helping to Produce Global Human Resources in Anticipation of Web 3.0”
- Digital Agency “Web3.0 Study Group Report”
- Shiwa, Iwate Prefecture (2022) Digital Agency “Web3.0 Study Group” materials
- MIC (2023) “Survey Research on the Advancement of ICT Infrastructure and Distribution of Digital Data and Information”
- MIC “Study Group on the Utilization of Metaverse Towards Web3 Era” (interim summary)
- “Basic Policy on Economic and Fiscal Management and Reform 2022” (approved by the Cabinet on June 7, 2022)
- Intellectual Property Strategy Headquarters (2022) “Intellectual Property Promotion Plan 2022”
- Shanghai City (2022) “Shanghai Harnessing 'Digital Twin' Technology to Improve City Management”
- Microsoft (2023)“Confirmed: the new Bing runs on OpenAI’s GPT-4”
- SEQUOIA (2022)“ Generative AI: A Creative New World”
- National Telecommunications and Information Administration (2203) “AI Accountability Policy Request for Comment”
- JETRO (2023) “Biden Administration Announces New Measures To Promote Responsible AI Innovation”
- EU (2023)“EDPB resolves dispute on transfers by Meta and creates task force on Chat GPT”
- G7 “Digital and Tech Ministers' Declaration” (2023)

- G7 "Hiroshima Summit Communique" (2023)
- METI (2022) "Council of Experts on Economic Security Legislation and Review Committee on Core Infrastructure" materials
- MIC (2022) "Research Study on Ensuring the Economic Security of Digital Society"
- MIC (2022) "Study Group on Intercarrier Roaming in Emergency Situations" materials
- MIC (2022) "Study Group on Intercarrier Roaming in Emergency Situations" (first report)
- KDDI (2023) "New Easy-to-Use Auxiliary Line Service Now Available"
- SoftBank (2023) "SoftBank to Launch Auxiliary Line Service Compatible with au on April 12"
- Tokyo (2023) "Connected Tokyo - New Initiatives of the Connected Tokyo Promotion Division for Fiscal 2023"
- MIT Technology Review "How Many Weeks to Recover from the Tongan Eruption? Internet Vulnerabilities Revealed"
- Japan IGF "What is the IGF?"
- Yasuhiko Taniwaki (2022) "National Sovereignty and Cyber Sovereignty on the Internet"
- "WEAPONS OF CONTROL, SHIELDS OF IMPUNITY"
- "Declaration for the Future of the Internet" (2022)

Chapter 4

- Data provided by Statista
- Gartner press release (February 27, 2023) "Gartner Predicts 4.7% Growth in Enterprise IT Spending in Japan in 2023"
- MIC (2023) "Survey on Economic Analysis of ICT in Fiscal 2022"
- MIC "ICT Inter-Industry Table" (for each fiscal year)
- MIC "2022 Science and Technology Research Survey"
- MIC "Science and Technology Research Survey" for each fiscal year
- Center for Research and Development Strategy, Japan Science and Technology Agency "Comprehensive Report on Research and Development (2022)"
- MEXT National Institute of Science and Technology Policy "Science and Technology Indicators 2022"
- Japan Patent Office "Recent Trends in Business-Related Inventions"
- Japan Patent Office (2022) "Fiscal 2022 Summary of Results of Investigation of Applications for AI-Related Inventions"
- Ricoh Institute of Sustainability and Business (2022) "Data Center Energy Saving: What is Photoelectric Fusion?"
- MIC "2022 Basic Survey on the Information and Communications Industry"
- MIC "Information and Communications Statistics Database"
- MIC "Broadband Infrastructure Development Survey for End of Fiscal 2021"
- OECD Broadband statistics
- MIC (2023) "Results of Aggregating Internet Traffic in Japan (for November 2022)"
- MIC "Quarterly data on the Number and Share of Telecommunications Services Subscriptions (Third Quarter of Fiscal 2022 [End of December])"
- MIC "FY2022 Survey on Domestic-Overseas Price Difference of Telecommunication Service"
- MIC "Voice Communication Usage in Japan by Communication Volume (Fiscal 2021)"
- MIC "Telecommunications Service Accidents (Fiscal 2021)"
- MIC "Regular Meeting for Monitoring Consumer Protection Rules and ICT Service Reliability" materials
- IDC "Japan Virtual Client Computing Market Share" (July 6, 2022)
- GSMA(2023)"Industry moves to execute on open RAN potential"
- Orange (2023) "Major European operators accelerate progress on Open Ran maturity, security and energy efficiency"
- Vodafone "Vodafone's first Open RAN sites deliver better connectivity in busy seaside towns"
- Japan OTIC (2022) "Japan OTIC Established in Yokosuka as a Testing and Certification Site for Base Stations and Other Devices Based on International Standards Established by the O-RAN ALLIANCE"
- NTT DOCOMO (2023) "DOCOMO Now Supports Five Overseas Telecom Operators in Open RAN Efforts"
- Rakuten Group (fiscal 2022) financial results
- Nippon Telegraph and Telephone Corporation "NTT and SKY Perfect JSAT Reach Decision to Establish Space Compass, Inc."
- MIC "Income and Expenditures of Private Broadcasters" and NHK "Financial Statements" for each fiscal year
- Dentsu "Advertising Expenses in Japan"
- MIC "Income and Expenditures of Private Broadcasters" for each fiscal year
- MIC "Current State of Cable Television"
- Japan Electronics and Information Technology Industries Association materials, Japan Cable Laboratories materials, NHK materials, and MIC materials ("Current State of Satellite Broadcasting" and "Current State of Cable Television"
- MIC "Broadcast Suspension Accidents" (fiscal 2021)
- MIC Institute for Information and Communications Policy "Survey on Media/Software Production and Distribution"
- Dentsu Group "Global Advertisement Spend Growth Rate Forecast (2022-2025)"
- Dentsu "Knowledge & Data: Advertising Costs in Japan in 2022"
- MIC "Analysis of Current State of Overseas Expansion of Broadcast Content" (for each fiscal year)
- Data provided by Omdia
- METI "Production Dynamics Statistics Survey: Machine Statistics"
- Yano Research Institute Ltd., "Global Market of Mobile Phone Subscriptions and Shipment Volume: Key Research Findings 2022" , February 7, 2023
- CIAJ "Medium-Term Demand Forecast for Communications Devices [Fiscal 2022 to Fiscal 2027]"
- Fuji Chimera Research Institute, Inc. "5G/8K business future outlook survey 2022"
- JEITA "Domestic Shipments of Consumer Electronic Devices"

- Yano Research Institute Ltd., “The Market of HMDs (Head Mounted Displays) for XR (VR/AR/MR) and 360-Degree Videos: Key Research Findings 2021” , May 11, 2022
- UNCTAD “UNCTAD STAT”
- Wright Investors' Service, Inc “Corporate Information”
- IPA “DX White Paper 2023”
- MIC “Second Summary of the Platform Service Study Group”
- GEM Partners “Video Streaming (VOD) Market Five-Year Forecast (2023-2027) Report”
- Recording Industry Association of Japan “Japanese Recording Industry 2023”
- All Japan Magazine and Book Publisher's and Editor's Association, Research Institute for Scientific Publications (2023) “Monthly Publishing Report”
- Yano Research Institute Ltd., “Location and Geographic Information Service Market in Japan: Key Research Findings 2020” , November 5, 2020
- Yano Research Institute Ltd., “Indoor Positioning Solutions Market in Japan: Key Research Finding 2021” , January 7, 2022
- Yano Research Institute Ltd., “Metaverse Market in Japan: Key Research Findings 2022, September 21” , 2022
- IDC “Japan Datacenter Services Forecast” (August 29, 2022)
- Synergy “Virginia Still Has More Hyperscale Data Center Capacity Than Either Europe or China”
- IDC “Japan Public IT Cloud Services Forecast” (September 15, 2022)
- MM Research Institute “Survey on Domestic Cloud Service Demand Trends” (as of June 2022)
- MIC “Survey on Usage Trends”
- IDC “Japan Edge Infrastructure Forecast” (January 18, 2023)
- Deloitte Tohmatsu MIC Research Institute “Reality and Future Prospects of Edge AI Computing Market” (October 24, 2022)
- IDC “Japan Artificial Intelligence Systems Forecast” (April 27, 2023)
- Stanford University “Artificial Intelligence Index Report 2023”
- Thundermark Capital “AI Research Ranking 2022”
- IDC “China’s Artificial Intelligence Market Will Exceed US$26.7 Billion by 2026, According to IDC” (October 4, 2022)
- Canalys estimates
- Canalys “Strong channel sales propel the cybersecurity market to US$20 billion in Q4 2022”
- Canalys data
- IDC Japan, July 2022 “Japan IT Security Products Market Shares, 2021: External Threat Measures and Internal Threat Measures” (JPJ47880222)
- National Institute of Information and Communications Technology “NICTER Observation Report 2022”
- NPA, MIC, METI “Unauthorized Access Activities and Status of Research and Development of Access Control Technology”
- MIC “Fiscal 2022 Result of Survey on Wireless LAN User Attitudes”
- MIC (2023) “Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad”
- MIC “Survey on Household Income and Expenditures” (total households)
- MIC Institute for Information and Communications Policy “Fiscal 2022 Survey on Information and Communications Media Usage Time and Information Behavior”
- FactCheck Initiative “Questionable Discourse Database (ClaimMonitor)”
- MIC “Fiscal 2022 Result of Survey on Actual Condition of Telework Security”
- Digital Agency “Overview of Results of Administrative Procedure Inventory”
- UN e-Government Surveys
- Waseda University Institute of d-Government “World Digital Government Ranking”
- MIC “Fiscal 2022 Online Usage of Administrative Procedures by Local Governments”
- MIC “Overview of Promotion of DX and Use of Information by Local Governments: Summary of Fiscal 2022 Survey on Promotion of Use of Administrative Information by Local Governments”
- MIC “Individual Number Card Delivery Status”
- Digital Agency “Policy Data Dashboard (Beta)”
- MIC “Promotion of AI/RPA Usage by Local Governments”
- MIC “Survey on Remote Work Initiatives by Local Governments”
- Japan Post Group “Financial Results for the Period Ending March 2023”
- Japan Post Group “Disclosure Report”
- Japan Post Holdings Co., Ltd. “Overview of Financial Results”
- Japan Post Holdings Co., Ltd. “Postal Service Income and Expenditures”
- Japan Post “Information on Number of Post Offices <Open Data>”
- Japan Post “Number of Accepted Postal Matters” for each fiscal year
- Japan Post Bank Securities Report
- Japan Post Insurance Securities Report

Chapter 5

- MIC “Direction of ICT policy toward 2030” (first report)
- MIC “Direction of ICT policy toward 2030” (final report)
- MIC (2023) “Telecommunications Accident Verification Conference Notification and Contact Organization Working Group” (summary)
- MIC (2022) “Summary of the Future of Broadcasting in the Digital Age”
- “Cybersecurity Strategy” (2021)
- Cybersecurity Strategic Headquarters (2022) “Action Plan on Information Security of Critical Infrastructure”
- Digital Agency (2022) “Sub-working Group for Trust-Assured Digital Transformation” report
- Tokyo Shoko Research (2022) “The 22nd 'COVID-19 Questionnaire' Survey”

- “Joint Principles of the Japan-U.S.-Australia-India Cybersecurity Partnership” (2022)
- IHS Markit materials
- JST Center for Low-Carbon Society Strategies (2021) “Proposal for Establishing Policy to Achieve a Low-Carbon Society: Impact of Advances in Information Society on Energy Consumption (Vol. 3)”
- Map data © 2022 Google