November 30, 2010

Mizuho Industry Focus Vol. 91

Introduction and Expansion of Infrastructure Sharing among Japan's Mobile Network Operators
- Will infrastructure sharing be the key to cost cuts in a saturated market? -

Takeshi Onishi
takeshi.ohnishi@mizuho-cb.co.jp
+81 3-5222-5147

Yoshiki Tsuna
yoshiki.tsuna@mizuho-cb.co.jp
+81 3-5252-6021

(Executive Summary)

- Accompanying the spread of plans and increase in penetration, Japan's mobile communications market revenues are fast approaching their peak. However, mobile communications traffic continues to grow exponentially, and concerns exist regarding future network cost increases. As mobile network operators (MNO) face pressures to make investments to strengthen mobile infrastructure with installation of additional BTS and make the shift to next generation standards, they are facing the harsh reality of seeing no broad returns on such additional investments.
- Going forward, while monetizing increasing traffic is an issue for MNO, it is also important for management to streamline on the cost side. Above all, because of its substantial cost reduction effects, infrastructure sharing merits serious consideration.
- Overseas there are many examples of infrastructure sharing in the US, European and Indian markets. Specifically, the various MNO are realizing network cost reductions by promoting cooperative construction of infrastructure between multiple companies, shared facilities usage between companies that own individual infrastructure, and other methods.
- In Japan until now, due to i) the fact that Japan's land area is small compared to other countries and ii) the number of carriers is limited, iii) with the evolution of alternate methods to respond to increased traffic and iv) a focus on carrier network construction as the core competence, infrastructure sharing is currently not progressing.
- Regarding infrastructure sharing in Japan going forward, because benefits for fixed network offloading are in the lead it is thought that infrastructure sharing in the short term will be difficult, but as pressures to reduce network costs gradually increase in the mid to long term, it is expected that infrastructure sharing will occur with the distribution of 700/900MHz frequencies and BTS construction after the introduction of 4G.
- Strengthening of overseas operations will be demanded from Japanese MNO in order to further develop the Japanese telecommunications industry. In order to realize this, improvement of profitability through promoting industry wide efficient network construction and achieving industry wide network cost reductions is an immediate task. It is desirable to count on infrastructure sharing as an effective measure for Japanese domestic MNO's network creation.

Mizuho Corporate Bank, Ltd.
Industry Research Division

Contents

Introduction and Expansion of Infrastructure Sharing among Japan's Mobile Network Operators

− Will infrastructure sharing be the key to cost cuts in a saturated market? −

Chapter 1: Introduction

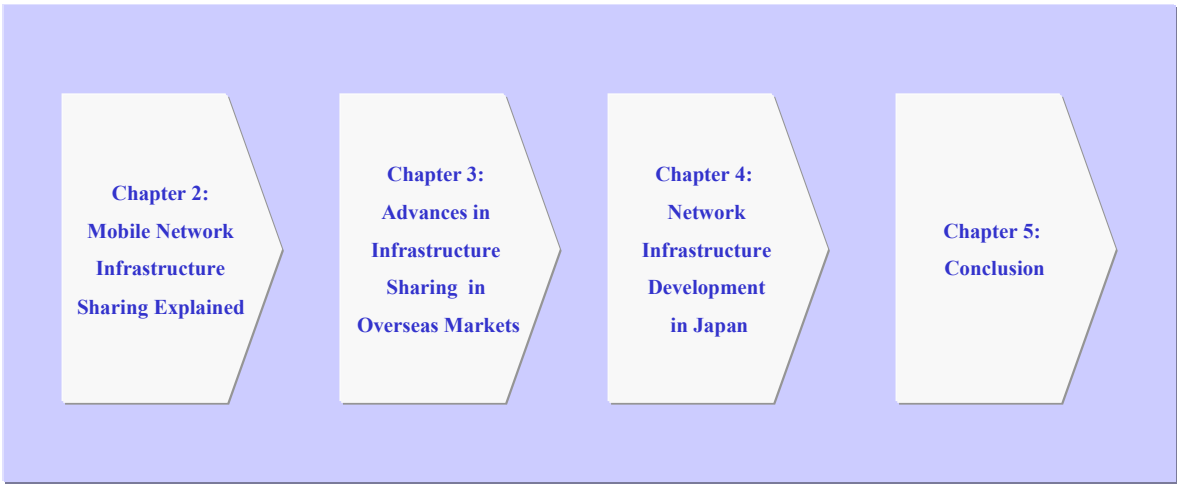
The issue: Rapid increase in mobile communications traffic volume

Although due to the popularization of and increase in number of subscribers to flat-rate plans, Japan's mobile communications market revenues are fast approaching their peak, mobile communications traffic continues to grow exponentially, the rate approximately doubling yearly. Japan's mobile network operators (MNO) face a difficult challenge. The top layer (functional application layer) and overseas markets offer opportunities for additional growth. However, while the spread of the flat-rate system in the domestic market means that additional investment offers no prospect for increasing revenues, MNO are under pressure to invest in next generation standards and additional base transceiver stations.

Cost measures will become more important due to limited scope for profit growth in the domestic market. Infrastructure sharing is one option for reducing costs.

Looking ahead, while the challenge will be to monetize the rapidly increasing traffic, increasing cost efficiency is expected to become another key task for business management. Network-related expenses account for a substantial proportion of MNO costs, and infrastructure sharing (joint ownership/usage) is considered an option because it offers substantial opportunities to reduce costs.

This chapter provides a detailed explanation of the issues outlined above, while the following chapter addresses the concept of infrastructure sharing. Chapter 3 takes a look at the trends in foreign markets where network infrastructure sharing is gaining ground. Chapter 4 examines the current state of network infrastructure development among Japan's MNO. Chapter 5 concludes the prospects for the introduction and expansion of infrastructure sharing in Japan.

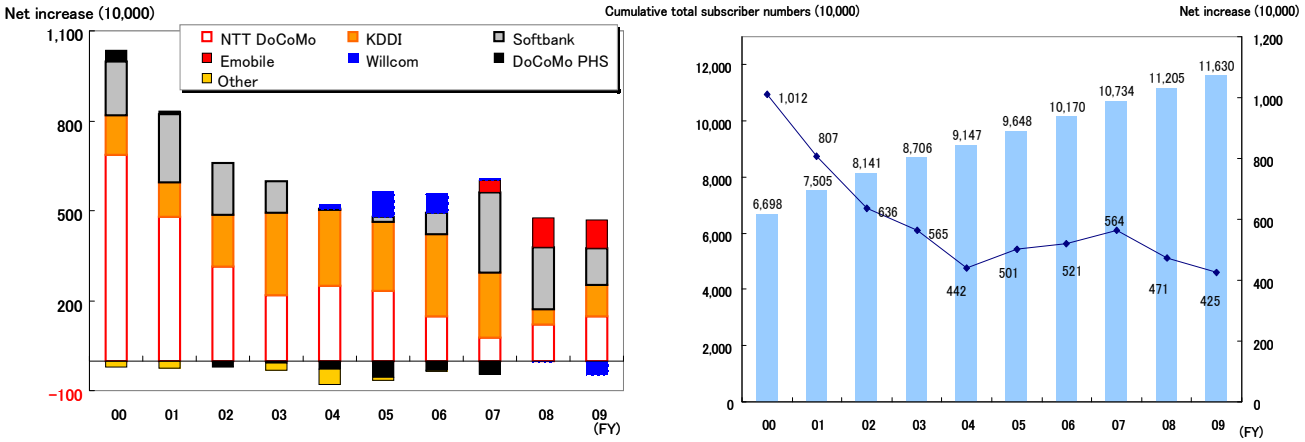


MNO revenues topping out due to falling unit prices and sluggish subscriber growth

MNO revenues have been leveling off in recent years. Simply, the revenue from telecommunications, the core business, can be expressed as (1) average revenue

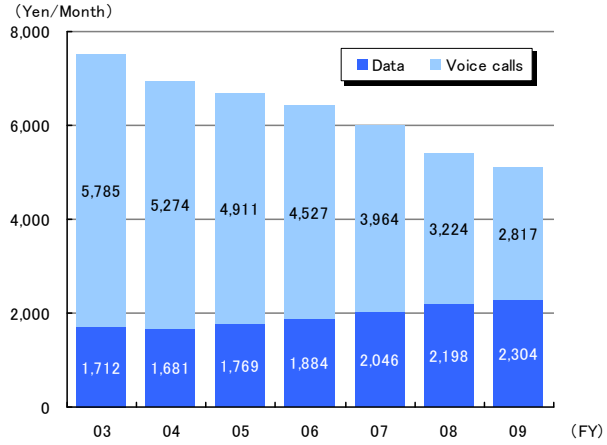
per user (ARPU, i.e. "units") multiplied by (2) the number of subscribers. Some "units" (1) are showing signs of bottoming out, but the general trend in ARPU to date has been downward. Looking ahead, while data ARPU is expected to increase[1] as data traffic consumption among data packet subscribers grows, the introduction of the fixed-rate system means that the prospects for exponential growth are limited. With the exception of data cards and M2M (machine-to-machine) communications, growth in subscriber numbers, or "quantity" (2), is slowing as the market reaches the saturation point (see Figs. 1–3).

[Fig. 1] Trends in Mobile Phone/PHS Subscriber Numbers (left-hand chart: cumulative totals and annual net adds; right-hand chart: breakdown of net adds by MNO)



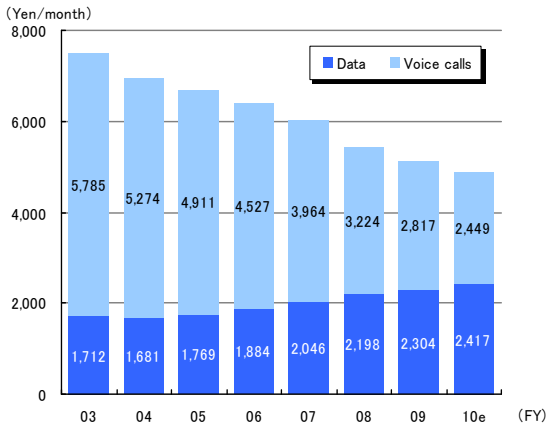
Source: Compiled by MHCB Industry Research Division based on Telecommunications Carriers Association data and respective IR materials

[Fig. 2] ARPU Trends for Japan's Top Three MNO



Source: Compiled by MHCB Industry Research Division based on Telecommunications Carriers Association data and respective IR materials

[Fig. 3] Telecommunications Profits for Japan's Top Three MNO



Source: Compiled by MHCB Industry Research Division based on Telecommunications Carriers Association data and respective IR materials

[1] Japan's MNO have introduced a so-called two-tier flat-rate system that combines so-called minimum charges, pay-as-you-go charges and maximum charges. As data traffic grows, more subscribers will reach their limit meaning that there is some room for ARPU growth.

Network development imperative given the rapid growth in data traffic per subscriber in recent years

At the same time, network development is urgently needed to cope with the rapid growth in data traffic per subscriber seen in recent years. According to AdMob data, while the figures vary from region to region, mobile data traffic has been growing at breakneck speed over the past few years. Data released by Japan's Ministry of Internal Affairs and Communications (MIC) show that mobile data traffic increased at a rate of 13.2% per quarter between June and September 2010 (which equates to an annualized growth rate of 64%). Cisco, meanwhile, forecasts that mobile data traffic will increase at a rate of 80% annually to reach 350 petabytes in 2014, which equates to an approximately 20-fold increase in the five years from 2009 when data traffic was 18 petabytes per month. At its results briefing for the fiscal year ending March 2010, NTT DOCOMO indicated that mobile traffic has been approximately doubling year-on-year in line with the increase in data subscribers. Consumption of mobile data communications is advancing at a faster pace in Japan than in many other countries, with absolute data traffic volumes for 2009 showing the monthly mobile traffic per subscriber in Japan to be more than triple that in the North American market, indicating that there is a heavy strain on Japan's mobile networks (see Figs. 4–7).

Exponential increases in traffic expected to continue going forward

The rapid increases in mobile traffic are an indication of efforts to stimulate user needs; the combined result of MNO efforts to speed up networks while contents providers strive to deliver enriched contents. As this spiral structure is expected to remain in place going forward, the exponential increases in traffic are forecast to continue.

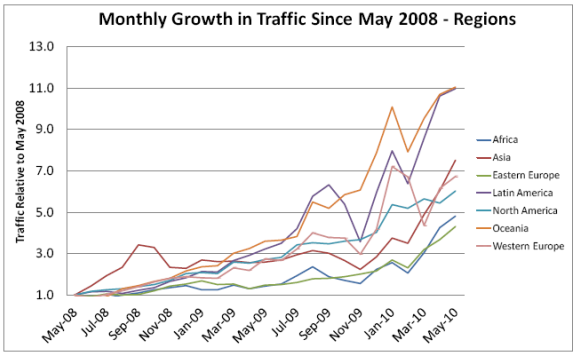
The bottom line could worsen if network development incurs massive costs. MNO should consider infrastructure sharing in addition to measures such as offloading traffic onto fixed networks.

MNO bottom lines could come under pressure should the network development needed to cope with this rapid increase in traffic incur massive costs. Japan's MNO are developing various measures aimed at realizing efficient network development, including fixed network offloading[2] and the introduction of next generation standards to improve the efficiency of frequency band use. Also, it would behoove MNO to consider the type of inter-carrier infrastructure sharing (joint ownership/usage (hereunder "IS"))[3] that is evolving in Europe, the US, India and other foreign markets (see Fig. 8).

This report focuses on IS as a yet fully unexplored approach by Japan's MNO to reduce network costs.

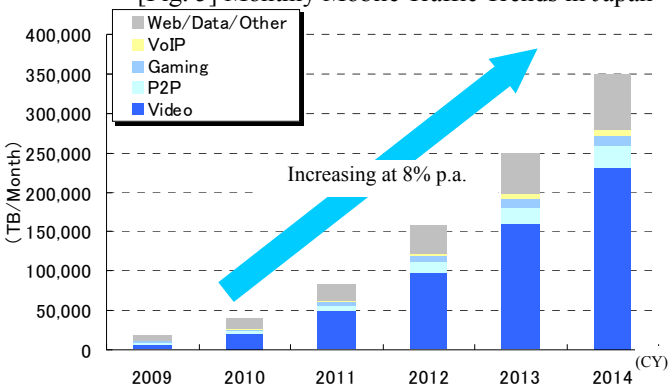
[2] Dispersing mobile traffic onto fixed telecommunications networks serves to reduce the load on mobile networks.
[3] This report uses two separate terms in relation to infrastructure sharing: "joint ownership" and "joint usage". The meaning of the respective terms is as follows: "Joint ownership" refers to infrastructure sharing in the form of joint network development by multiple MNO, and the establishment of a co-funded joint venture for infrastructure sharing. "Joint usage" refers to infrastructure sharing in the form of leasing, wherein a single MNO or an independent non-carrier leases its network infrastructure to another carrier.

[Fig. 4] Mobile Traffic Growth Trends (by region)



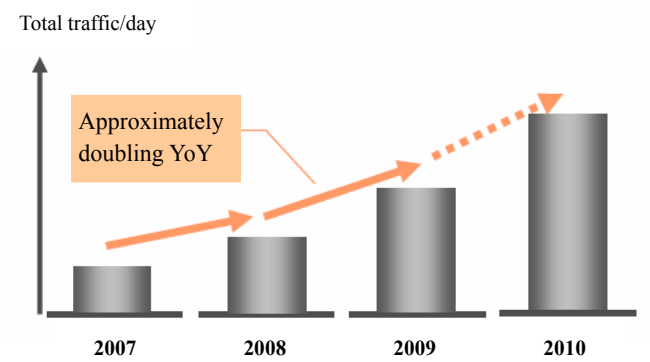
Source: Compiled by MHCB Industry Research Division based on "AdMob Mobile Metrics" (AdMob, May 2010)

[Fig. 5] Monthly Mobile Traffic Trends in Japan



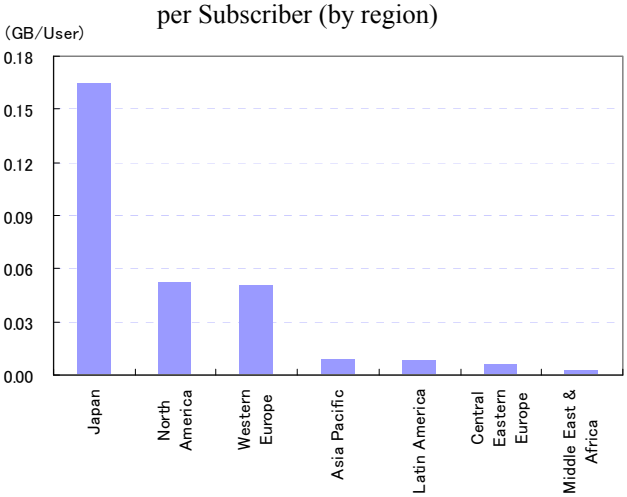
Source: Compiled by MHCB Industry Research Division based on "Cisco VNI Mobile 2010" (Cisco)

[Fig. 6] NTT DOCOMO Traffic Trends



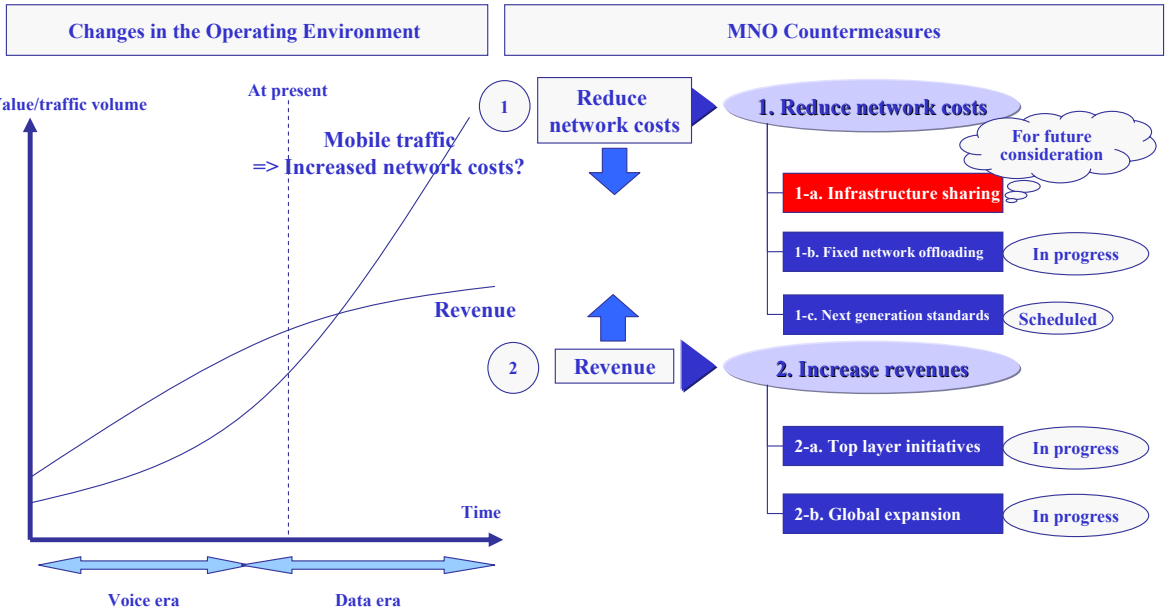
Source: Compiled by MHCB Industry Research Division based on NTT DOCOMO results IR materials for the fiscal year ending March 31, 2010

[Fig. 7] Comparison of Monthly Mobile Traffic Rates per Subscriber (by region)



Source: Compiled by MHCB Industry Research Division based on "Cisco VNI Mobile 2010" (Cisco)

[Fig. 8] Changes in the MNO Operating Environment and Assumed MNO Responses



Source: Compiled by MHCB Industry Research Division

Chapter 2: Mobile Network Infrastructure Sharing

An overview of the various mobile infrastructure joint ownership/usage concepts

This chapter sets forth the various concepts of joint ownership or usage of mobile network infrastructure with a view to establishing a concrete definition of IS. The objectives and effects of IS are also discussed, and the types of administrative structure and the business model characteristics are explained.

(1) The various types of mobile infrastructure joint ownership/usage: defining IS

The types of joint ownership or usage that apply to mobile network infrastructure can be broken down as follows (see Fig. 9).

Type 1: MVNO

A mobile virtual network operator (MVNO) is a company that provides telecommunications services but does not build its own network infrastructure. In other words, an MVNO leases the mobile infrastructure that forms the base of its mobile telephony operations from a mobile network operator (MNO; in Japan, NTT DOCOMO, KDDI, SoftBank Mobile or EMOBILE) rather than developing its own network, adding functions to the telecommunications services it provides to subscribers.

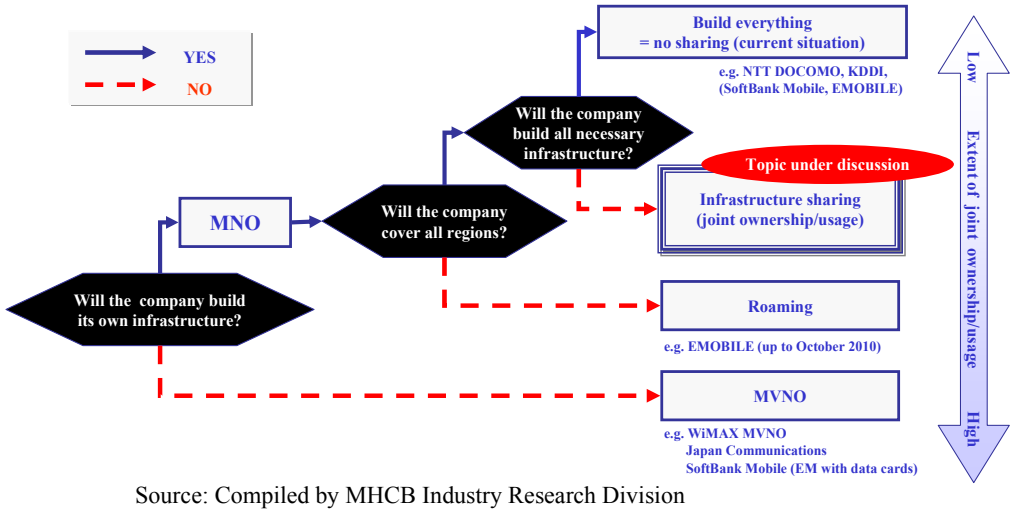
Type 2: Roaming

The second type of joint ownership or usage is **roaming**. Roaming refers to the use of another MNO network for certain areas and services by companies that have built their own mobile network infrastructure and provide telecommunications services (i.e. an MNO). EMOBILE, a new MNO that began providing telecommunications services in 2007, signed a roaming agreement with NTT DOCOMO in order to provide voice services to subscribers throughout the country (this agreement terminated on October 31, 2010). Domestic MNO seeking to provide telecommunications services to their subscribers overseas have signed roaming agreements with foreign MNO due to the impracticality of building individual networks throughout the world.

Type 3: Infrastructure sharing

Type 3 is a company with its own network infrastructure that elects to construct and share part of that infrastructure in conjunction with another MNO and may lease some of the infrastructure constructed by the other MNO. There are also cases in which operators from outside the industry (i.e. non-carriers) construct network infrastructure that they then lease to multiple MNO. This type constitutes the central theme of this report and is referred to as **IS (joint ownership/usage)**.

[Fig. 9] Types of Mobile Infrastructure Joint Ownership/usage



Source: Compiled by MHCB Industry Research Division

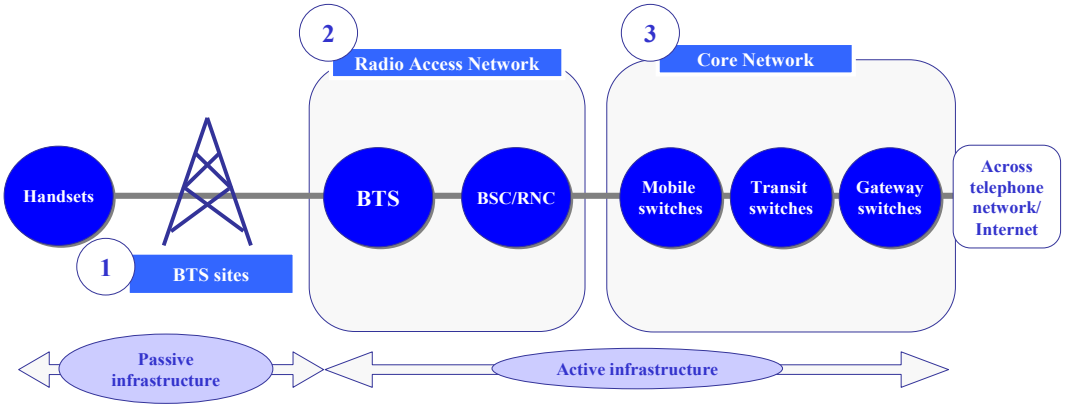
(2) Mobile network infrastructure components and the scope of IS

This section opens with a look at mobile network infrastructure components.

Mobile infrastructure components

Mobile network infrastructure is comprised of **(1) base transceiver station (BTS) sites (referred to as "towers" hereunder), (2) a radio access network and (3) a core network** (see Fig. 10).

[Fig. 10] Mobile Network Infrastructure Components



Source: Compiled by MHCB Industry Research Division

Radio Component (1): BTS sites (towers)

(1) **Base transceiver station sites (towers)** are the structures, e.g. towers, concrete columns, rooftop masts, and where BTS are installed. By site of installation, these can be divided into ground-based towers (GBT) and rooftop towers (RTT) (see Fig. 11). There are several types of GBT, including the four-legged angle-truss towers, which are assembled from L-shaped steel; cylinder masts, which comprise several cylindrical steel columns; steel column

Panza masts, and the concrete columns that resemble telephone poles. In built-up areas, BTS tend to be installed on the top of relatively tall buildings in urban areas and referred to as RTT. BTS installations include a power supply unit, cooling apparatus and a storage box (or cabinet) (see Fig. 12), and are generally referred to as "passive infrastructure".

Radio Component (2): Access network

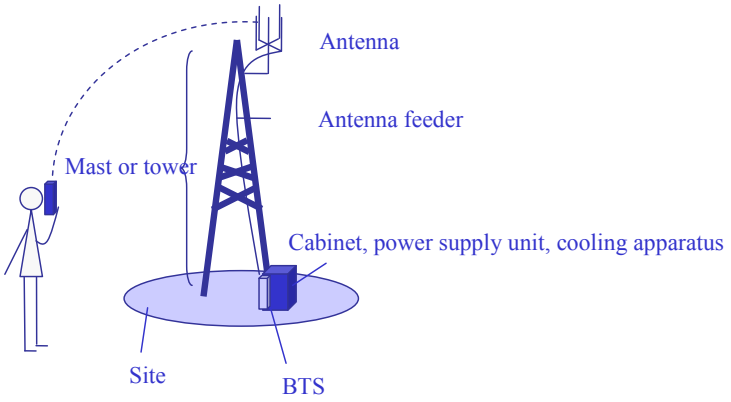
(2) A **radio access network** refers to the BTS (Node B, which includes the antenna) and the BTS control units (BSC/RNC), etc. that link multiple BTS and control the assignment and switching of mobile unit wireless channels. By contrast to the "passive infrastructure" referred to in (1) above, the access network, together with the core network described hereunder, are generally referred to as "active infrastructure".

[Fig. 11] Types of Base Transceiver Station Sites (Towers)

	Ground Based Towers (GBT)				Roof Top Towers (RTT)
	Angle Truss	Cylinder	Panza	Concrete Column	
Definition	■ Four-legged towers assembled from L-shaped steel	■ Cylindrical steel pillar	■ Steel pillar	■ Concrete column	■ Erected on the top of buildings
Use	■ Used in the early stages of area development as they offer wide-area coverage	■ Used to cover medium-sized areas	■ Used to cover comparatively small areas	■ As left	■ Primarily used in urban areas
No. of antennas mountable	■ 3-6 (2 × 0.9mØ microwave antennas)	■ 2-3 (2 × 0.9mØ microwave antennas)	■ 1-2	■ 1-2	–
Images					

Source: Compiled by MHCB Industry Research Division based on the MIC's "The Role of Connection Rules given Environmental Changes in the Telecommunications Market" (an Information and Communications Council report dated October 16, 2009). The angle truss and cylinder mast images are taken from the NASU DENKI-TEKKO website (http://www.nasudenki.co.jp/products/pylon/index.htm). The image of the concrete column is taken from the Atlas Communication website (http://www.atlas-cc.com/products/pro6/pdf/pro6_1.pdf).

[Fig. 12] BTS Site Component Names



Source: Compiled by MHCB Industry Research Division

Component (3): Core network

(3) A **core network** refers to the mobile switches that function to manage the set up, opening, switching and transfer of voice and data communication channels, and the gateway switches that function to route calls, etc. across telephone network, ISDN or other mobile telecommunications networks. As stated above, the core network and the access network are generally known as "active infrastructure".

Tower sharing acceptable from a competition policy perspective

The joint ownership or usage of towers, which are passive infrastructure, is more easily acceptable in of terms regulators' competition policy. Designing site location (cell design) is an important part of network development, but unlike the active infrastructure (i.e. the access network and core network) it has no impact on network configuration technology. What this means is that even if towers are jointly owned or used by multiple MNO, each MNO can continue to pursue service-based differentiation strategies. Should the scope of joint ownership/usage extend to the access network and core network, however, the MNO involved in the IS agreement will no longer be able to build technologically unique networks, thus inhibiting technical innovation and making it difficult for the MNO to provide differentiated services. The joint ownership or usage of towers is thus likely to be more acceptable from competition policy perspectives than the joint ownership or usage of access networks and core networks.

Tower sharing also effective in terms of its economic benefits

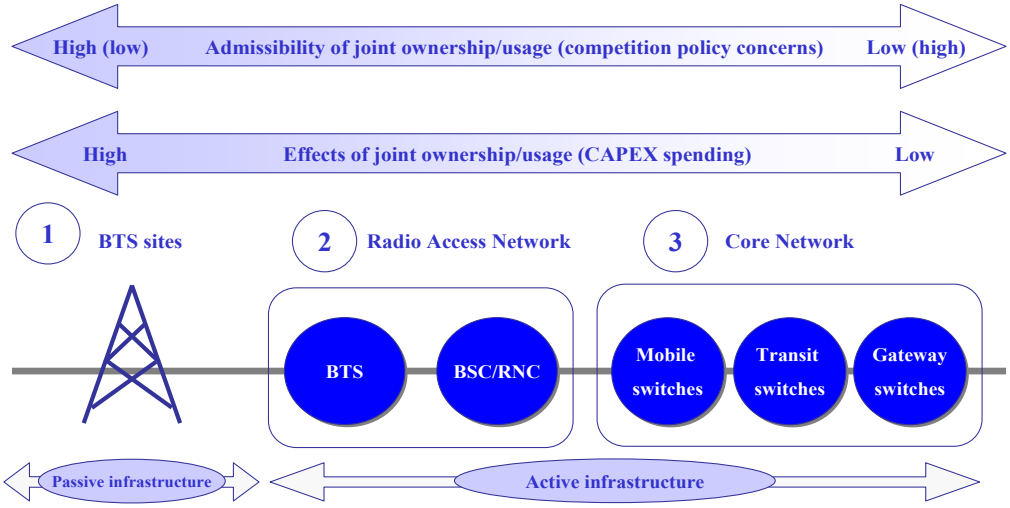
The joint ownership or usage of towers has powerful economic benefits and is thus an option that MNO should pursue. According to Ericsson[4], passive infrastructure costs, towers included, account for as much as 20% of total network costs. Towers must conform to rigorous wind loading criteria and are costly installations in terms of both raw materials and labor costs, not to mention foundation construction. A single suburban BTS is said to cost tens of

[4] Source: Ericsson "Shared Networks"

millions of yen to install, although cost varies depending on size. Moreover, aggregate costs mount up due to the large number of BTS, which is at the end of the network. Given the magnitude of tower-related costs involved, the economic benefits of joint ownership or usage should not be disregarded.

Given the above, the "admissibility of joint ownership/usage" in view of its limited impact on competition policy, and the "necessity of joint ownership/usage" in terms of the financial impact on network streamlining, suggest that promoting the joint ownership or usage of towers is a highly meaningful undertaking for Japan's MNO (see Fig. 13).

[Fig. 13] The Scope and Significance of Infrastructure Sharing



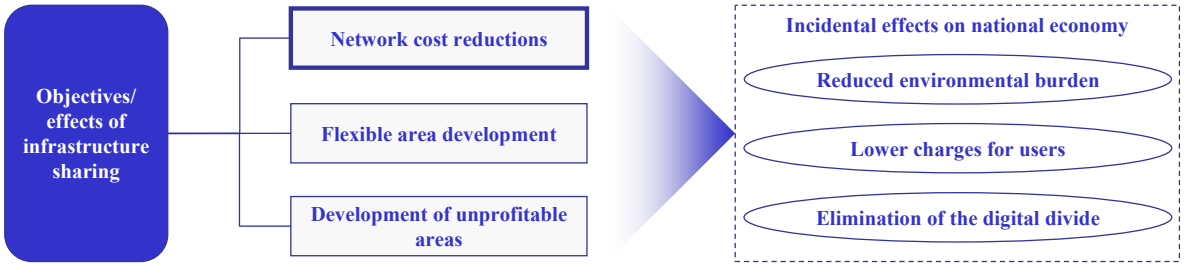
Source: Compiled by MHCB Industry Research Division

(3) Objectives and effects of IS

Objectives and effects of infrastructure sharing

Network IS offers a number of objectives/benefits for MNO, including network cost reductions, flexibility in area development and the potential to develop underperforming areas in which individual MNO are struggling to secure a profit (see Fig. 14).

[Fig. 14] Objectives/effects of Infrastructure Sharing



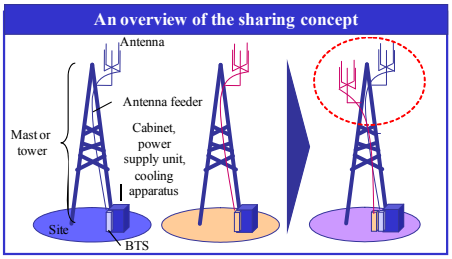
Source: Compiled by MHCB Industry Research Division

Potential reductions in CAPEX and interim costs

In terms of network cost reductions, joint infrastructure construction involving several MNO offers individual MNO the opportunity to reduce both their capital expenditure budgets and the interim network costs (operating expenditure) that include operation, maintenance and power charges.

While the extent of the reductions will vary considerably depending on the scope/scale of joint ownership/usage and the type of BTS being installed, it is possible to estimate the potential economic benefits by making certain assumptions. For example, if two MNO to install 10,000 new angle truss towers under a joint ownership/usage agreement, each MNO could reduce their CAPEX by 225.0 billion yen and their interim costs by 14.5 billion yen, resulting in estimated cuts of 239.5 billion yen over 10 years (see Fig. 15). The economic benefits would be even greater if the joint ownership/usage agreement encompassed antennas and other BTS site components.

[Fig. 15] Estimated Economic Benefits of Infrastructure Sharing for Individual MNO



Prerequisites

General:
- No. of shared BTS: 5,000-20,000 new masts/towers
- Target area: Rural areas

CAPEX:
- Towers: 50-60 million yen

Costs will vary depending on the number of MNO involved in sharing
- No sharing of antennas, BTS, feeders, etc.

OPEX:
- Land lease charges: 250,000 yen p.a.
- Electricity charges: No sharing
- Maintenance charges: 50,000 yen p.a.; 80% shareable
- Cost estimates are the presumed total over a 10-year period

(With two MNO sharing infrastructure)

Number of Shared BTS	CAPEX (Billion yen)	OPEX (10-year total) (Billion yen)	Total (Billion yen)
5,000	−112.5	−7.3	−119.8
10,000	−225.0	−14.5	−239.5
20,000	−450.0	−29.0	−479.0

(With three MNO sharing infrastructure)

Number of Shared BTS	CAPEX (Billion yen)	OPEX (10-year total) (Billion yen)	Total (Billion yen)
5,000	−150.0	−9.7	−159.7
10,000	−300.0	−19.3	−319.3
20,000	−600.0	−38.7	−638.7

Source: Compiled by MHCB Industry Research Division
Note: The "Prerequisites" (upper right) and estimated economic benefits (lower section of chart) are based on MHCB Industry Research Division estimates.

Potential for flexible area development of unprofitable areas

In addition to the network cost reductions offered, IS offers MNO the opportunity for flexible area expansion in the early stages of area development. Moreover, while individual MNO may struggle to reach the break-even point in rural and other areas with a limited number of potential subscribers, the construction and shared use of a shared network by multiple MNO would make it possible to secure a profit by reducing the fixed and variable costs involved (i.e. reducing the marginal costs to each MNO).

Positive effects on the national economy

IS also offers incidental benefits for the national economy. The negative impact on the landscape and natural environment in scenic areas can be mitigated since

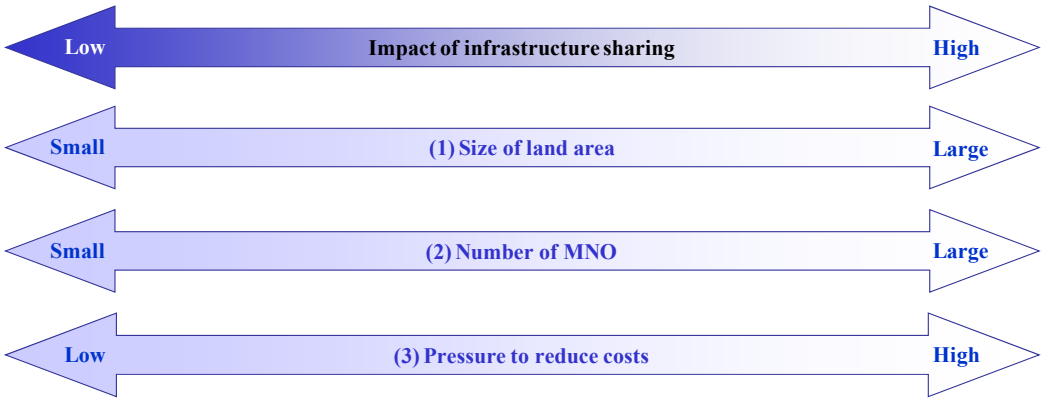
joint ownership/usage of BTS makes it possible to reduce BTS numbers. Also, the reductions in network costs mean that MNO have the scope to offer lower user charges. Consolidated development of rural areas can also be expected to help eliminate the digital divide.

(4) External factors affecting IS effects

Three external factors to determine the impact of infrastructure sharing

In general terms, the three factors listed below are external, country-specific factors that will determine the effects of IS described above (see Fig. 16). The first of these is the size of the national land area. In large countries, MNO will need to spend vast amounts on CAPEX in order to increase their coverage ratios. Thus, IS offers MNO an efficient means of increasing their coverage ratios. The second factor is MNO numbers. IS offers significant cost reductions in countries that have a large number of MNO where overlapping infrastructure investment tends to be a problem. The third factor is pressure to reduce costs. There are strong incentives for individual MNO to become involved in IS where consumer needs, national regulations and the competitive environment create significant pressure to reduce costs.

[Fig. 16] Country-specific External Factors affecting Infrastructure Sharing Effects



Source: Compiled by MHCB Industry Research Division

(5) Types of IS operators

The IS operators can be categorized as follows based on the degree of MNO involvement (see Fig. 17).

Type (1): MNO-controlled

The first type of IS operator is **"MNO-controlled"**; in this instance, the infrastructure is managed by an MNO spin-off or by a wholly owned subsidiary that has been established by the MNO for that purpose. In the majority of cases, the tenant is the MNO and a limited amount of sharing is involved (see below for details).

Type (2): Partial MNO sell-off

With Type (2), a portion of MNO shares will be sold-off to financial investors or another third party, though control will reside with the MNO (**"partial MNO sell-off"**). Generally speaking, the MNO will be the main tenant and will seek higher infrastructure efficiency and new revenue streams by leasing its infrastructure to other MNO. Reliance Infratel, which is a member of the Reliance Group, India's largest conglomerate, and Bharti Airtel fall into this category.

Type (3): Multi-MNO sharing

The third type involves **"multi-MNO sharing"**. With this type, several MNO will set up a joint venture, funded using in-kind contributions in the form of existing MNO infrastructure. The MNO are involved in the joint venture make shared use of existing towers and, where necessary, will construct new towers that are then used by several MNO. The infrastructure can also be leased to MNO that are not involved in the joint venture. Indus Towers, India's largest tower owner, falls into this category.

Type (4): Independent operators

The fourth type involves **"independent operators"**. With this type, the infrastructure is constructed by an operator from outside the industry (i.e. a non-carrier), which then leases this infrastructure to numerous MNO for shared use. American companies American Tower, Crown Castle International and SBA Communications, and the Indian company GTL Infrastructure, which is a member of the network construction firm Global Group, are representative examples of this type of IS operators. Japan's power providers belong to this group in the sense that they are non-carriers, though these companies are not exclusively engaged in the IS business and such operations are limited in scale.

[Fig. 17] Types of Infrastructure Sharing Operators

	Composition of shareholders	Business model	Examples
Type 1: MNO-controlled	■ 100% MNO or an MNO spin-off	■ Tenants are primarily in-house; infrastructure efficiency is generally low	■ BSNL (India) - Lease to other MNO ■ (Japan's MNO)
Type 2: Partial MNO sell-off	■ Linked to the MNO ■ Some shares sold to outside investors	■ Essentially, the MNO targets use by other carriers while becoming the main tenant ■ Monetization through partial sell-off of assets	■ Reliance Infratel (India) ■ Bharti (India)
Type 3: Multi-MNO sharing	■ Joint venture established by multiple MNO	■ Infrastructure sharing among specific MNO ■ Moderate infrastructure efficiency	■ Indus Towers (Joint venture between Vodafone, Bharti, Idea) (India)
Type 4: Independent operators	■ Established by a non-carrier, independent entity	■ Multiple MNO become tenants ■ High infrastructure efficiency	■ Crown Castle (US) ■ American Tower (US) ■ SBA Comm. (US) ■ GTL (India) ■ Tata (WTTI) Quippo (India) ■ (K-OPTI.COM (Japan))

Source: Compiled by MHCB Industry Research Division
Note: Europe's carriers have been excluded from the chart because the type of infrastructure sharing practiced in the region is unknown.

(6) Business model characteristics for IS operators (tower operators)

Business model characteristics

This section examines the characteristics of business models available to IS operators. As explained in the previous section, the options for IS operation are varied; however, this discussion will focus on the independent companies (Type (4)) such as US-based tower operators, American Tower and Crown Castle International, which specialize in tower leasing.

The business model has the following characteristics in terms of revenues:

Long leases with high renewal rates

(1) **Long lease agreements with high renewal rates**: Independent operators construct towers, which are owned by the company upon completion and subsequently leased to MNO under long-term lease agreements. These lease agreements normally span five-to-ten years and are renewed for additional five-year periods upon maturity. The lease payments are generally set to increase at a rate of 3–5% per annum. Cancellation rates are extremely low at around 1–2%[5] due to the high cost of switching to the MNO (i.e. the tenants), which offers operators a stable revenue stream over the long term.

Small customer base focus

(2) **Customer base centered on a handful of MNO**: Customer base diversification is a high-risk business model because the operator focuses on a handful of MNO. The collapse of a single MNO carries the risk of a massive drop in revenues.

[5] Source: Morgan Stanley "Telecom Services Tower Industry – Attractive on Strong Fundamentals" (May 19, 2008)

On the other hand, the business model has the following characteristics in terms of cost:

High fixed cost ratios

(3) **High fixed cost ratios**: Approximately 70% of costs are fixed costs[6] such as depreciation on towers, thus signing up additional tenants will generate few additional costs (variable costs). What this means is that once a company crosses the break-even point, its profitability will improve by a wide margin. The job of tower operators is thus to increase their tenancy ratios, i.e. the number of tenants per tower.

The following section examines the IS business model in terms of its attractiveness to the industry within the framework of Porter's Five Forces model with a view to the US market (see Fig. 18).

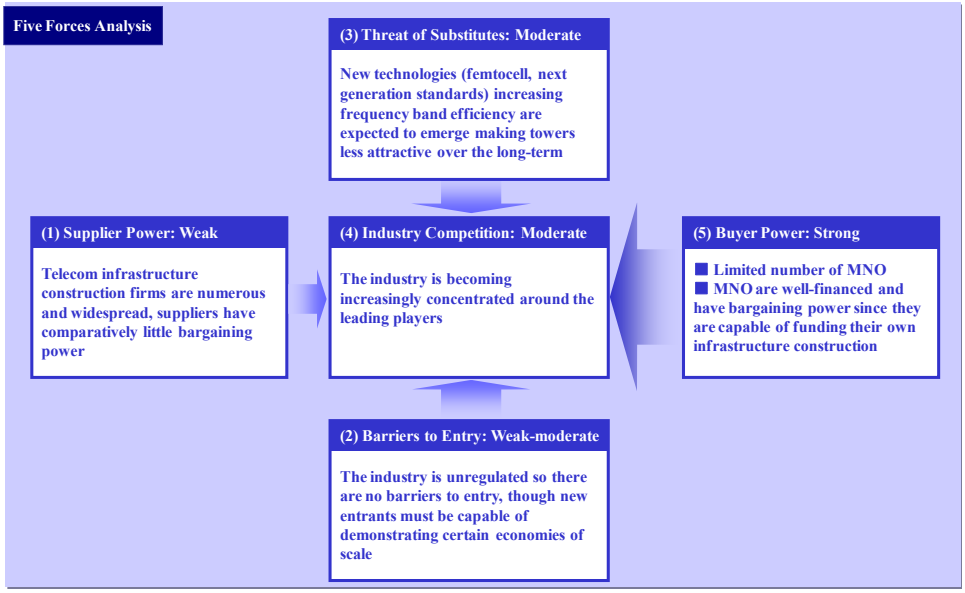
Buyers constitute biggest threat amongst competitive pressures from peripheral industries

Suppliers (1) (steel suppliers and telecom infrastructure construction firms) are numerous and widespread, and the weakness of the competitive pressures from this source serves to enhance the attractiveness of the industry. The competitive pressures from barriers to entry (2) are weak to moderate, while those from the threat of substitutes (3) and industry competition (4) are considered to be moderate. While the regulatory barriers to entry (2) are low, a company seeking to establish a business will need to be able to demonstrate certain economies of scale if it is to succeed. Due consideration must also be given to trends in femtocells (tiny cellular base stations), next generation standards and other alternative network development techniques, i.e. the threat of substitutes (3). With (4), while there are a large number of players operating within the industry, the degree of concentration among the leading players is increasing, which suggests that industry competition is moderate.

The biggest threat comes from buyers (5). The limited number of MNO, i.e. service buyers, and the possibility that the MNO will construct their own infrastructure suggests that buyers constitute a considerable threat.

[6] Source: Delta Partners "Tower sharing in the Middle East and Africa: Collaborating in competition" (April 2009)

[Fig. 18] Five Forces Analysis of the US Infrastructure Sharing Business



Source: Compiled by MHCB Industry Research Division

Chapter 3: Introduction of Overseas Markets Advancing in Infrastructure Sharing

This chapter explores overseas case study examples of existing IS. These case studies will serve as reference material for the introduction and expansion of IS in the Japanese market.

(1) Regulations pertaining to the joint ownership/usage of mobile infrastructure overseas

Just like Japan, overseas markets also essentially to allow MNOs to share (1) towers, (2) radio access networks and (3) core networks, provided there is no sharing of frequencies. However, each country differs in the status of its initiatives in the area of joint ownership and usage of mobile infrastructure. Below we will introduce some of the regulatory policies adopted by the authorities in major overseas countries with regards to IS.

Generally speaking, there are no restrictions on infrastructure sharing in the US.

In the US, state governments, regional governments and other auxiliary institutions cannot, as a general rule, impose restrictions on wireless operators with regard to the installation, construction or maintenance of infrastructure[7]. The FCC[8] has indicated that it will not be imposing any restrictions on IS, generally speaking, because market principles are operating sufficiently in the US mobile communications industry[9]. In fact, the FCC actively promotes the joint use of infrastructure (leasing) through its policies, such as the rule that stipulates, based on past examples[10], how owners of infrastructure must respond within 90 days to requests for IS, stating whether such sharing would be possible.

The Indian government is actively promoting infrastructure sharing.

India is actively promoting IS, and it has developed to a considerable extent amongst India's MNO. The TRAI [11] (the authority in charge of telecommunications regulation in India) originally only authorized the sharing of "passive infrastructure" such as towers, but in an April-2007 recommendation paper[12], the TRAI finally recommended the sharing of "active infrastructure" or "backhauls (transmission lines)" between BTS and BSC in some nodes. Against a backdrop of area development needs in India's rapidly growing telecommunications service industry, the TRAI has pointed to the urgency of IS between MNO, though it has not forced MNO to lease "passive infrastructure" to other companies. However, the TRAI does not permit

[7] Source: Code of Federal Regulations Title47 § 332(c)(7)
[8] The Federal Communications Commission
[9] Source: FCC "Contribution of the United States Federal Communications Commission 2008 Global Symposium for Regulators Consultation" (March 2008)
[10] Source: Varnum LLP "FCC Tower Siting Shot Clock Order: A Municipal Perspective"
[11] Telecom Regulatory Authority of India
[12] Source: TRAI press release "No.33 TRAI recommends Infrastructure Sharing of passive, active and backhaul networks." (April 11, 2007)

frequency sharing.

In the UK, the regulatory authorities are recommending infrastructure sharing, though there are some restrictions.

In May 2001, **the UK's** Oftel[13] (the agency in charge of telecommunications at that time) issued its first Note for Information[14] regarding 3G (3rd Generation) IS. The Note specified the different types of IS and spelled out the fundamental guidelines regarding IS regulations. Oftel recommended the sharing of towers and so on, but it forbade any infringements of the Wireless Telegraphy Act, which banned the transfer behavior of spectrums or licenses. It also forbade any anti-competitive practices between MNO using IS. In April 2003, the EU gave its approval for 3G IS within the UK.

In France, infrastructure sharing regulations are divided into five levels.

In France, ART[15] (the predecessor to the current regulatory body, ARCEP) supports IS, provided that the sharing maintained a reasonably competitive environment between MNO and also proved advantageous for subscribers. In concrete terms, ART sets down regulations according to five different levels that correspond to the type of 3G IS (see Fig.19). According to these regulations, ART prohibits the sharing of core networks related to the sharing of frequencies, but it does permit the sharing of access networks up until the level of RNC.

Furthermore, ARCEP[16] is promoting IS in rural areas. In April 2009 ARCEP presented its plan[17] for 3G network sharing and in February 2010 France's three MNO (Orange France, SFR, and Bouygues Telecom) concluded an agreement with regard to 3G network sharing for the purposes of developing 3G services mainly in rural areas. Focusing on dead zones, the three MNO are sharing the workload of constructing a 3G network by 2013, a task that includes the re-utilization of the pre-existing 2G network. Upon completion, the network will be jointly used by the three MNO. Priority areas are deemed to be those where (1) 10% or more of the population remain uncovered by the networks of any of the MNO or (2) 1% or more of the population is unable to use mobile telecommunications services due to geographical problems. In this way, the authorities expect to be able to offer 3G coverage to 98% of the population.

[13] Source: Oftel Press Release "3G Mobile Infrastructure Sharing in the UK" (May 1, 2001)
[14] Office of Telecommunications (the UK's telecommunications regulatory authority). Thereafter merged with other regulatory bodies in December 2003 to form Ofcom (Office of Communications)
[15] Autorité de Régulation des Télécommunications. Reorganized into ARCEP in 2005
[16] Autorité de Régulation des Communications Electroniques et des Poste. France's telecommunications regulatory authority
[17] Source: An RCEP Press Release "Under the aegis of ARCEP, operators sign a 3G mobile network sharing agreement that will enable full nationwide coverage by the end of 2013" (February 24, 2010)

[Fig. 19] French Regulations Pertaining to Infrastructure Sharing

Infrastructure Sharing Level	Scope of Infrastructure Sharing	Contents of Regulations
Level 1	Land, civil engineering works, buildings, pylons, electric supplies, cooling systems, transmission between BSC and Node B	■ All passive infrastructure sharing is permitted and **is in fact encouraged** ■ Transmission between BSC and Node B are limited to those not directly connected to UMTS networks
Level 2	Antennas, feeders, passive sectors from amongst connected areas and other peripheral equipment	■ Sharing of active or other peripheral equipment is permitted ■ Antenna and peripheral equipment are regarded as passive infrastructure and are considered an extension of Level 1
Level 3	BSC/Node B	■ BSC/Node B sharing is permitted ■ For Node B that operate frequencies, the Node B must be kept and operated in a totally independent manner by each MNO ■ Active installations such as TRX must be kept independently by each MNO
Level 4	RNC	■ RNC sharing is permitted ■ RNC must be kept and operated independently by each MNO
Level 5	MSC, Routers	■ Sharing of rooters linked to MSC or fixed-line networks is not permitted ■ Infrastructure sharing that might lead to frequency sharing is not allowed in the regulatory framework, so the sharing of the core network sector as a whole is not permitted.

Sharing permitted

Sharing not permitted

Source: Compiled by MHCB Industry Research Division from GSMA "Mobile Infrastructure Sharing"

(2) Examples of overseas mobile IS

In the US the tower industry is a unique industry sector composed of independent tower operators

In **the US**, independent tower operators are more common than examples of tower sharing between MNO. These operators lease towers to MNO (see Fig. 20). The largest of these operators are the big three of American Tower (26,600 towers), Crown Castle International (24,000 towers) and SBA Communications (8,324 towers). The two largest companies (American Tower and Crown Castle International) have a huge presence in the US market, with an aggregate market price in excess of $10 billion. The "tower industry" is a unique industry sector in the US with its own industry organization, the Personal Communications Industry Association (PCIA). According to The Wireless Association's (CTIA) "CTIA Semi-Annual Wireless Industry Survey", as of December 2009 there were a total of 247,081 towers in the US[18], with total industry sales estimated at $14.1 billion (about 1.3 trillion yen[19], Mizuho estimate).

[18] Source: CTIA "CTIA Semi-Annual Wireless Industry Survey"
[19] Estimated based on a conversion rate of $1 = 92.07 yen (TTM at end of December 2009)

[Fig.20] Summary of Main, Independent Infrastructure Sharing Operators (Tower Operators) in the US

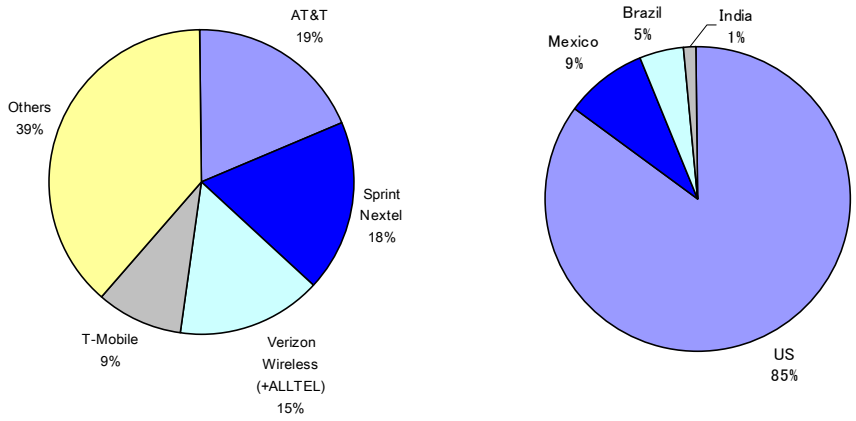
	American Tower (AMT)	Crown Castle Int'l (CCI)	SBA Communications (SBAC)
No. of towers (end of December 2009)	26,600	24,000	8,324
Year established	1995	1994	1989
Sales (FYE December 2009)	$1,724 million	$1,685 million	$555 million
Total market value (end of October 2010)	$20.6 billion	$12.5 billion	$4.5 billion
Major customers	■ AT&T ■ SprintNextel ■ Verizon Wireless ■ Grupo Iusacell ■ Nextel International ■ Telefonica ■ Vodafone ■ Idea ■ Aircel	■ Verizon ■ AT&T ■ SprintNextel ■ T-Mobile	■ AT&T ■ SprintNextel ■ T-Mobile ■ Verizon Wireless
Countries of operation	US, Mexico, Brazil, India	US, Australia, Canada	US (including the Virgin Islands), Canada, Puerto Rico

Source: Compiled by MHCB Industry Research Division from IR material from each company

American Tower

The tower industry's leading company, **American Tower**, was established in 1995 by the American Radio Systems radio station. The company was spun off and offered up in an IPO following an acquisition by CBS in 1998. The company currently holds 26,600 tower sites in the US, Mexico, Brazil and India. American Tower leases tower sites to major US MNO such as AT&T, Sprint, Verizon and T-Mobile. In 2005 it acquired SpectraSite (which owned 7,800 tower sites) and is expanding the scale of its operations within the US. Furthermore, following forecasts for market saturation in the US, the company has expressed an interest in actively expanding into the developing market of India. After acquiring two local operators in 2009 (Xcel Telecom and Transcend Infrastructure), American Tower then acquired Essar Telecom Infrastructure in 2010 (owner of 4,450 tower sites) for $430 million. It now has 7,000 towers in India and has established itself as one of the leading independent operators in India (see Fig. 21).

[Fig.21] American Tower's Customer Base (left) and Sales by Country (right)



Source: Compiled by MHCB Industry Research Division from American Tower IR material

Crown Castle International

Crown Castle International, the second-largest entity, is an independent tower operator. As of December 2009 it owned 24,000 towers. In addition to the US, it has also expanded into Australia and Canada. In the US it provides towers to Verizon, AT&T, SprintNextel and T-Mobile amongst others, while in Australia its customers include Telstra and Optus. It is expanding its scale of operations and in 2007 it acquired Global Signal (owner of 10,659 towers) for $580 million (around 662.1 billion yen[20]).

SBA Communications

SBA Communications, the third-largest independent player, owns 8,000 towers, significantly less than the top two companies. The company's profit and loss status is fairly unhealthy, with net income after tax posting a loss of $140 million (end of December 2009). It acquired ATT's 1,850 towers in 2006, Optasite's (528 towers) in 2008 and, in the same year, Light Tower's 340 towers for $220 million (around 20 billion yen[21]). It is actively pushing forward with business expansion and in 2008 it also acquired around 701 towers from several other operators at a cost of $440 million (around 40 billion yen[22]).

As for MNO, **AT&T (internal division)** owns 9,940 towers while **T-Mobile (internal division)** possesses 7,000. In 2008, Sprint Nextel bought around 3,000 towers from the independent operator **TowerCo** for $670 million.

In India, there are many examples of MNO sharing infrastructure (see Fig. 22).

Infrastructure sharing in India takes many forms

In 2007, India's three largest MNO by subscriber number – Bharti, Vodafone and Aditya Birla (Idea Cellular) – pooled together their pre-existing towers (around 70,000 in total) to create **Indus Towers**. This new company is believed to be the world's largest operator in terms of the number of towers owned. In

[20] Estimated based on a conversion rate of $1 = 114.15 yen (TTM at end of December 2007)
[21] Estimated based on a conversion rate of $1 = 91.01 yen (TTM at end of December 2008)
[22] Estimated based on a conversion rate of $1 = 91.01 yen (TTM at end of December 2008)

addition to its three parent companies, the new company possesses a wide customer base that includes BSNL, Aircel, Reliance Communications, Union, Loop and Tata Teleservices. It currently owns 102,696 towers (as of December end 2009).

Reliance Infratel

Reliance Communications, one of the big three MNO, created a new subsidiary company for its tower operations (**Reliance Infratel**). It then sold 5% of the new company's stock to investors. Reliance Infratel's customer base includes its parent company as well as Etisalat, S-Tel, Aircel, Tata and MTS. In January 2010, Reliance Infratel received permission from the regulatory authority (SEBI) for an IPO and there were rumors of an imminent IPO. However, on June 27 of the same year, the company announced that it would be merging with GTL Infrastructure.

Quippo Telecom

In January 2009, the independent operator **Quippo Telecom** (QTIL)[23] and **Wireless TT Infoservices** (WTTIL)[24], a subsidiary of Tata Teleservices, announced that they would be consolidating their towers. In March 2010, the new company then acquired the tower subsidiary of Tata Teleservices (Maharashtra), a sister company of Tata Teleservices, acquiring 2,535 towers in Mumbai and other major urban areas for 13.1 billion rupees (around 27.1 billion yen). As of the end of March 2010, the company possessed around 40,000 towers in total. After the consolidation, the company's shareholder composition is expected to be as follows: Tata Group with 55%, SREI Group with a total of 11% and the rest owned by funds affiliated with the Singapore and Oman governments.

GTL Infrastructure

The independent operator **GTL Infrastructure** is a subsidiary of the Global Group, a company involved in network construction and so on. It is listed in India's domestic securities markets (BSE, NSE). In January 2010 it announced the purchase of 17,500 towers at a cost of 8.4 billion rupees (around 173.9 billion yen[25]) from the mid-sized MNO Aircel. Its post-acquisition tower site number stood at 32,500. It aims to construct a network of 50,000 towers by 2013. As mentioned above, the company announced a merger with Reliance Infratel in June 2010.

[23] An infrastructure company under the umbrella of SREI Infrastructure Finance, a company involved in infrastructure business
[24] A 100% subsidiary of Tata Teleservices established in 2004
[25] Estimated based on a conversion rate of 1 rupee = 2.07 yen (TTM at end of March 2010)

[Fig.22] Summary of India's Main Infrastructure Sharing Operators (Tower Operators)

	Indus Towers	Reliance Infratel	BSNL	GTL Infrastructure	Bharti Infratel	Tata (WTTIL) Quippo
No. of towers	102,696 (End of Dec.2009)	48,000 (End of Sept. 2009)	45,000 (End of Oct. 2009)	32,500 (End of Dec. 2009)	30,568 (End of Mar. 2010)	25,000 (End of Aug. 2009)
Year established	2007	2001	—	2004	2006	2004
Shareholder composition	■ Bharti Infratel 42% ■ Vodafone Essar 42% ■ Aditya Birla 16%	■ Rcom 94.5% ■ Funds 5% ■ Employee-owned holding company 0.5%	—	■ GTL Around 50%	■ Bharti Airtel 92.51% (End of Mar. 2009)	■ Tata 51% ■ Quippo 49%
Major customers	Parent companies (Idea, Vodafone, Bharti) + BSNL, Aircel, Rcom, Union, Loop, Tata, etc.	Parent company (Rcom) + Etisalat, S-Tel, Aircel, Tata, MTS, etc.	Undisclosed	Tata, Aircel, RCom, Bharti, BSNL, Vodafone, Idea, etc.	Undisclosed	Parent company (Tata) + Idea, Vodafone, Aircel, BSNL, Rcom, etc.
Type	(3) Multi-MNO sharing	(2) Partial MNO sell-off	(1) MNO-controlled	(4) Independent operator	(2) Partial MNO-sell-off	(4) Independent operator
Remarks	■ JV by three companies	■ Subsidiary of Reliance Communications Infrastructure	■ Owned by BSNL	■ Listed in 2006 ■ Tower numbers include those of Aircel ■ Merger with Reliance Infratel (announced June 2010)	■ Partially sold off to firms	■ Originally established as Tata Tele Info, changed trading name to WTTIL in March 2005 ■ Merger with Quippo in 2009

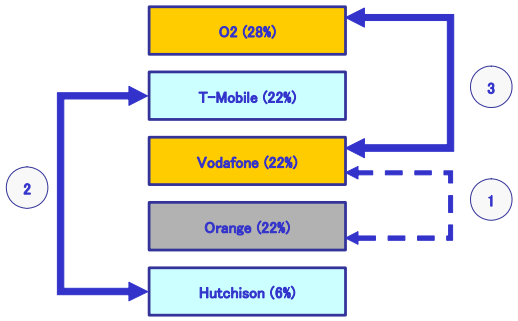
Merger

Source: Compiled by MHCB Industry Research Division from IR material from each company

In the UK, there are examples of comprehensive tie-ins that include other European nations.

In the UK, there are three examples of sharing collaborations. These are (1) the tie-up between Vodafone UK and Orange UK, (2) the tie-up between T-Mobile and Hutchinson 3G (sharing of the UK's domestic towers and access networks) and (3) the tie-up between Vodafone and Telefonica (see Fig. 23). Examples (1) and (2) concern the sharing of towers and RAN[26] within the UK, whereas example (3) concerns a comprehensive sharing that includes other countries in Europe as well as the UK.

[Fig.23] IS Tie-ups between UK MNO



Source: Compiled by MHCB Industry Research Division from IR material from each company
Note: The figure in parentheses is the subscriber share as of the end of March 2009

(1) The example of Vodafone UK and Orange UK

(1) In February 2007, **Vodafone UK** and **Orange UK** announced plans to share RAN in their domestic UK operations (see Fig. 24). In the press release of both companies, RAN was defined as towers, BTS and BSC/RNC. The companies are not sharing core networks.[27]

[26] Radio Access Network. A part of mobile infrastructure access networks (see Fig. 10)
[27] Source: Vodafone Press Release "Vodafone UK and Orange UK propose radio access network share" (February 8, 2007)

(2) The example of T-Mobile and Hutchinson

(2) In December 2007, **T-Mobile** and **Hutchison** announced a tie-up in the area of 3G network sharing within the domestic UK market. The tie-up concerns the sharing of towers and access networks only and does not include core network sharing. They expect to reduce tower numbers by 5,000 as part of the deal, making financial savings in the region of **200 million pounds over the next 10 years** (around 456.1 billion yen[28]). Both companies invested 50% of the capital to create a new joint venture, Mobile Broadband Network Limited. This new company will manage access networks.

(3) The example of Telefonica and Vodafone Group

(3) Also, in March 2009 **Telefonica** and the **Vodafone Group** announced that they would be working together to share mobile infrastructure in several European nations. They expect to cut costs by several **hundreds of millions of pounds** over the next 10 years. They plan to share passive infrastructure in Germany, Ireland, Spain and the UK, but the scope and shape of the sharing differs according to country, as detailed below. Judging from the press release, the scope of the sharing seems limited – compared to (1) and (2), the target infrastructure in this deal will be BTS sites only. The sharing will not encompass BTS or BSC/RNC.

[Fig. 24] Details of the IS Agreement between Telefonica and Vodafone Group

Target country	Details of sharing
Germany	Sharing of pre-existing 2G/3G sites. The target pylons are also used for wireless backhaul communications.
Ireland	All sites are shared mutually. New constructions will also be undertaken jointly for areas where their expansion plans are in accord.
Spain	Extension of the agreement to share pre-existing sites from 2007 onwards. This includes the sharing of power supply equipment, cabinets and masts.
UK	Joint construction of new sites and consolidation of pre-existing 2G/3G sites

Source: Compiled by MHCB Industry Research Division from Vodafone Group Press Release (March23, 2009)

[28] Estimated based on a conversion rate of 1 pound = 228.05 yen (TTM at end of December 2007)

Just like in the regulatory sphere, the situation in each country also differs according to external factors and the form of infrastructure sharing

Below is a summary of the examples of IS in each country together with the external factors that influence the effects of the IS discussed in Chapter 3 (see Fig. 25). Because the **US** is a large nation and has many MNO there are demand-side factors, namely the strong demand for IS. On top of this, independent tower operators were set up relatively early in the US and the tower industry is now one of the major US industries. **India** is also a large country and has a great many MNO, so there is strong pressure to cut costs from a competitive standpoint. Thus the same strong demand for IS also exists in India. Due to rapidly rising network demands, the operators have been pressed by the regulatory authorities into spinning off their infrastructure operations to create their own tower operators or tower operators run together with other companies. These new companies then lease towers to other MNO. The markets in the **UK and the rest of Europe** are reaching the saturation point. Under these circumstances, there have been several examples of sharing in which a number of MNO work together to cut network costs and develop 3G areas. Pre-existing MNO are also leasing their towers to other companies to achieve effective capital utilization.

[Fig.25] Comparative analysis of each country's infrastructure sharing status and external factors

		UK	India	US
Infrastructure sharing status		■ The focus is on joint ownership/usage between MNO (1)Vodafone UK and Orange UK (2) T-Mobile and Hutchison3G (3) Vodafone and Telefonica	■ Independent tower companies operate while there are examples of sharing between MNO ■ India's largest company (Indus Tower) owns over 100,000 towers ■ Out of India's top seven MNO, five have established tower operators in joint ventures with other MNO or funds	■ A large tower industry exists, composed of many tower operators ■ There are examples of sharing between MNO
External Factors	**(1) Size of land area**	Small (240,000 square km)	Large (3.29 million square km)	Large (9.37 million square km)
	(2) No. of MNO	Average (Five companies)	Very many (Over 10 companies)	Many (Four majors and several others)
	(3) Pressure to reduce costs	Average	High	Average

Source: Compiled by MHCB Industry Research Division from IR material from each company

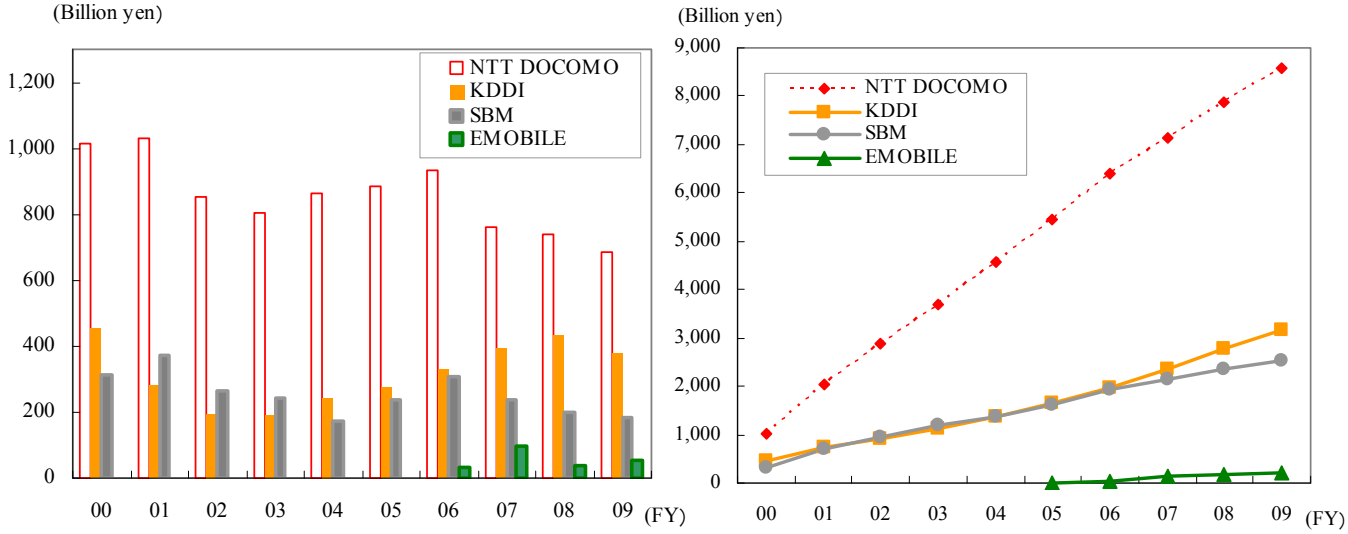
Chapter 4: Network Infrastructure Development in Japan

Japan making significant progress in network infrastructure development

Helped by its small land area and high profitability, and led by NTT DOCOMO – Japan's most popular mobile MNO by subscribers, network infrastructure has developed at a considerable pace in Japan. NTT DOCOMO led the world in launching its commercial 3G network in the early 2000s, and all three of Japan's leading MNO have developed their 3G networks.

In terms of infrastructure development costs, the three leading MNO (i.e. NTT DOCOMO, KDDI [including the former TU-KA] and SoftBank Mobile) are estimated to have invested more than 14 trillion yen over the decade spanning FY 2000 through FY 2009. Of the three, NTT DOCOMO has plowed a massive 8.6 trillion yen into infrastructure development and its capacity investment towers above that of its rivals (see Fig. 26).

[Fig. 26] Capital Expenditure Figures for MNO
(left chart: single-year basis; right chart: cumulative spending since fiscal 2000)



Source: Compiled by MHCB Industry Research Division based on IR material from each company

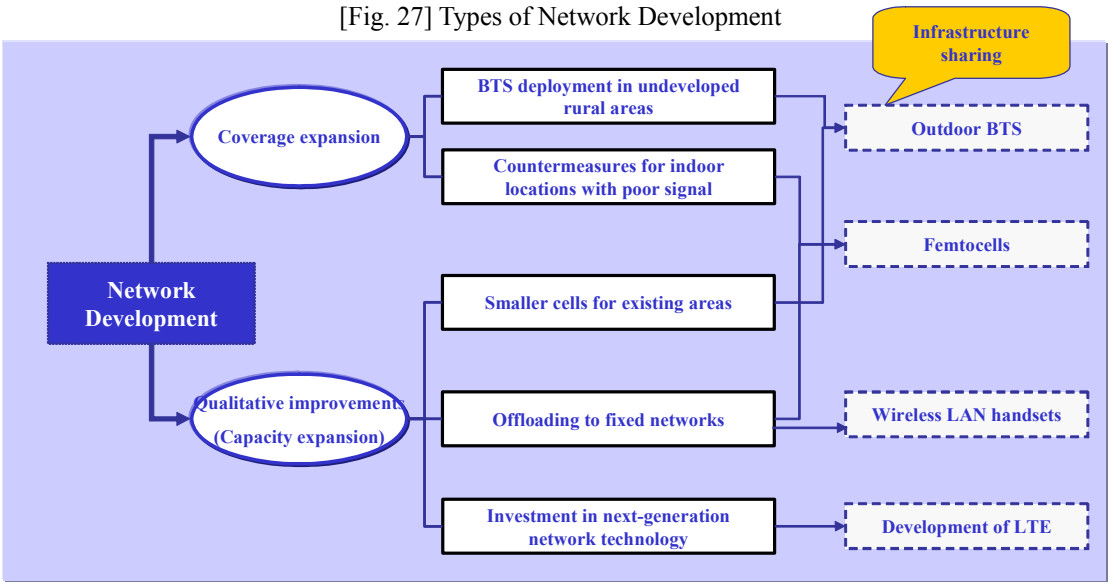
Room for further network development in terms of 'coverage expansion', especially in mountainous areas

There are two aspects to network development: 'coverage expansion' and 'qualitative improvements' (capacity expansion) (see Fig. 27). 'Coverage expansion' literally refers to extensions to the regions (areas) in which communication services are available through the construction of new base transceiver stations (BTS). This is typically expressed in terms of 'percentage population coverage' and is calculated on the basis of service availability at municipal government office sites[29]. Put simply, insofar as communication services are usable at a municipal government office the entire population of

[29] As stated in the DOCOMO April 2010 Mobile Phone Catalogue

that municipality is included in the coverage ratio, irrespective of whether such services are available from their homes, which means that the figures tend to be higher than the reality. Calculated on this basis and with the exception of EMOBILE, which entered the market in 2007 and is still in the process of developing its area network, the three leading MNO have all achieved close to 100% population coverage nationwide, with the figures seeming to imply that there is no room for further coverage expansion (see Fig. 28).

[Fig. 27] Types of Network Development



Source: Compiled by MHCB Industry Research Division

[Fig. 28] BTS and Tower Sharing Nationwide

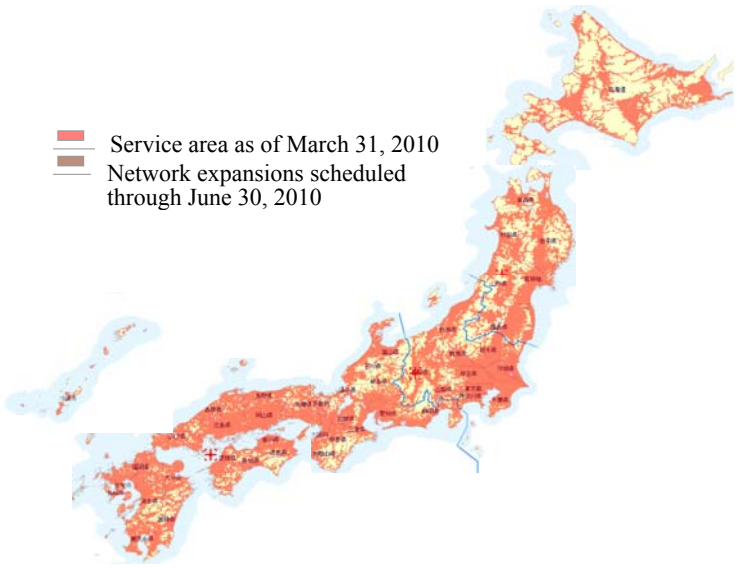
	NTT Docomo	KDDI	Softbank Mobile	eMobile	Willcom	UQ Com.
■ BTS	84,947	47,705	73,196	9,508	Approx. 160,000	13,060
■ Communications standard	W-CDMA HSDPA HSUPA	CDMA2000 1x EV-DO Rev.A EV-DO Rev.A MC	W-CDMA HSDPA	W-CDMA HSDPA HSUPA HSPA+	PHS/XGP (Micro cell)	Mobile WiMAX
■ Pop. coverage	100%	99.9%	99.98%	Over 90%	99%	76%
■ Shared infrastructure	Less than 1% (Angle truss steel towers only)	Less than 1%	Less than 1%	n/a	n/a	n/a

Source: Compiled by MHCB Industry Research Division. Figures on BTS numbers for DOCOMO, KDDI, SoftBank Mobile, EMOBILE and UQ Com were taken from the Ministry of Internal Affairs and Communications (MIC) Radio Use Web Site (http://www.tele.soumu.go.jp/) (as of October 30, 2010). Information regarding Willcom's BTS was compiled by MHCB Industry Research Division from Willcom's IR documents. The figures on shared usage were taken from the MIC's "The Role of Connection Rules given Environmental Changes in the Telecommunications Market". (An Information and Communications Council report dated October 16, 2009)

As is illustrated by Figures 29 through 32, however, there are still many areas, particularly in the mountains, that do not have access to mobile phone services. A closer comparison of MNO area coverage reveals a marked gap between DOCOMO and its rivals in terms of network development, with DOCOMO having a conspicuous edge in rural areas. By contrast, Japan's other MNO continue to have significant network development needs going forward.

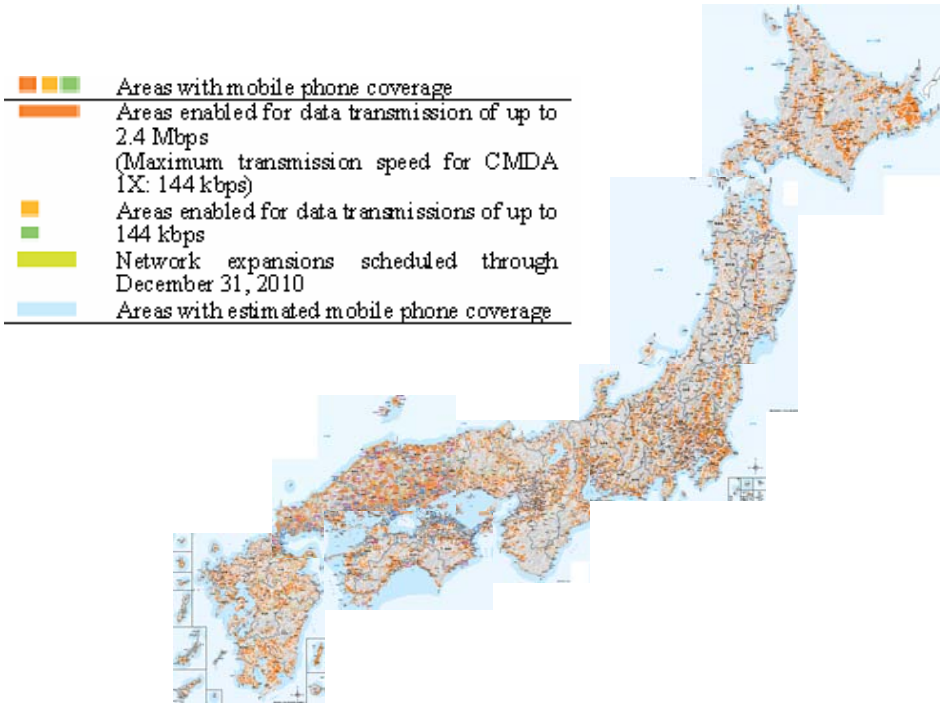
Furthermore, due to the unique nature of radio waves, signal loss indoors and in between tall buildings remain a problem even in urban areas. There is a need for finely tuned area development to improve coverage at these so-called dead spots.

[Fig. 29] DOCOMO National Network Coverage (as of August 2010)



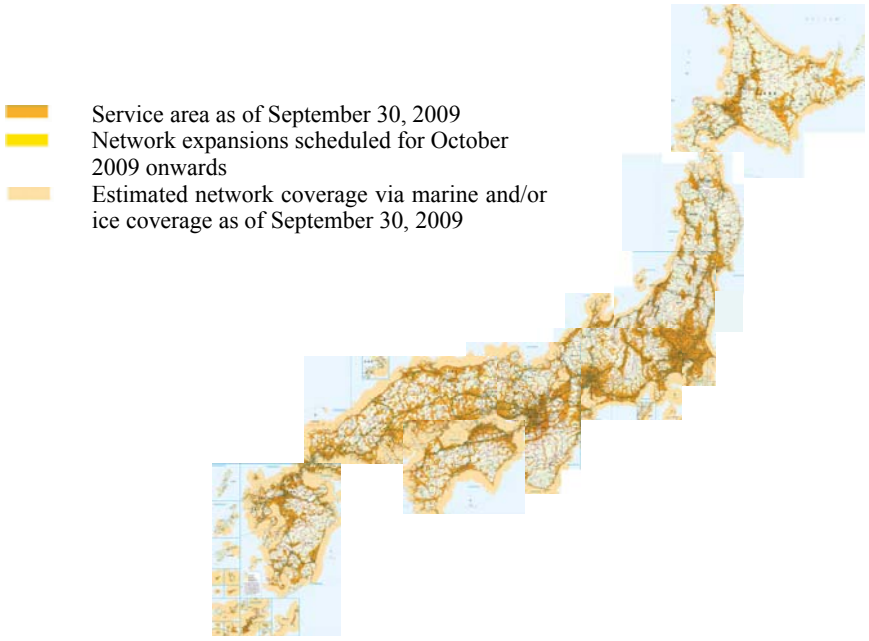
Source: Compiled by MHCB Industry Research Division from the NTT DOCOMO website (http://www.nttdocomo.co.jp/support/area) (November 29, 2010)

[Fig. 30] KDDI National Network Coverage (as of August 2010)



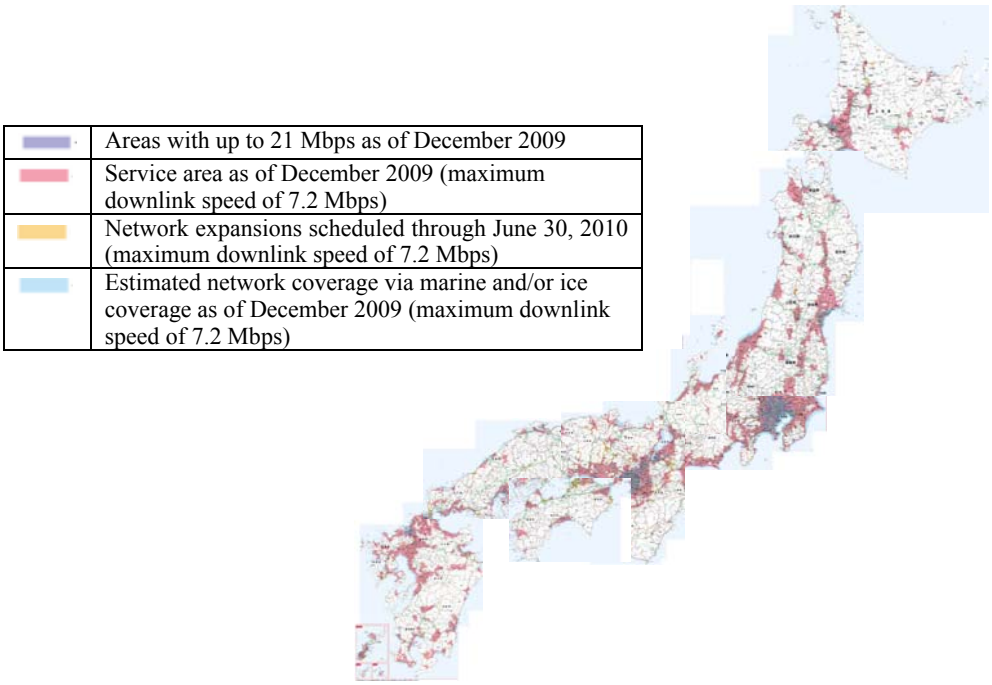
Source: Compiled by MHCB Industry Research Division from the KDDI website (http://www.au.kddi.com/service_area/zenkoku/index.html) (November 29, 2010)

[Fig. 31] SoftBank Mobile National Network Coverage (as of August 2010)



Source: Compiled by MHCB Industry Research Division from the SoftBank Mobile website (http://mb.softank.jp/mb/service_area/) (November 29, 21010)

[Fig. 32] EMOBILE National Network Coverage (as of August 2010)



Source: Compiled by MHCB Industry Research Division from the EMOBILE website (http://emobile.jp/area/area.html) (November 29, 2010)

Japan's MNO more concerned about 'qualitative improvements' than coverage expansion

By contrast, 'qualitative improvements' to network architecture are designed to enhance network capacity to cope with the growth in mobile data traffic. MNO are modifying cell design (BTS deployment) in areas that already have BTS to prevent problems with signal strength and interference, and installing new BTS. This serves to increase overall network capacity by distributing the data traffic load carried by individual BTS and to amplify the effective speed (throughput) of data transmissions.

Another effective option involves offloading traffic onto fixed lines: installing tiny cellular base stations (femtocells) or wireless local area network (LAN) routers indoors, as opposed to outdoor BTS, to pick up the radio waves transmitted by mobile devices and offload them onto fixed broadband networks.

Japan's MNO have all begun offering wireless LAN and are currently providing the services outlined in the table below (see Fig. 33). DOCOMO launched Japan's first consumer service for fixed-mobile convergence: Home U, in June 2008, and in May 2009 announced a reduction in the fees for its dual-mode service. That month, SoftBank Mobile announced the launch of its "Mobile Wireless LAN" service, and in November it ran a campaign offering free service use having renamed its service "Mobile Wi-Fi". Wi-Fi became the key point in the battle for sales during the winter of 2009, and the network of

Wi-Fi hotspots has expanded rapidly. KDDI, meanwhile, announced the launch of its wireless LAN service, "Wi-Fi WIN", in May 2009 to coincide with the debut of its "biblio" handset, which was designed for downloading e-books with an eye to the electronic book market.

[Fig. 33] Overview of Wireless LAN Services Offered by Japan's MNO

MNO	NTT DOCOMO	KDDI	SoftBank
Name of Service	Home U	Wi-Fi WIN	Mobile Wi-Fi
Launch date/monthly fee	Available from June 2008 at ¥1,029 per month Announced montly fee reduction to ¥490 in May 2009 (applicable from June onward)	Available from May 2009 at ¥525 per month	Announced launch of Mobile Wireless LAN in May 2009 (reduced montly charges to ¥490 after DOCOMO opposed the proposed figure of ¥1,290) Renamed the service Mobile Wi-Fi in November 2009 and ran a campaign offering free service
Service content	Free VoIP calls to other Home U users around the clock; 30% discount on calls to non-Home U users Available with a two-tier flate-rate plan subscription Exclusive contents for Home U subscribers In Principle, cannot be used at public wireless LAN hotspots	Available with a two-tier flat-rate plan subscription In principle, unusable at public wireless LAN hotspots	Usable at public wireless LAN hotspots provided by SoftBank Mobile or SoftBank Wi-Fi Hotspots (only at SoftBank Telecom "BB Mobile Points" initially) "mobile Wi-Fi Channel" provided exclusively to subscribers Subscribers must sign up for a flat-rate plan (¥4,410 per month; no two-tier rate available)
Promotional campain (fees)	No monthly charges for the first two months	No monthly charges through June 2011	No montly charges for users who subscribe by December 2010

Source: Compiled by MHCB Industry Research Division based on the IR materials and the websites of each company

Fig. 34 provides an overview of femtocell services in Japan, with DOCOMO leading the field in November 2009. In March 2010 SoftBank Mobile unveiled a manifesto to improve signals and announced that it would begin offering free femtocells to subscribers without network coverage from May onwards (see Fig. 35). KDDI followed suit with its July announcement that it would provide free femtocells to cater for areas without reception, meaning that all three of Japan's leading MNO are now offering femtocell services. For SoftBank Mobile and KDDI, the primary aim is to improve reception in high-rise condominiums, though the moves also serve to offload traffic from mobile phones to fixed lines.

[Fig. 34] Overview of Femtocell Services Offered by Japan's MNO

	NTT DOCOMO	KDDI	SoftBank
Name of service	MyArea	au Femtocell	Home Antenna FT
Launch date	November 2009	July 2010	May 2010
Objectives	Provide value added services	Network coverage for areas with no reception	Network coverage for areas with no reception
Monthly fee	¥980	Free	Free
Remarks	Initial signup fee of ¥2,100 (free after campaign runs its course) Monthly fee of ¥490 following reductions	Free installation	Installation charges of ¥17,850

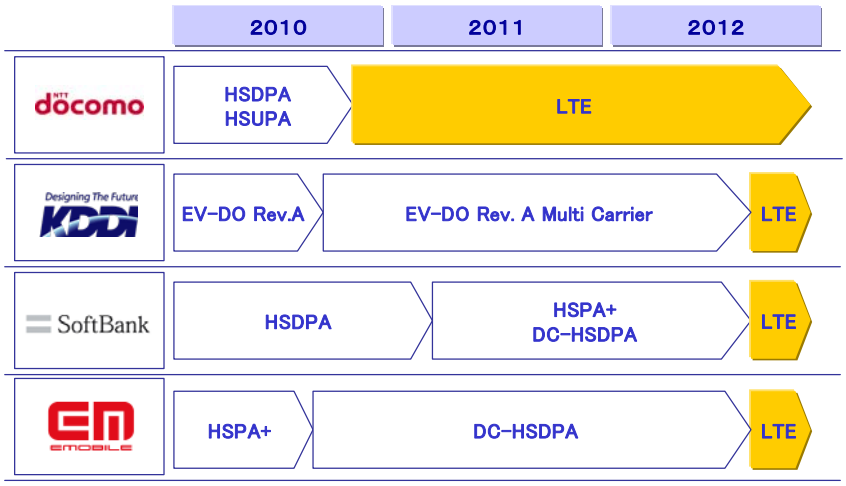
Source: Compiled by MHCB Industry Research Division based on the IR materials of each company
Note: The exemption from KDDI monthly charges applies only to subscribers to its au Hikari fiber-to-the-home service

[Fig. 35] Femtocell BTS (SoftBank Mobile devices; left photo shows a home use femtocell, right photo shows an office use femtocell)

Source: Excerpted from the SoftBank Mobile financial report for fiscal 2009

Investing in long-term evolution (LTE) and other highly efficient next generation wireless communications standards is another viable means of reducing the cost per bit (i.e. the cost per unit of traffic) because such new standards make more efficient use of radio waves. Ultimately, all of Japan's MNO are planning to upgrade to LTE (see Fig. 36), though the timing will vary depending on differences in the respective stances towards the extent to which existing standards can be used up and the relative merits of their technology development capabilities.

[Fig. 36] LTE Upgrade Plans of Japan's MNO



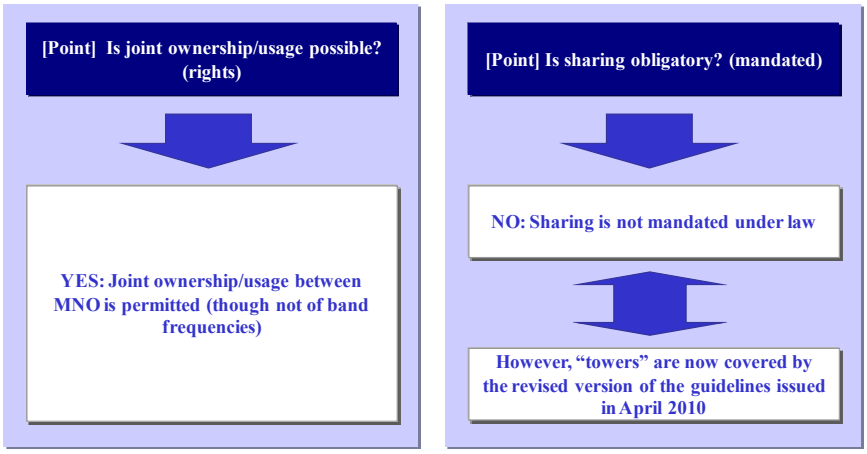
Source: Compiled by MHCB Industry Research Division from various IR documents and media
Note: November 2010 current

While none of Japan's MNO have disclosed information on the indicators used to measure qualitative improvements in network capacity, all are in a greater rush to make the improvements needed to meet the explosion in data traffic than to expand the coverage of their networks.

(2) Regulations on the joint ownership/usage of mobile network infrastructure in Japan

At present, the joint ownership and/or usage of network infrastructure is permitted at the discretion of the MNO. On the other hand, Japan's MNO are under no obligation to share company facilities with another (or other) MNO. However, with the inclusion of towers in the revised guidelines on the leasing of telephone poles and other facilities released in April this year, there is evidence of a shift in the stance of Japan's regulatory authorities towards the concept of 'obligation' (see Fig. 37). A detailed explanation is provided hereunder.

[Fig. 37] Current Regulation on Mobile Network Infrastructure Sharing



Source: Compiled by MHCB Industry Research Division

Joint ownership/ usage is possible

Joint ownership/usage rights (no prohibition on joint ownership): The joint ownership/usage of infrastructure between MNO is permitted. Not surprisingly, the joint ownership/usage of band frequencies is not permitted from competition policy perspectives. At present, there is no prohibition on the cooperative, voluntary joint ownership/usage of (1) towers, (2) radio access networks, and (3) core networks between MNO.

No obligation to share infrastructure with other MNO

No obligation to share mobile infrastructure with other MNO: On the other hand, the sharing (leasing) of network infrastructure has yet to be mandated. A report from the Information and Communications Council dated October 16, 2009 states that: "To date, the sharing of towers and other facilities has been undertaken as a voluntary initiative based on cooperation between mobile network operators, and there is no need to mandate infrastructure sharing". The Council argues that: "Since mobile communications providers are allocated a limited number of radio frequencies, in principle, the construction of national networks is necessary to business expansion and mandating the sharing of

towers, etc. would be detrimental to mobile network operators that install such towers, etc. and compete on the basis of network infrastructure, and could inhibit such competition."

Guidelines revised in light of need to promote infrastructure sharing

With the revision of the guidelines, define the procedures regarding tower sharing:

In the same response it was said "physical space for the location of towers is limited and in the case that due to regulations regarding exterior appearance, the construction of multiple towers is limited, there are many cases in which it is impossible for a company to construct its own towers", and due to the fact that "in the event that smooth cooperation is not achieved between the providers, and leads to the inability to share towers, the result is that service cannot be provided in the specified area, which harms the interests of the users", "based on the sharing of an autonomous plan developed through the cooperation of the providers, realization of further improvement in cooperation between providers in order to promote tower sharing, is necessary in increasing user convenience".

Responding to the aforementioned Information and Communications Council report and in light of the perceived need to promote infrastructure sharing, a revised edition of the "Guidelines on the Use of Poles, Ducts, Conduits and Other Similar Facilities Owned by Public Utilities" that is based on the existing framework for voluntary sharing but aims to facilitate cooperation between mobile network operators was published in April this year (see Fig. 38). These guidelines establish procedures for the sharing of "towers" that are intended to serve as mobile BTS, and while the effects are unquantifiable, the guidelines represent a step towards additional infrastructure sharing.

[Fig. 38] Overview of the Revised Guidelines on the Use of Poles, Ducts, Conduits and Other Similar Facilities Owned by Public Utilities

Provision	Pre-Revision	Post-Revision (additions)
Equipment covered	Electric poles, ducts, conduits, water mains and other equipment that can be used to lay tracks	Steel towers and other equipment for which antennas can be installed
Equipment owners	■ Telecommunications providers ■ Electric power providers ■ Railway companies	■ Telecommunications providers
Operators	Authorized telecommunications providers	Unchanged (though scope limited to the installation of mobile phone BTS)
Responses	Within two months, in principle	Unchanged
Reasons for loan refusal	No available space, incompatibility of technical standards, etc.	Unchanged
Loan term	Five years, in principle	Unchanged
Loan compensation	An amount appropriate to the use of the facilities based on cost	Unchanged

Source: Compiled from MIC's "Revisions to Guidelines Regarding Utility Poles, Ducts, Conduits, etc." by MHCB Industry Research Division

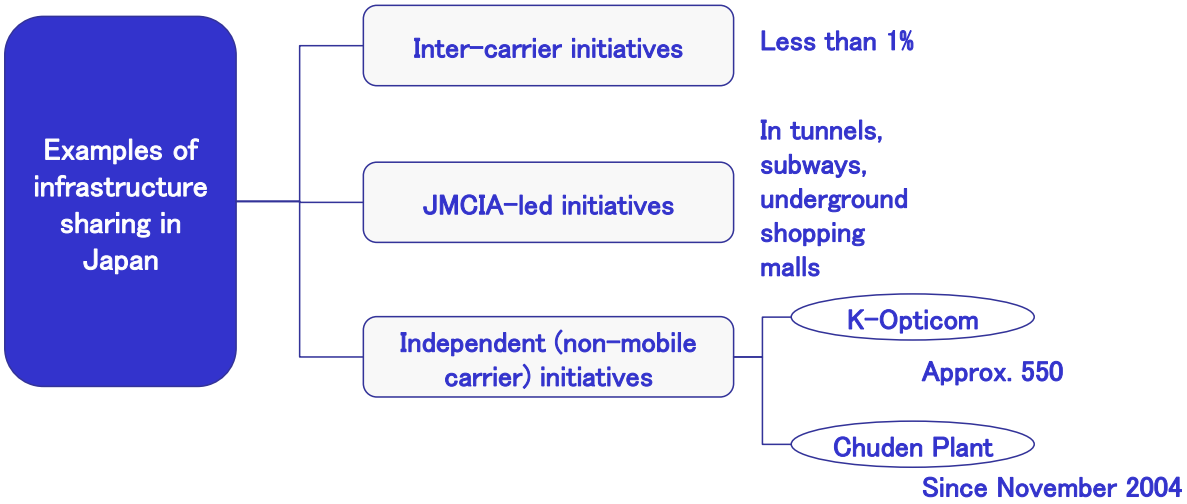
These guidelines establish some standards for steel tower sharing between mobile network operators, where there were no specific standards before. Where a telecommunications provider owning the facilities covered by the guidelines receives a request for the lease of said facilities from another provider, it is required to furnish a response either consenting to or declining the request "within two months, in principle" having confirmed empty space availability, conformity with technical standards and other related matters. The guidelines establish a leasing term of five years, in principle, and stipulate that compensation shall be "an amount appropriate to the use of the facilities based on cost".

(3) Mobile infrastructure sharing in Japan today

Little infrastructure sharing at present

This section examines the current status of infrastructure sharing in Japan. Unlike U.S. and India, Japan has just four MNO: the three leading groups and one new entrant named EMOBILE. At 380,000 square kilometers, Japan's land mass is also smaller than that of many other nations. At the same time, with market saturation (i.e. a growth plateau) close at hand, domestic MNO will increasingly need to reduce their network costs. These external factors resulted in the small amount of mobile infrastructure sharing in Japan. At present, less than 1% of all BTS nationwide are shared. The Japan Mobile Communications Infrastructure Association (JMCIA), meanwhile, is at the head of an initiative to promote infrastructure sharing by domestic MNO in tunnels and other specific sites. Added to which, despite the fact that so-called non-mobile carriers (i.e. independents) have a considerable presence in overseas markets, their presence in Japan is limited to power systems (see Fig. 39). A detailed explanation is offered below.

[Fig. 39] Examples of Mobile Infrastructure Sharing in Japan



Source: Compiled by MHCB Industry Research Division based on MIC's "State of Connection Rules in Response to the Environmental Changes in the Telecommunications Market", the Japan Mobile Communications Infrastructure Association HP (http://www.jmcia.or.jp/main/002gaiyou.htm), and K-Opticom HP (http://www.k-opti.com/business/tower/)

Inter-carrier sharing represents less than 1% of all towers

While there are some examples of **inter-carrier sharing**, the practice is limited at best. According to "The Role of Connection Rules Given Environmental Changes in the Telecommunications Market", an Information and Communications Council Report, less than 1% of total towers owned by DOCOMO, KDDI and SoftBank Mobile are shared. DOCOMO leases (shares) some of its angle truss steel towers, which are used for wide-area coverage in

the early stages of network development. Since such towers are designed to support the weight of existing BTS antenna and the choice of tower type is an issue, the towers must either be reinforced or rebuilt in order to support the weight of additional antenna.

Some infrastructure sharing through independent organizations

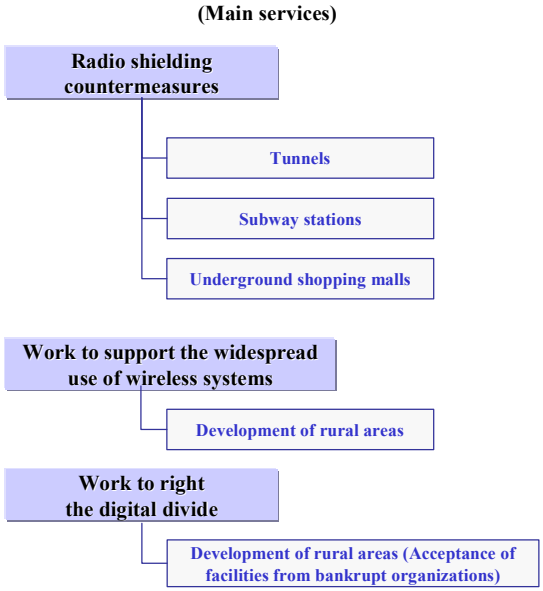
Association-led (third-party) initiatives: Besides equipment sharing through mutual cooperation between MNO, there are a number of examples of sharing (certain equipment) through the mediation of a third-party organization[30]. The Japan Mobile Communications Infrastructure Association (JMCIA) [31] coordinates MNO in their efforts to develop and upgrade communications equipment, and makes it possible for multiple MNO to share towers and other equipment in poor signal locations and/or regions (see Fig. 40). The Association was established in 1994 under the administration of the then Ministry of Posts and Telecommunications (the current Ministry of Internal Affairs and Communications) and the Ministry of Construction (the current Ministry of Land, Infrastructure, Transport and Tourism), and is in charge of the planning and efficient development of mobile phone repeaters that are shared consensually between MNO in expressway tunnels, railroad tunnels, subway stations, and those underground shopping malls and parking lots that are located under public highways.

Ongoing efforts to promote the joint ownership and usage of mobile network infrastructure through such bodies are considered a meaningful undertaking. Where equipment is to be installed inside tunnels to solve the signal loss problem, for example, a joint undertaking using shared equipment, as opposed to individual MNO all installing their own equipment, makes it possible to: (1) keep the traffic restrictions needed during installation work to a minimum (thus avoiding congestion), (2) make effective use of the limited space for equipment available inside tunnels, and (3) minimize the negative impact on the landscape and environment. This example of equipment sharing could be usefully applied in subway stations, underground shopping malls, underground parking lots and other such locations

[30] Australia has a similar organization: Mobile Carriers Forum, though the scope of services it provides differs somewhat from that of JMCIA. (http://www.mcf.amta.org.au/)
[31] JMCIA was formerly known as the Road Tunnel Mobile Communications Infrastructure Association. It changed its name to JMCIA in 2005. The Association has upwards of 50 members, including 7 communications carriers, 28 communications architecture firms, and 18 equipment and cable manufacturers.

[Fig. 40] Overview of JMCIA and its Undertakings

Name	Japan Mobile Communications Infrastructure Association
Established	1994
Administrators	Ministry of Internal Affairs and Communications, Ministry of Land, Infrastructure, Transport and Tourism
Representative	Kei Irie, Director (Chairman)
Board	■ 8 directors (4 communication carriers, 2 communication architecture firms, 2 equipment manufacturers) ■ 2 auditors (1 communication architecture firm, 1 communications carrier)
Members	■ 17 full-time member companies (8 of which are communication carriers; other members include communication architecture firms, etc.) ■ 37 supporting member companies
Services	1. Development, maintenance, management and provision of the repeaters needed to enable the use of mobile communications services in expressway tunnels, underground passageways, etc. 2. Maintenance, management and provision of the repeaters needed to enable the use of mobile communications services in areas where it is deemed necessary to correct the digital divide 3. Surveys relating to countermeasures for poor signal areas 4. Other work necessary to accomplishing JMCIA goals



Source: Compiled by MHCB Industry Research Division based the Japan Mobile Communications Infrastructure Association HP (http://www.jmcia.or.jp/main/002gaiyou.htm)

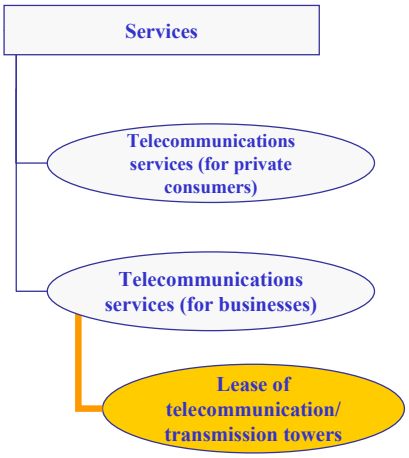
Some electric power providers leasing towers as independent agencies

Infrastructure sharing by non-carrier, independent companies: Some businesses are leasing towers to MNO as independent (i.e. non-mobile carriers) operators. Such operators make it possible for several MNO to share a single tower by allowing them to install their BTS on the leased tower. K-Opticom, a wholly-owned subsidiary of Kansai Electric Power Company (KEPCO), provides fixed broadband solutions and other telecommunications services and owns some 600 telecommunications towers, of which around 550 are on lease to Japan's three leading MNO (see Fig. 41). In addition, Chuden Plant, which is owned by the Chugoku Electric Power Group and undertakes construction and maintenance work for group companies, mediates leases of the transmission towers owned by the Chugoku Electric Power Company to MNO.

[Fig. 41] Overview of the Tower Rental Business Operated by K-Opticom
(a wholly-owned subsidiary of KEPCO)

Construction of telecommunications infrastructure towards the realization of a networked society
Leases communication/transmission towers to mobile network operators and TV broadcasters

Has constructed and manages just under 600 communications and transmission towers in the Kansai, Tokai and Hokuriku regions, which it loans to KDDI (au), SoftBank Mobile and NTT DOCOMO as mobile phone BTS. Since 2005 it has been loaning equipment to private TV stations in the Kansai region for digital broadcast transmission circuits and linkups to the southwest of Hyogo Prefecture, and the company is involved in the development of communications infrastructure. It is also contributing to environmental conservation efforts by facilitating tower sharing and the multiple use of transmission towers. The company also executes ancillary works for the wireless equipment used in mobile phone BTS and countermeasures to improve indoor reception in poor signal locations.



Source: Compiled by MHCB Industry Research Division based on K-Opticom HP (http://www.k-opti.com/business/tower/)

Chapter 5: Conclusion

(1) Towards introduction and expansion of infrastructure sharing in the Japanese market

We will examine the factors promoting or impeding the introduction of infrastructure sharing.

At the beginning, we pointed out the "structural problems" that the MNO are aware of facing. We then looked at some case studies of advanced overseas infrastructure sharing, after which we discussed the status of the network infrastructure upgrading by domestic MNO and confirmed the domestic situation. Based on this, can we expect the domestic MNO to move towards infrastructure sharing from hereon? In this chapter we will examine the factors influencing the introduction of infrastructure sharing between domestic MNO in the Japanese market. We will also look at the prospects for the future.

Driver (1): Growing pressure to cut network costs that are rising due to an increase in domestic data traffic

If we look at the **drivers** of infrastructure sharing**, driver number one** is the growing **pressure to cut network costs.** As mentioned before, an increase in traffic is leading to an increase in the costs associated with network upgrading and maintenance. At the same time, with the market reaching saturation point, competition is becoming ever more intense between MNO as they seek a share of the limited market pie, with earnings expected to fall as a result. Based on this, there is, as mentioned, growing pressure to cut network costs. In the network field, MNO are looking at the idea of infrastructure sharing as a way to cut costs.

Driver (2): The allocation of frequencies in the 700/900MHz bandwidth will act as a trigger.

Driver number two is the likelihood that infrastructure sharing will be spurred on by the **allocation of frequencies in the 700/900MHz**, scheduled from July 2012. The characteristics of frequencies differ according to their wavelengths. Some MNO (SoftBank Mobile or EMOBILE) have not currently been allocated low-frequency bandwidths (800MHz), but if they acquire these bandwidths, then they probably face a growing need to set up new BTS or to upgrade the scale of their BTS in order to handle the special characteristics of these frequencies. In this event, we are likely to see moves towards joint ownership and usage amongst the MNO, especially amongst the MNO mentioned above.

Driver (3): MNO will need to increase the number of BTS in line with the upgrade to next-generation communication standards.

Driver number three is the likelihood that infrastructure sharing will be spurred on by the necessity for **upgrading in order to meet next-generation communication standards.** The next-generation LTE communication standards, 4G (LTE-Advanced, etc.), will use higher frequencies that those currently allocated according to 3G and 3.5G standards (see Fig. 42). The higher a frequency becomes, the more it travels in a straight line, so MNO will be faced with the necessity of deploying more BTS into smaller cells and increasing the number/density of these cells above and beyond current levels. Of course, this demand can not be met with outdoor BTS only, so the MNO will probably have to develop femtocell hybrid base stations, but at any rate,

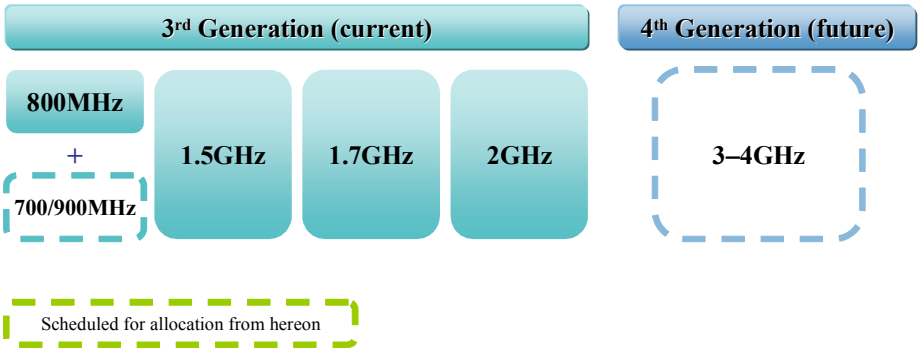
the MNO will have to increase BTS numbers. We are likely to see infrastructure sharing between MNO in order to meet this necessity for new BTS development. In Europe, joint-ownership and usage was adopted in order to efficiently develop 3G areas. Japan may also see these kinds of movements with the introduction of 4G, coupled with driver number one.

Furthermore, from LTE (3.9G) onwards the MNO will have standardized their communication standards. Though there are various technological obstacles, this standardization also means that MNO will also be able to undertake joint ownership and usage on a wider scale, not just by sharing towers but also through the joint ownership/usage of RAN.

Driver (4): Changes to the regulations may also act as a driver.

The MNO might also be spurred on by **changes to the regulations relating to the joint ownership and usage of mobile infrastructure**. In addition to the revisions to the guidelines in April 2010, from hereon we may see a strengthening of the regulations in the direction of compulsory joint ownership/usage. In this event, we can expect to see further cases of MNO with infrastructure (like NTT DOCOMO) leasing this infrastructure to MNO without any, and the industry will probably move further in the direction of infrastructure sharing.

[Fig. 42] Currently-allocated Frequency Bands and Bands Scheduled for Allocation



Source: Compiled by MHCB Industry Research Division

Obstacle (1): Improvements to the network environment through the offloading of traffic onto fixed lines

On the other hand, if we look at the **obstacles** to infrastructure sharing, **obstacle number one is the improvement to the network environment through alternative means of offloading traffic onto fixed lines.** Specifically, the MNO are developing methods of offloading traffic onto fixed lines using wireless LAN and femtocell, etc. In this way, it is thought that the MNO will, on a standalone basis, be able to provide enough network capacity. This offloading onto fixed lines is also recognized as a cost effective strategy, so each MNO is pushing forward with their own initiatives in this area.

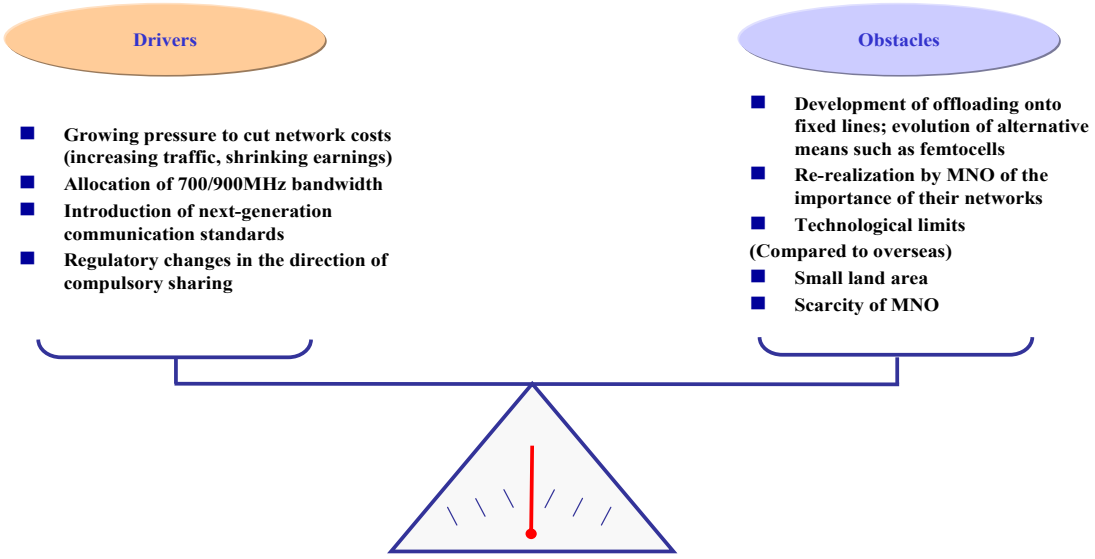
Obstacle (2): MNO may realize once more the importance of their networks.

Obstacle number two is the fact that **the MNO may once again realize the importance of their networks.** The leading MNO (the ones with an advanced level of infrastructure development and who possess infrastructure that other MNO don't) have always seen their "networks" as the source of their competitiveness. From hereon, if the spread of smart phones leads to the enrichment of the contents flowing through the mobile networks, then networks capable of supporting the usage of higher-layer services will become even more important as sources of competitiveness. Under these circumstances, those MNO possessing this infrastructure might become aware once more of the importance of their infrastructure and as a result may be less inclined to share it with those MNO who do not possess such infrastructure.

Obstacle (3): Technological limits to infrastructure sharing

Obstacle number three is the fact that there are technological limits to infrastructure sharing. Those already-established BTS were originally designed with the intention of supporting the weight of pre-existing antenna, so in order to add extra, new antennas, substantial additional costs would be necessary for reinforcing or rebuilding these BTS. Furthermore, as mentioned above, BTS in urban areas tend to be of the "rooftop type", a kind unsuitable to joint ownership or usage. For these reasons, the practical viability of infrastructure sharing, including the building of new facilities, is very low. Therefore, from a technological standpoint (concerning weight capacity in particular), infrastructure sharing will probably be limited in scale to some newly-built BTS or some pre-existing facilities that are located outside of urban areas.

[Fig. 43] Factors Influencing Moves towards Infrastructure Sharing between MNO



Source: Compiled by MHCB Industry Research Division

Detailed above are the drivers and obstacles influencing the introduction of infrastructure sharing between domestic MNO in the Japanese market (see Fig. 43). If infrastructure sharing does go ahead, what kind of timeframe are we looking at? Which MNO will make the first moves and what form will these take?

Infrastructure sharing is unlikely in the short term but a growing number of drivers are expected in the mid- to long-term.

If we look at the timeframe, then infrastructure sharing looks unlikely in the short-term due to the obstacles mentioned before, such as (1) the alternative means to deal with traffic by offloading it onto fixed lines using wireless LAN and femtocell, etc. and (2) the technological limits of joint ownership/usage of existing towers. However, in the mid- to long-term, pressure will gradually increase to cut network costs, so infrastructure sharing can be expected to occur in tandem with the allocation of frequencies in the 700/900MHz bandwidth (starting in 2012) and the rolling out of BTS for 4G onwards.

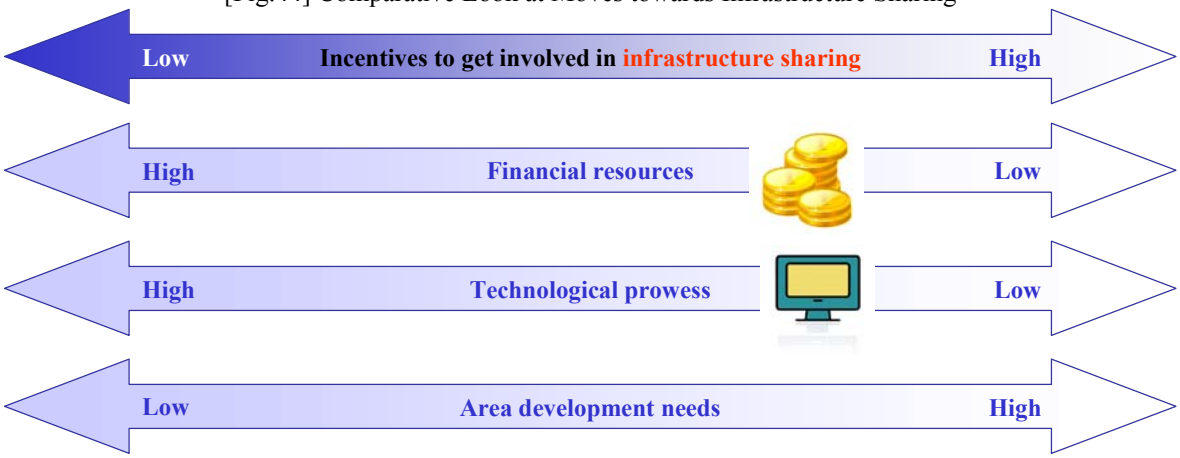
MNO with high-level infrastructure will have less need for infrastructure sharing.

As for which MNO might get involved with infrastructure sharing, it is only natural that there will be less incentive for those MNO who already have a high level of infrastructure than for those without such advanced infrastructure (see Fig. 44). Those MNO with advanced infrastructure have been steadily upgrading their infrastructure using their preeminent technological prowess and strong financial power. As a result, they have reached a high level of service both in terms of area and quality. Networks are becoming more important as data traffic grows. In these circumstances, MNO who have developed advanced infrastructure will be aware that their competitive superiority may be shaken by the opening up of this infrastructure to other MNO, so they probably maintain a cautious attitude to infrastructure sharing for the time being.

MNO with a low-level infrastructure will have more need for infrastructure sharing.

On the other hand, for MNO with a low level of infrastructure, the necessity of using the existing infrastructure of the other MNO will be higher. Additionally, it is also thought that the necessity will be high for shared construction (joint ownership) of infrastructure between MNO with low levels of infrastructure, as well as sharing.

[Fig.44] Comparative Look at Moves towards Infrastructure Sharing



Source: Compiled by MHCB Industry Research Division

There will probably be infrastructure sharing centered on those MNO with a low level of infrastructure.

Based on the above, if we do see moves in the direction of infrastructure sharing, in the short term this will be **centered on those MNO with a low level of infrastructure** (see Fig. 45). It would not be a good business strategy for those MNO who have advanced infrastructure to hand over the advantage in infrastructure to those MNO with substantial room for infrastructure development. Therefore, we are unlikely to see the realization of infrastructure sharing that involves those MNO who have developed advanced infrastructure.

Suburbs and rural areas will be the initial target locations for infrastructure sharing.

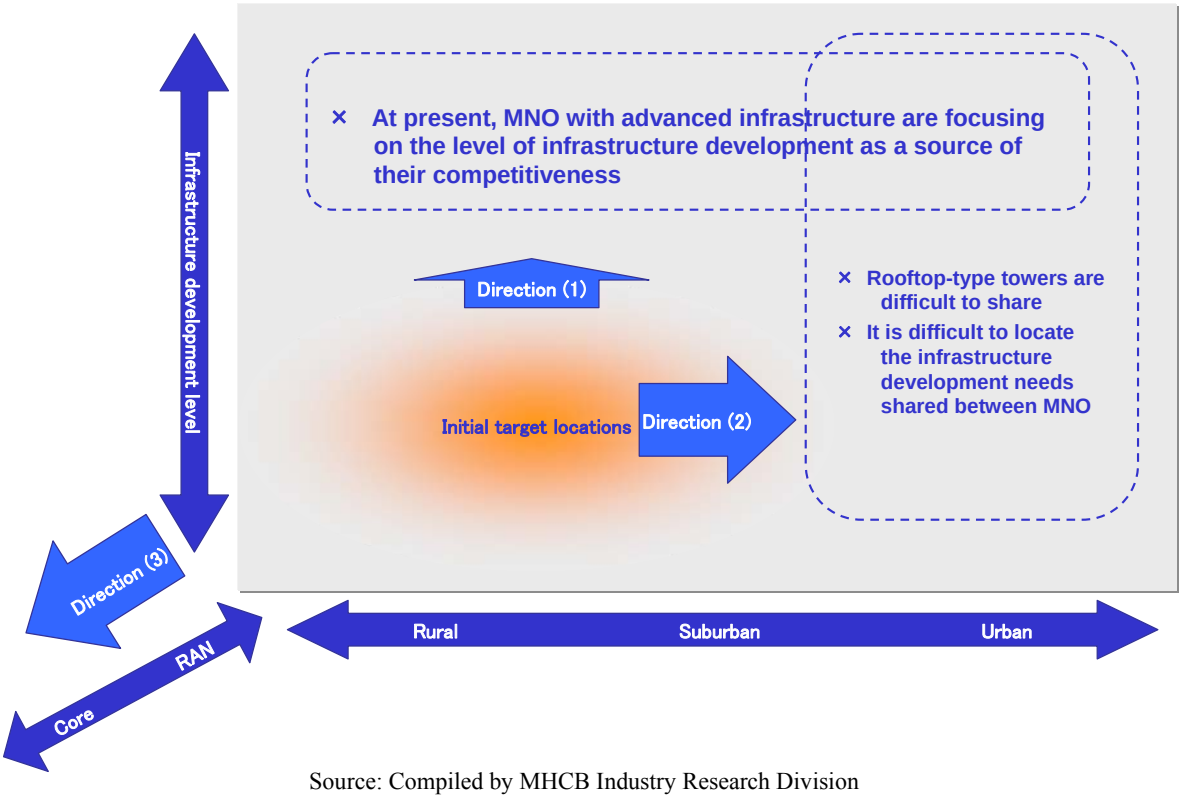
With regards to the location of infrastructure sharing, in urban areas, most of BTS are located on the roofs of buildings, so these areas will be unsuitable for joint ownership and usage. Furthermore, cellular phones are different from PHS in the sense that they are susceptible to signal interference, so it will be necessary to intricately plan the deployment of cells in a way that takes into consideration the location of pre-existing BTS. It will be difficult to select installation sites that cater to the shared needs of multiple MNO.

Therefore, in the mid-term, "**suburbs**" and "**rural areas**" are likely to the locations of infrastructure sharing between "**MNO with room for infrastructure upgrading**".

In the future it will be possible to share infrastructure over an ever-wider area.

With this as a starting point, there will probably be (1) moves towards **the expansion of infrastructure sharing** to involve those MNO who have already upgraded their infrastructure and (2) moves towards the **joint upgrading of infrastructure**, not just in suburbs and rural areas but also **in urban areas**. (3) Also, though there will probably be disagreements over competition policy, in the long term it will be possible to expand **the scale of the joint ownership and usage of infrastructure to include not just access but also RAN and mobile core networks**.

[Fig. 45] Expected Areas for Infrastructure Sharing (MHCB estimates)



Source: Compiled by MHCB Industry Research Division

(2) Further Overseas Expansion of Japanese Carriers

This report has presented examples of infrastructure sharing by MNO in foreign markets where network infrastructure is already gaining ground, and has examined the current infrastructure sharing practices of Japan's MNO and the prospects for Japan's telecommunications market going forward. The final section briefly examines the implications of promoting network infrastructure sharing in the domestic market for Japan's MNO in their efforts to expand to foreign markets.

Japan's MNO way behind foreign players in bid to expand overseas

For example, compared to Spain's Telefonica, the UK's Vodafone and Mexican MNO America Movil, Japan's MNO have been regrettably slow in their bid to expand overseas. NTT DOCOMO has been acquiring shares in foreign MNO over the past few years in a bid to globalize its operations, but due to the fact it is unable to post the revenue from its offshore investments in its consolidated earnings reports because the majority are minority interests, overseas earnings amount to no more than a fraction of total sales. Meanwhile, KDDI now has shares in just one foreign MNO: Mobicom (Mongolia), having sold off its 70% holding in the Paraguayan MNO, Hola Paraguay, in August 2010. The SoftBank Group is focusing on early-stage investment in net ventures and is beginning to realize the value of its investments in China's Alibaba.com and others, though it has yet to invest in mobile telecommunications per se.

The weakness of these efforts to expand overseas mean that Japan's MNO are slipping down the global market capitalization rankings (see Fig. 46), and their global presence is diminishing as a result.

[Fig. 46] Fluctuations in the Market Value of Global Telecommunications Carriers (Unit: US$ billion)

	Dec. 31, 2000		Dec. 31, 2005		Dec. 31, 2009	
1	Vodafone	236.7	Vodafone	132.9	China Mobile	182.0
2	NTT DoCoMo	164.6	AT&T	95.8	AT&T	167.1
3	AT&T	161.6	China Mobile	93.8	Telefonica	127.7
4	Verizon	135.3	Verizon	83.3	Vodafone	121.2
5	NTT	115.9	NTT DoCoMo	74.3	Verizon	94.9
6	China Mobile	101.6	Telefonica	74.0	America Movil	76.0
7	France Telecom	99.7	NTT	71.5	France Telecom	66.5
8	Deutsche Telekom	90.4	Deutsche Telekom	69.9	Deutsche Telekom	64.4
9	Telefonica	71.8	Sprint Nextel	69.0	NTT	62.2
10	Qwest Communications	67.7	France Telecom	64.6	NTT DoCoMo	61.7
11	BT Group	56.0	Telecom Italia	53.9	Telstra	38.0
12	Telstra	46.0	America Movil	53.5	Singapore Telecom	35.2
13	Cable & Wireless	37.6	Softbank	44.5	China Telecom	33.2
14	TELEF MEXICO-L	32.1	Telstra	35.9	TeliaSonera	32.5
15	Singapore Telecom	23.9	BT Group	32.2	China Unicom	30.6
16	BCE	23.6	China Telecom	29.7	MTN Group	28.9
17	China Unicom	19.2	TELEF MEXICO-L	27.9	KPN	27.7
18	Swisscom	19.2	Singapore Telecom	26.2	Telecom Italia	27.6
19	KDDI	18.0	TeliaSonera	25.1	Bharti Airtel	26.4
20	Sprint Nextel	18.0	KDDI	24.4	Softbank	25.4
21	SK Telecom	17.8	BCE	22.2	KDDI	23.9
22	TeliaSonera	15.4	KPN	21.6	Saudi Telecom	23.5
23	Colt Telecom	15.1	Swisscom	19.4	Telenor	23.2
24	PCCW	14.2	Telenor	16.8	China United Network	22.6
25	KPN	13.9	MTN Group	16.3	ETISALAT	21.5
26	Level 3	12.0	Bharti Airtel	14.5	BCE	20.9
27	Softbank	11.5	Telus	14.4	Swisscom	20.4
28	Portugal Telecom	11.0	Rogers Comm	13.4	Telekomunikasi Indonesia	20.2
29	TPSA	9.4	Mobile Telesystems	13.4	Vimpelcom	19.1
30	Telekom Malaysia	9.2	TDC A/S	11.9	Rogers Comm	18.8

Source: Compiled by MHCB Industry Research Division based on various publicly available materials

Although remaining competitive at the infrastructure level is undoubtedly critical to promoting capital investment and technical innovation, with the rapid growth in network investment needs, cooperative ventures involving a portion of this network infrastructure are needed to prevent a decline in the profitability of the industry as a whole. Given the limited scope for growth in Japan's domestic market, promoting a degree of joint ownership/usage among MNO will likely be essential to achieving rational and efficient network infrastructure development for the industry. Japan's MNO must promote infrastructure sharing in order to secure the profitability from their core domestic operations and allocate resources to foreign market expansion. Foreign markets offer substantial growth opportunities, thereby raising the global presence of Japan's telecommunications industry.

References:

Mobile Infrastructure Sharing, GSMA

Intelligible Wireless Communications, Hiroshi Tanaka & Hiroshi Kazama, Tokyo Denki University Press (in Japanese)

Mizuho Industry Focus Vol. 91 Jan. 25, 2011 (Original Japanese Version Published Nov. 30, 2010)

Edited / issued by Industry Research Division Mizuho Corporate Bank, Ltd.

Address: 1-3-3 Marunouchi Chiyodaku Tokyo

Tel: (03)5222-5075


MIZUHO
Channel to Discovery