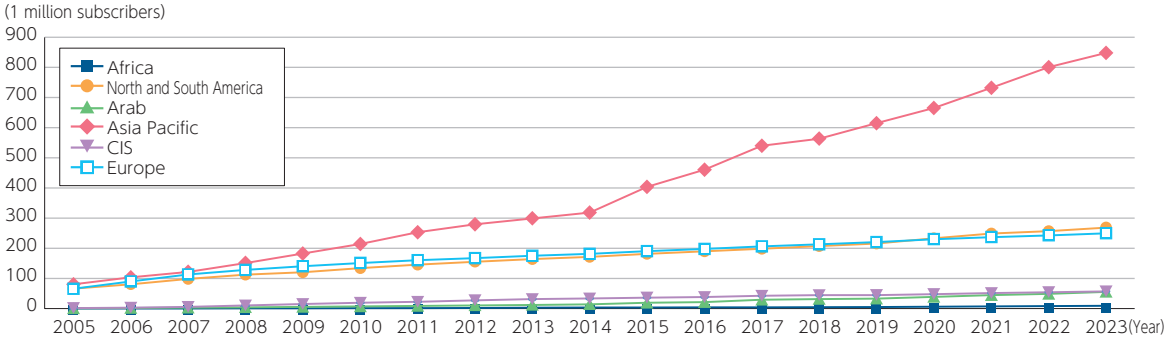
Section 2 Trends in the telecommunication field

1. Trends in the domestic and overseas telecommunications market

The number of fixed broadband service subscriptions worldwide[1] has been on the rise since 2005 in all regions **(Figure 2-1-2-1)**. Particularly, the Asia-Pacific region has seen a significant increase since 2015, surpassing 850 million in 2023, with an average annual growth rate of 14.0% from 2005 to 2023. The second-largest number of subscribers is in North and South America, with an average annual growth rate of 8.1%, followed by Europe with 7.7%.

The number of mobile phone subscriptions[2] has also been increasing in all regions. The Asia-Pacific region has the highest number of subscriptions, reaching 4.93 billion in 2023, with an average annual growth rate of 10.4% from 2005 to 2023. Following this, the regions with the most subscribers in descending order are North and South America (5.2% annual growth rate), Africa (15.0%), Europe (2.1%), the Arab region (10.2%), and the CIS (5.7%), with Africa experiencing the most rapid expansion in mobile phone subscriptions **(Figure 2-1-2-2)**.

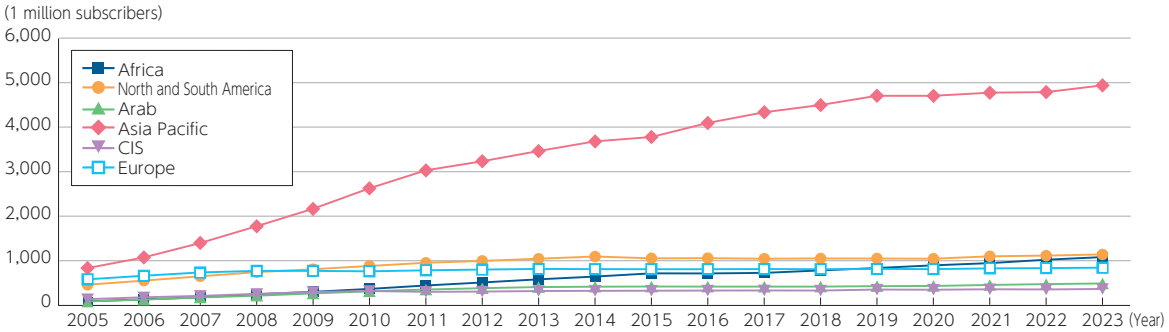
Figure 2-1-2-1 Changes in the number of fixed broadband service subscriptions (by region)



* ITU statistics. Fixed-broadband subscriptions are listed. Fixed broadband refers to high-speed connections that provide a transmission speed of 256kbps or higher in either the upstream or downstream direction, or both. High-speed connections include cable modems, DSL, fiber optics, satellite communications, fixed wireless access, and WiMAX, but do not include the number of data communication contracts using mobile networks (cellular systems).

(Source) ITU[3]

Figure 2-1-2-2 Changes in the number of mobile phone subscriptions (by region)



* ITU statistics. Mobile-cellular subscriptions are listed. The number of contracts includes postpaid and prepaid contracts. However, in the case of prepaid contracts, only those used for a certain period (e.g., 3 months) are included. Data cards and USB modems are not included.

(Source) ITU[4]

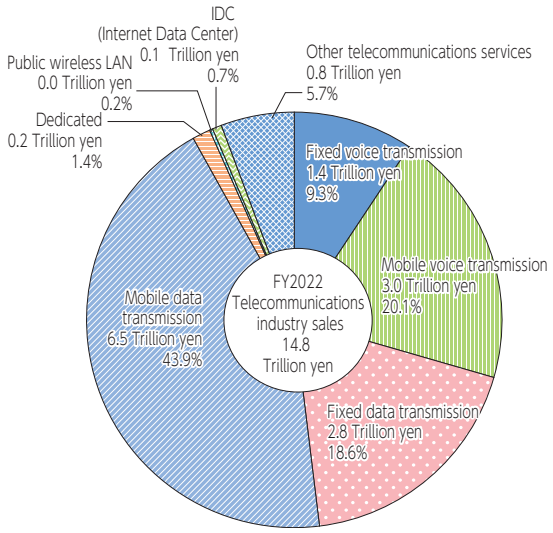
[1] Statistics from the ITU. Fixed-broadband subscriptions are shown. Fixed broadband refers to high-speed lines providing a communication speed of 256 kbps or faster for either or both uplink and downlink. High-speed lines include cable modems, DSL, optical fiber and satellite communications, fixed wireless access and WiMAX, etc., but do not include mobile network (cellular system) based data communications subscriptions.
[2] Statistics from the 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] https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx
[4] https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx

2. Current status of the telecommunications field in Japan

(1) Market size

The total revenue of the telecommunications industry for FY2022 is estimated to be approximately 15 trillion yen. Breaking it down, data transmission (both fixed and mobile) accounts for about 9.3 trillion yen (62.4%), and voice transmission (both fixed and mobile) accounts for about 4.4 trillion yen (29.5%) **(Figure 2-1-2-3)**.

Figure 2-1-2-3 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 MIC "2023 Basic Survey on the Information and Communications Industry"[5]

(2) Number of carriers

As of the end of FY2023, the number of telecommunications carriers is 25,534 (338 registered carriers and 25,196 notified carriers), continuing the increasing trend from the previous year **(Figure 2-1-2-4)**.

Figure 2-1-2-4 Changes in the number of telecommunications carriers

End of FY	2016	2017	2018	2019	2020	2021	2022	2023
Number of telecommunication carriers	18,177	19,079	19,818	20,947	21,913	23,111	24,272	25,534

(Source) Information and Communications Statistics Database[6]

(3) Infrastructure development status

As of the end of March 2023, the national coverage rate for fiber optic broadband services (household coverage rate) is 99.84% **(Figure 2-1-2-5)**.

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

Figure 2-1-2-5 Fiber optic broadband service coverage rate in Japan as of March 31, 2023 (estimated)

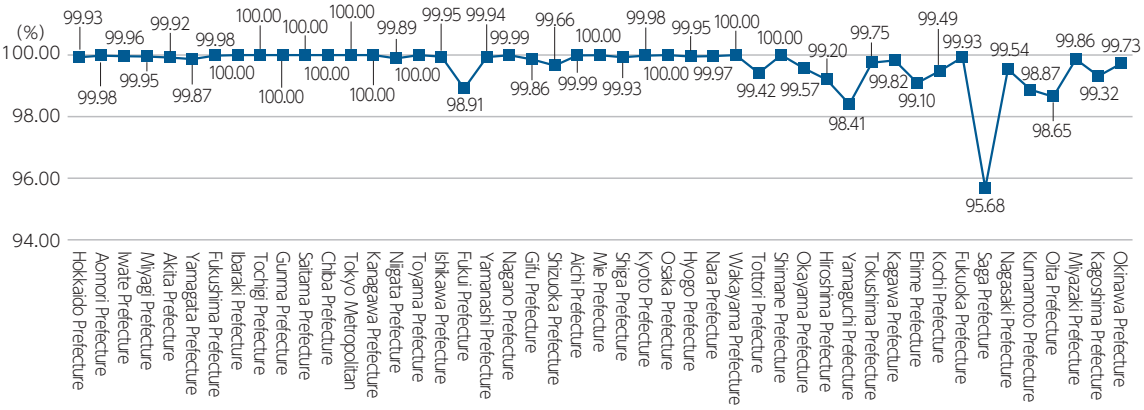
Nationwide fiber optic broadband service coverage rate

End of March 2023 **99.84%**

(Approximately100,000 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).

Fiber optic broadband service coverage rate by prefecture



(Source) Survey on Broadband Infrastructure Coverage Rate at End of FY2022[7]

According to the OECD, as of June 2023, the proportion of fiber optics in Japan's fixed broadband is the second highest among member countries, indicating that Japan's digital infrastructure is highly developed on an international scale.

Figure (related data) Percentage of optical fiber in fixed broadband in the OECD member countries
Source: OECD Broadband statistics. 1.10. Percentage of fibre connections in total fixed broadband, June 2023
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00141
(Data collection)

Additionally, as of the end of March 2023, the nationwide 5G population coverage rate in Japan is 96.6%, and all prefectures have exceeded 80% **(Figure 2-1-2-6)**.

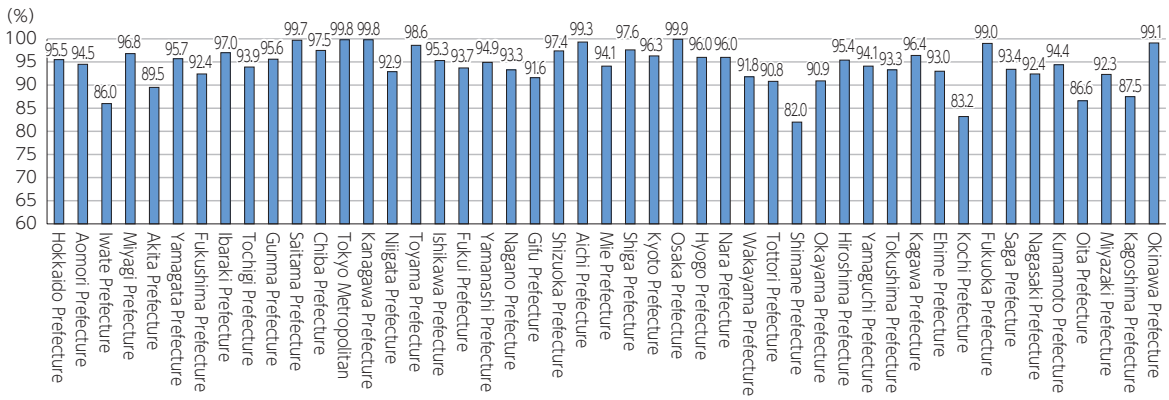
Figure 2-1-2-6 Japan's 5G coverage as percentage of population (as of end of March 2023)

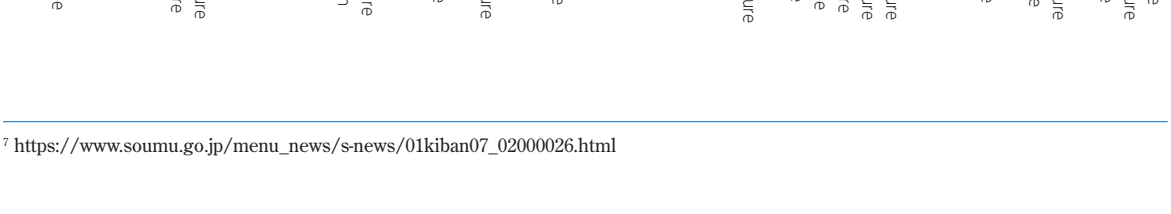
Population coverage rate of 5G nationwide (the end of March 2023)

96.6% (the end of March 2022 93.2%)

※Numbers that overlap the area coverage of four mobile carriers. Round off to the second decimal place.

Population coverage rate of 5G by prefecture (the end of March 2023)



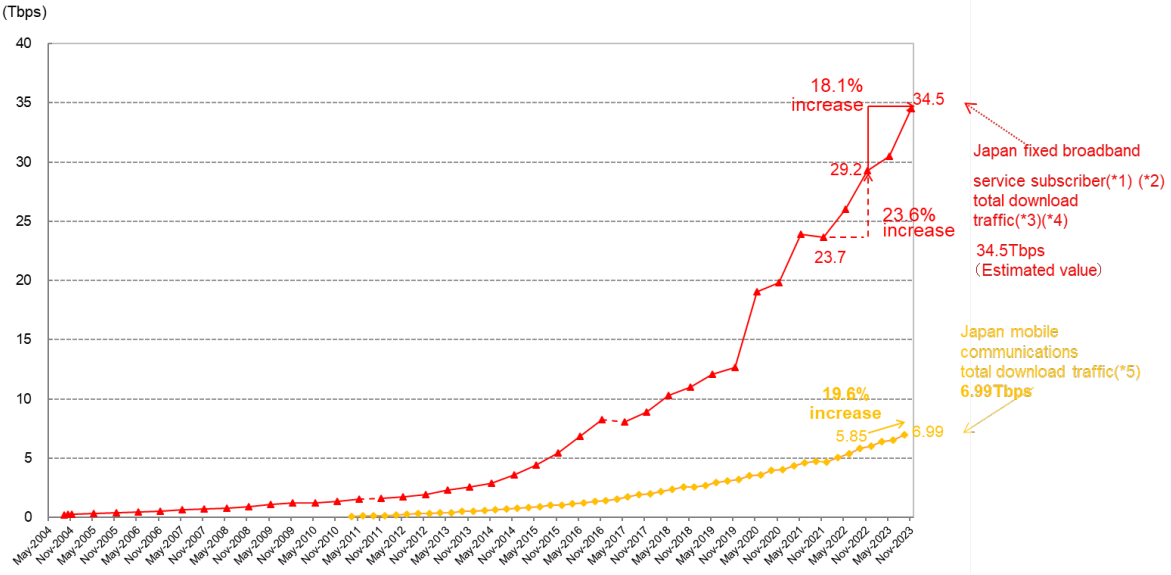


[7] https://www.soumu.go.jp/menu_news/s-news/01kiban07_02000026.html

(4) The status of traffic

The total download traffic of fixed broadband service subscribers in our country experienced a sharp increase after the outbreak of the COVID-19 pandemic. Subsequently, despite fluctuations in growth rates, it has generally continued to increase, reaching an 18.1% increase compared to the same month of the previous year as of November 2023. The total download traffic for mobile communication also continues to increase, with a 19.6% increase compared to the same month of the previous year as of November 2023 **(Figure 2-1-2-7)**.

Figure 2-1-2-7 Change in Internet traffic (fixed/mobile systems, download traffic)



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

*2 Including some corporations

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

*4 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

*5 From "MIC Current State of Mobile Communications Traffic in Japan (Sept 2023)" (measured in March, June, Sept, and Dec)

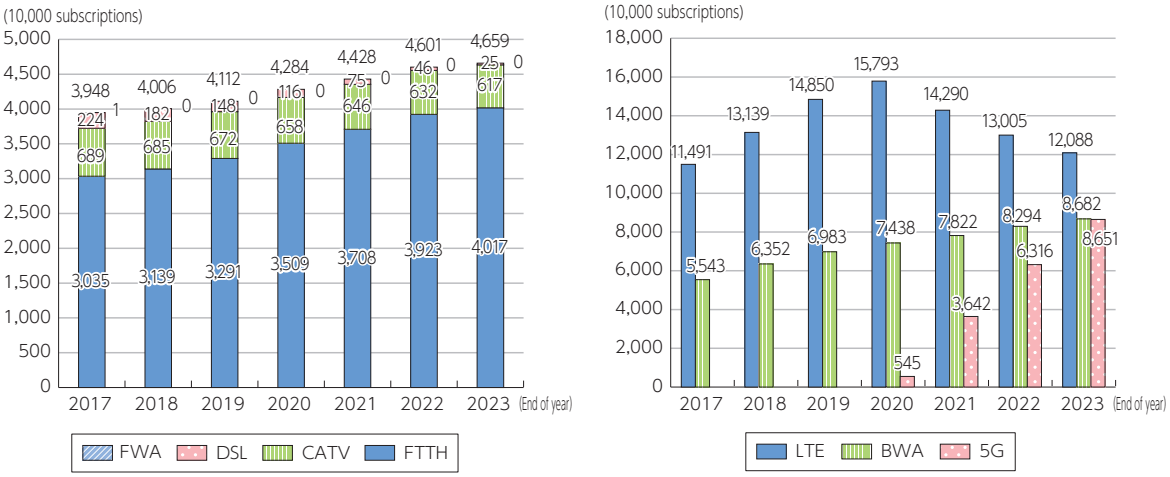
(Source) MIC (2024) "Results of Aggregating Internet Traffic in Japan (for November 2023) "[8]

(5) The status of use of broadband

As of the end of December 2023, the number of fixed broadband subscriptions[9] was 46.59 million (a 1.3% increase from the same period of the previous year). Among the subscriptions for mobile ultra-high-speed broadband[10], the number of 3.9-4th generation mobile phones (LTE) was 120.88 million (a 7.1% decrease from the same period of the previous year), 5th generation mobile phones was 86.51 million (an increase of 23.35 million from the same period of the previous year), and BWA was 86.82 million (a 4.7% increase from the same period of the previous year) **(Figure 2-1-2-8)**.

[8] https://www.soumu.go.jp/main_content/000929698.pdf
[9] The number of fixed-line broadband subscription is the sum of the FTTH, CATV (limited to coaxial, HFC), DSL and FWA subscriptions.
[10] This is the number of LTE, BWA and 5G subscriptions, and does not include 3G or PHS subscriptions.

Figure 2-1-2-8 Changes in the number of broadband subscriptions



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

(Source) Prepared based on MIC "Publication of Quarterly Data on the Number of Subscriptions and Share of Telecommunications Services (Q3 of FY2023 (End of December))"[11]

(6) Satellite communications

Satellite communications utilize both geostationary satellites[12] and non-geostationary satellites[13] to provide communication infrastructure in remote islands, mountainous areas, and for communication with ships and aircraft, and during emergencies such as natural disasters, making use of advantages such as wide area coverage, simultaneous communications and disaster resistance.

Figure (related data) Major geostationary satellites used as communication services in Japan (as of end of FY2023)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00149
(Data collection)

Figure (related data) Major non-geostationary satellites used as communication services in Japan (as of end of FY2023)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00150
(Data collection)

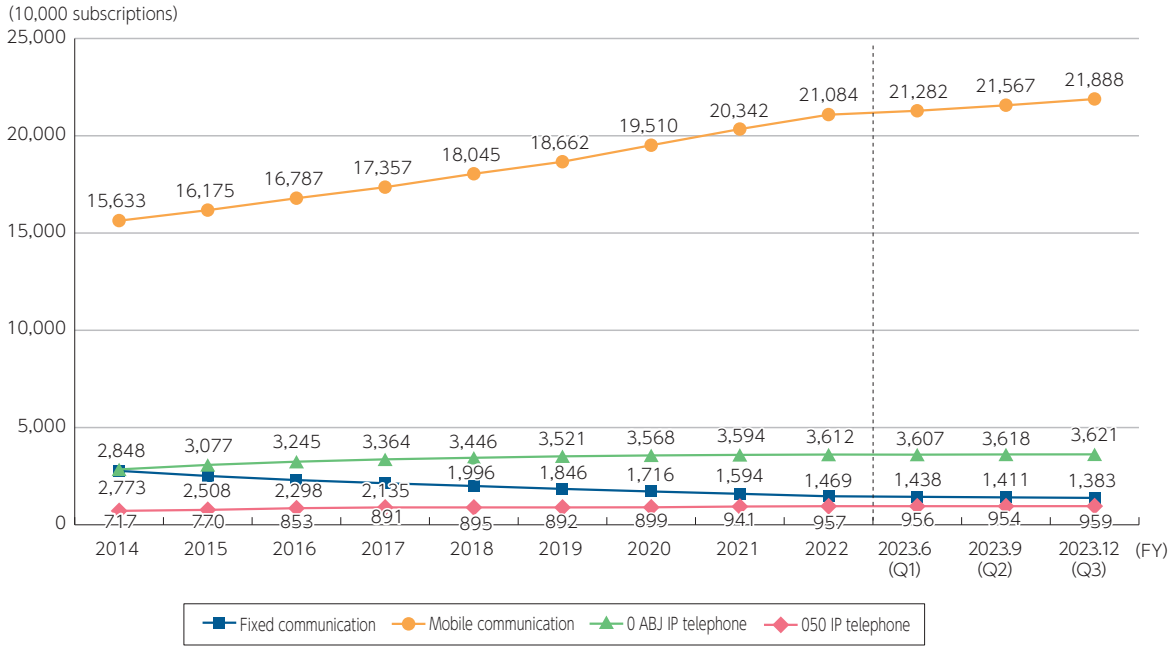
(7) Status of voice communication service subscription contracts

As for the status of voice communication service subscription contracts, the number of fixed communication contracts (including NTT East/West subscribed telephone services (including ISDN), non-NTT telephone service[14], and CATV telephone services, excluding 0ABJ type IP phone services) has been declining in recent years, while the number of mobile communications contracts (mobile phones, PHS, and BWA) and 0ABJ- IP phone services has been showing steady growth. As of the end of December 2023, the number of mobile communication contracts is approximately 15.8 times that of fixed communication contracts **(Figure 2-1-2-9)**.

Furthermore, as of the end of December 2023, the market share of mobile communication contracts by operator is as follows: NTT DOCOMO at 34.9% (a decrease of 1.2 percentage points from the same period of the previous year, including those provided to MVNO, the share becomes 40.7%), KDDI Group at 26.8% (a decrease of 0.2 percentage points, 30.5%), SoftBank at 20.4% (a decrease of 0.5 percentage points, 25.9%), Rakuten Mobile at 2.6% (an increase of 0.4 percentage points), and MVNO at 15.2% (an increase of 1.4 percentage points) **(Figure 2-1-2-10)**.

[11] https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000238.html
[12] An artificial satellite that orbits the Earth at an altitude of approximately 36,000 kilometers above the equator, synchronized with the Earth's rotation. With three satellites, it is possible to cover the entire Earth except for the polar regions.
[13] These satellites orbit at lower altitudes than geostationary satellites. Due to their lower orbit, they have lower transmission delays compared to geostationary satellites, enabling high-speed, high-capacity communication, and also allowing communication in polar regions. However, because the satellites move across the sky in a short period of time, simultaneous operation of a large number of satellites is required.
[14] Non-NTT telephone services are subscribed telephone services by telecommunications carries other than NTT East/West and includes direct subscriber telephone, ISDN services, new-type non-NTT telephone and ISDN services.

Figure 2-1-2-9 Changes in the number of subscriptions to voice communications services



*1 For FY2023, data up to the end of December was used, so care must be taken when comparing over time.

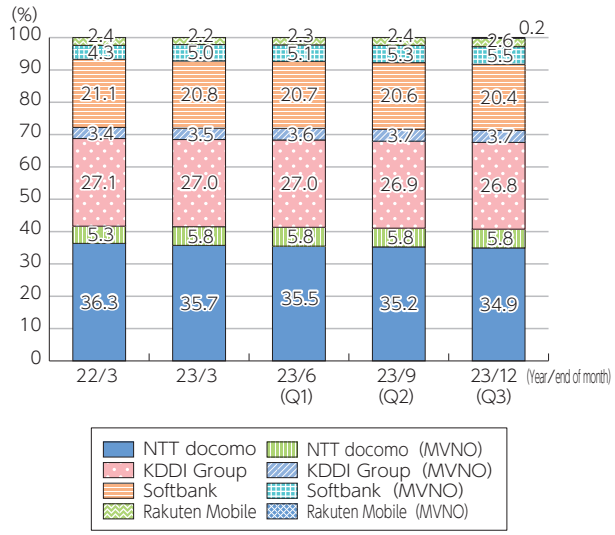
*2 Mobile communications is the sum of mobile phones, PHS and BWA.

*3 The number of mobile communication subscriptions, unless otherwise specified, refers to the figures "after intra-group transaction adjustments." "After intra-group transaction adjustments" means that when an MNO provides mobile phone or BWA services received from another MNO within the same group in the capacity of an MVNO, along with its own services, it is counted as one subscription instead of two.

*4 The reporting of MVNO service-specific subscription numbers was added from the fourth quarter of the FY2015, resulting in differences in the calculation method for the adjusted subscription numbers before the fourth quarter of the FY2014 and after the fourth quarter of the FY2015.

(Source) Prepared based on MIC "Publication of Quarterly Data on the Number of Subscriptions and Share of Telecommunications Services (Q3 of FY2023 (End of December)) "

Figure 2-1-2-10 Changes in share of mobile communications subscriptions (adjusted for intra-group transactions) by operator



*1 "After intra-group transaction adjustments" mea ns that when an MNO provides mobile phone or BWA services received from another MNO within the same group in the capacity of an MVNO, along with its own services, it is counted as one subscription instead of two.

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

*3 The share of MVNO 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 (MVNO) and KDDI Group (MVNO).

(Source) Prepared based on MIC "Publication of Quarterly Data on the Number of Subscriptions and Share of Telecommunications Services (Q3 of FY2023 (End of December)) "

(8) International comparison of communication charges

When comparing communication charges in Tokyo (Japan), New York (the U.S.), London (the UK), Paris (France), Dusseldorf (Germany), and Seoul (the Republic of Korea) as of March 2024, the smartphone (4G, for the leading MNO, for new contracts) fees in Tokyo are at a median level.

The fees for fixed-line telephones, including basic fees and the cost of a 3-minute local call at 12:00 on weekdays, are also at a median level.

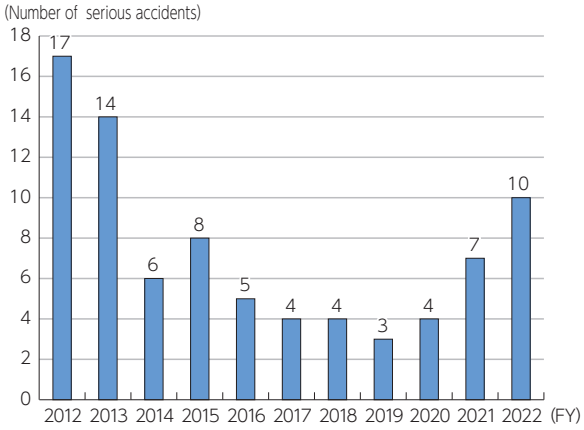
Figure (related data) International comparison of mobile phone charges by mode (FY2023)
Source: MIC "FY2023 Survey on Domestic-Overseas Price Difference of Telecommunication Service"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00161
(Data collection)

Figure (related data) International comparison of fixed telephone charges based on individual charges (FY2023)
Source: MIC "FY2023 Survey on Domestic-Overseas Price Difference of Telecommunication Service"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00162
(Data collection)

(9) Status of occurrence of telecommunications service accidents

In FY2022, there were 7,500 reported accidents requiring quarterly reports, of which 10 were classified as serious accidents[15]. This represents an increasing trend since FY2019 **(Figure 2-1-2-11)**.

Figure 2-1-2-11 Changes in the number of serious accidents



(Source) MIC "Accidents in Telecommunications Services (FY2022) "[16]

(10) Complaints and consultations regarding telecommunications services and consultations on illegal and harmful information

A Complaints and Consultations Regarding Telecommunications Services

In FY2023, the number of complaints and consultations regarding telecommunications services received by the MIC was 13,348, which represents a decrease from the previous fiscal year **(Figure 2-1-2-12)**. Additionally, when looking at the content of complaints and consultations received by consumer centers nationwide and the MIC by service type, those related to "MNO services" were the highest **(Figure 2-1-2-13)**.

[15] Accidents falling under the 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."

[16] https://www.soumu.go.jp/menu_news/s-news/01kiban05_02000302.html
* Number of reports from business operators. With regard to serious accidents, from FY2008, a decline in the quality of a telecommunications service is also classified as a serious accident, and from FY2015, 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 2-1-2-12 Changes in the number of complaints and inquiries received by the MIC

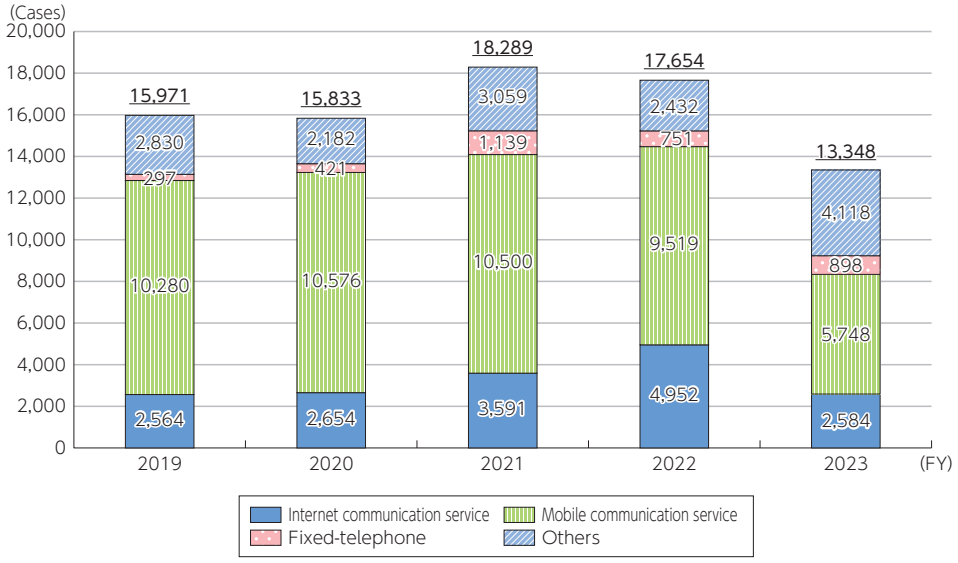
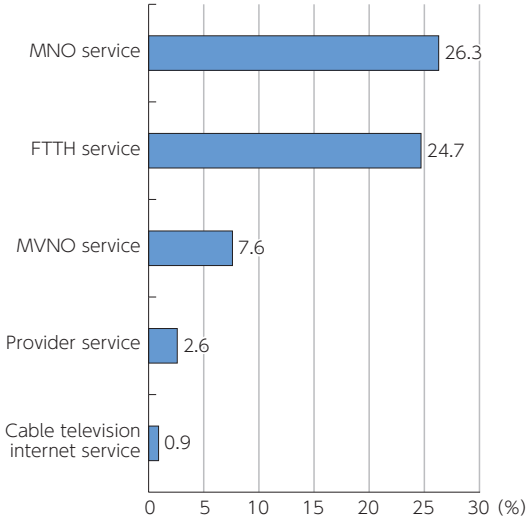


Figure 2-1-2-13 Breakdown of complaints and consultations received by consumer centers nationwide and the MIC (random sample of those received between April 2022 and March 2023)



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

(Source) MIC "Regular Monitoring Meetings on the Implementation Status of Consumer Protection Rules (15th meeting) "

B Consultations on illegal and harmful information

The number of consultations received by the Illegal and Harmful Information Consultation Center, which is operated under the commission of the MIC, has remained high, with 6,463 consultations in FY2023 **(Figure 2-1-2-14)**. The top five companies for the number of consultations in FY2023 were X (formerly Twitter), Google, Meta, LINE Yahoo, and 5ch **(Figure 2-1-2-15)**.

Figure 2-1-2-14 Changes in the number of consultations regarding illegal and harmful information

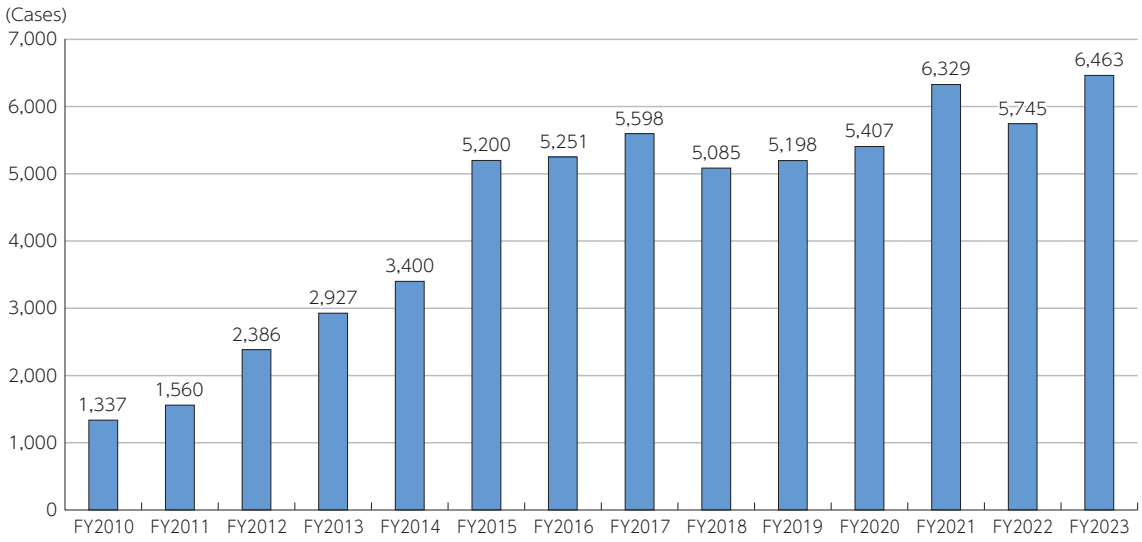
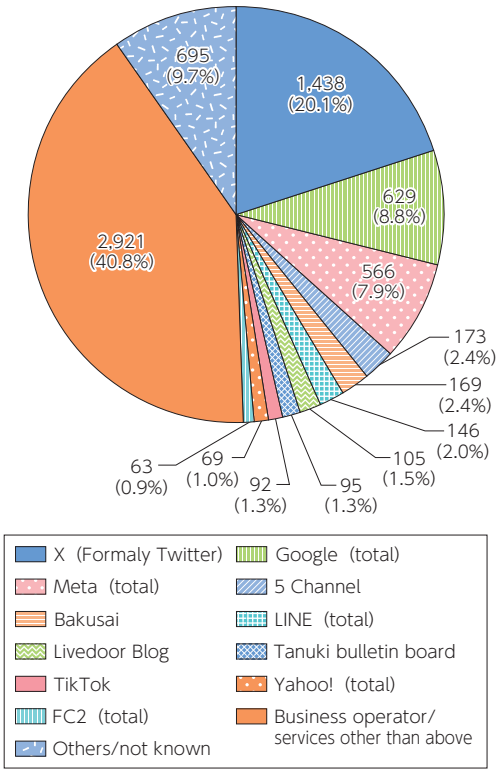


Figure 2-1-2-15 Breakdown of the number of consultations provided at the Illegal Harmful Hotline by business operator

* Breakdown of the number of consultations (work): By business operator/service (n=7,161) <FY2023> * Number of consultations (work): 6,463 cases



Business operator, service, etc.		Number of requests	Percentage
X (Formaly Twitter)		1,438	20.1%
Google (total)		629	8.8%
	Search	230	
	map	204	
	YouTube	164	
	Others	31	
Meta (total)		566	7.9%
	Instagram	422	
	Facebook	139	
	Whatsapp	5	
5 Channel		173	2.4%
Bakusai		169	2.4%
LINE Yahoo!* (total)		215	3.0%
	LINE (total)	146	2.0%
	Yahoo! (total)	69	1.0%
	Yahoo! search	18	
	Yahoo! (Others)	51	
Livedoor Blog		105	1.5%
Tanuki bulletin board		95	1.3%
TikTok		92	1.3%
FC2 (total)		63	0.9%
Business operator/services other than above		2,921	40.8%
Others/not known		695	9.7%

* "LINE Yahoo! (total)" is the sum of the number of "LINE (total)" and "Yahoo! (total)" including the one before merger of LINE and Yahoo! on October 1, 2023.

*1 It is a total number of consultations (work), and counseling centers do not determine whether or not individual consultations constitute a violation of rights.

*2 The number of work (6,463 cases) and the total number of graph above (7,161 cases) are not coincident because there is a case in which multiple services are answered.

*3 It is not strictly compiled statistical information because there are cases where the same service is answered multiple times.

*4 Some use their own domains, so the actual domain may not be known.

3. New trends in the communications field

(1) Web3

Web3 refers to a decentralized network environment or the concept of the internet based on blockchain technology. It is also used as a general term for technologies such as blockchain and NFTs. According to A.T. Kearney, the global Web3 market is expected to grow from 5 trillion yen in 2021 to 67 trillion yen in 2027, approximately 13 times larger. The domestic market is expected to grow from about 0.1 trillion yen in 2021 to about 2.4 trillion yen in 2027, more than 20 times larger.

The market size here refers to revenue from Web3-related businesses, including: (1) protocols (businesses utilizing blockchain infrastructure itself, transaction fees for cryptocurrencies, etc.); (2) applications (businesses utilizing blockchain, in-game purchases in blockchain games, etc.); and (3) content and IP (value of brands and animations attached to protocols and applications, blockchain games using NBA trading cards, etc.). Regarding the practical application of Web3, the number of large companies utilizing NFTs is increasing, with Asics selling NFT shoes, for example[17].

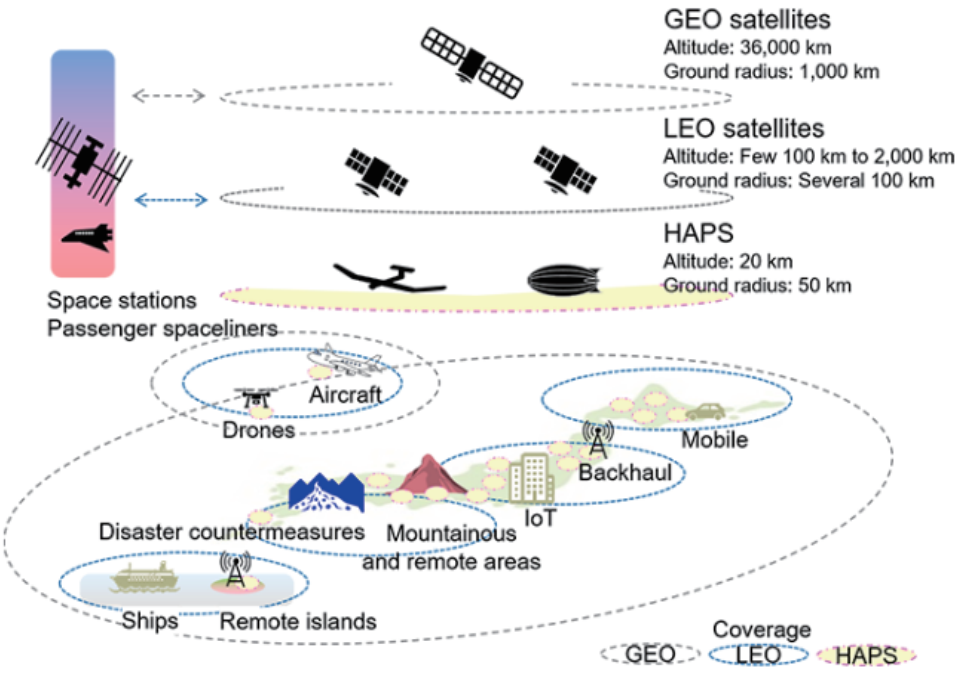
Figure (related data) Size of market related to Web3
Source: Prepared based on the A.T. Kearney "Dramatically Changing Web3 Market"[18]
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00171
(Data collection)

(2) NTN (Non-Terrestrial Network)

Non-Terrestrial Network (NTN) refers to a multi-layered network that connects not only the ground but also the sea, sky, and space, using HAPS (High Altitude Platform Station) and satellite communications. This allows for seamless communication services even in areas where communication infrastructure is not developed **(Figure 2-1-2-16)**.

NTN is also expected to be utilized for expanding 5G coverage, with the 5G NTN market size predicted to grow from 4.9 billion dollars in 2023 to 8.8 billion dollars in 2026 **(Figure 2-1-2-17)**.

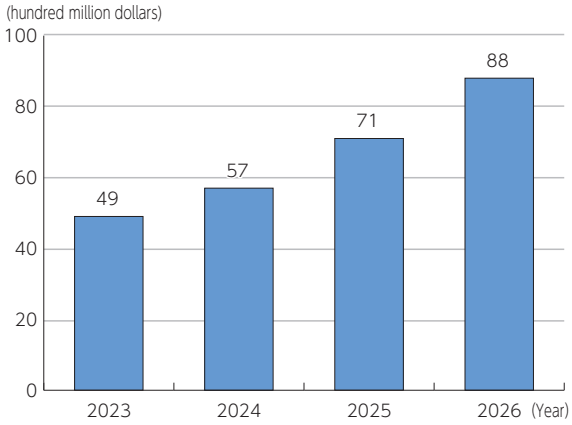
Figure 2-1-2-16 Image of provision of communication service by satellite and HAPS



(Source) NTT docomo[19]

[17] https://corp.asics.com/jp/press/article/2021-07-13-1
[18] https://www.jp.kearney.com/issue-papers-perspectives/web3-market-growth-scenario
[19] https://www.docomo.ne.jp/info/news_release/2022/01/17_01.html

Figure 2-1-2-17 Estimated global market size of 5G NTN



(Source) TrendForce[20]

Regarding HAPS, preparations such as the development of wireless equipment and aircraft are being made by mobile phone operators for its introduction as a mobile phone base station, with practical services expected to start in 2026.

In terms of satellite communications, the provision of communication services through "Satellite Constellations" that operate numerous non-geostationary satellites integrally is becoming active, especially among Western companies. For example, SpaceX's satellite communication service "Starlink" enables high-speed, large-capacity communication and has over 3 million users worldwide as of May 2024. Japanese companies are developing domestic services through investments and business partnerships with these companies. Additionally, with the increase in communication speed, satellite communications are being used for broadband services and as backhaul for mobile base stations.

Figure (related data) Change in speed of "Starlink"
Source: IIJ Engineers Blog (IIJ)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00174
(Data collection)

[20] https://www.trendforce.com/presscenter/news/20230413-11642.html