

# Through Service between Railway Operators in Greater Tokyo

Makoto Ito

## Introduction

Through service, or operators running trains over shared railway tracks, started on 16 March 2013 at the large Shibuya Station terminal to link the Tokyu Toyoko Line (connecting Shibuya and Yokohama) with the Tokyo Metro Fukutoshin Line (connecting the three urban sub-centres of Shibuya, Shinjuku and Ikebukuro). The Tokyo Metro Fukutoshin Line had already started through service at Ikebukuro with the Seibu Ikebukuro and Tobu Tojo lines serving suburban residential areas in the northwest of greater Tokyo. Likewise, the Toyoko Line had been running through service with the Yokohama Minatomirai Railway Minatomirai Line in Yokohama's new urban centre. Linking the Tokyu Toyoko and Tokyo Metro Fukutoshin lines marked the historic start of through service between five companies, something never seen before in Japan.

Japan has a long tradition of linking suburban lines of different companies with subways and running through trains directly between them. The first example started almost 50 years ago with the building of the Toei Asakusa Line (subway), which created through service access to Keisei Electric Railway and Keihin Electric Express Railway (both suburban railway lines). Tokyo's population had grown rapidly in the postwar years, and people were seeking homes in suburban residential areas, meaning commuter transport also grew rapidly and longer commuting distances. The solution demanded an increase in transport capacity of suburban railways and formation of a system allowing smooth transport to offices in central Tokyo. As a result more subways were built with through service to suburban railways. At the time, Tokyo was behind in subway construction compared to London, Paris, and New York, where substantial subway networks had been completed in the early 20th century. Only the Ginza and Marunouchi subway lines were operating in Tokyo and construction of new subways was a key factor driving through service between subways and suburban lines.

After through service started first in Tokyo, it then spread to Greater Osaka, Nagoya, and Fukuoka.

This article describes through service operations unique to Japan but focuses mainly on Greater Tokyo. It presents an

overview of through service including the background and objectives, development, matters when operating through service, and the effects of such service.

## Definition of Through Service

Through service means running the same train between trunk and branch lines of one operator or between different railway operators. Through service between lines of one operator has a long world history on trunk and regional lines of interurban railways or trunk and branch lines of suburban railways in urban areas. A rare case is Spain's through service on different-gauge tracks using variable-gauge TARGO carriages, but simply linking lines of the same standard is the usual procedure. Through service between different railway operators is typical of Japanese urban railways and commonly entails running trains back and forth directly along each other's line. Through service between different operators requires close coordination as discussed later.

There are non-Japanese examples of through service between different operators. One is between the Regional Express Network (RER), operated by the Autonomous Operator of Parisian Transports (RATP), and suburban lines of the French national railway company SNCF. It is said to have been started by learning lessons from Japan.

Japan has also introduced new forms of through service in recent years. One example is securing new transport routes using through service of passenger trains from suburban lines on freight railway lines of the same operator in an urban area. Another is setting up shunting lines between closely located railways located and running through service between them.

## Greater Tokyo's Railways

### Area and population of Greater Tokyo

Greater Tokyo is centred on Japan's capital of Tokyo, and includes parts of neighbouring Kanagawa, Saitama, Chiba, and Ibaraki prefectures. There is no clear border to Greater Tokyo, and there are different ideas about its size based on statistics and plans. According to the annual report on

urban transportation issued by the Institution for Transport Policy Studies under the editorial supervision of the Ministry of Land, Infrastructure, Transport and Tourism, it extends up to 60 km from the centre of Tokyo covering an area of 6549 km<sup>2</sup> with a population of 32.47 million people (2010). The capital and above three prefectures including Greater Tokyo area have an area of 19,654 km<sup>2</sup> and a population of 38.59 million (2010). By comparison, Greater London is 1572 km<sup>2</sup> with 8.17 million people (2011) and Île-de-France (Paris region) is 12,012 km<sup>2</sup> with 11.69 million people.

### Railway tracks and passengers

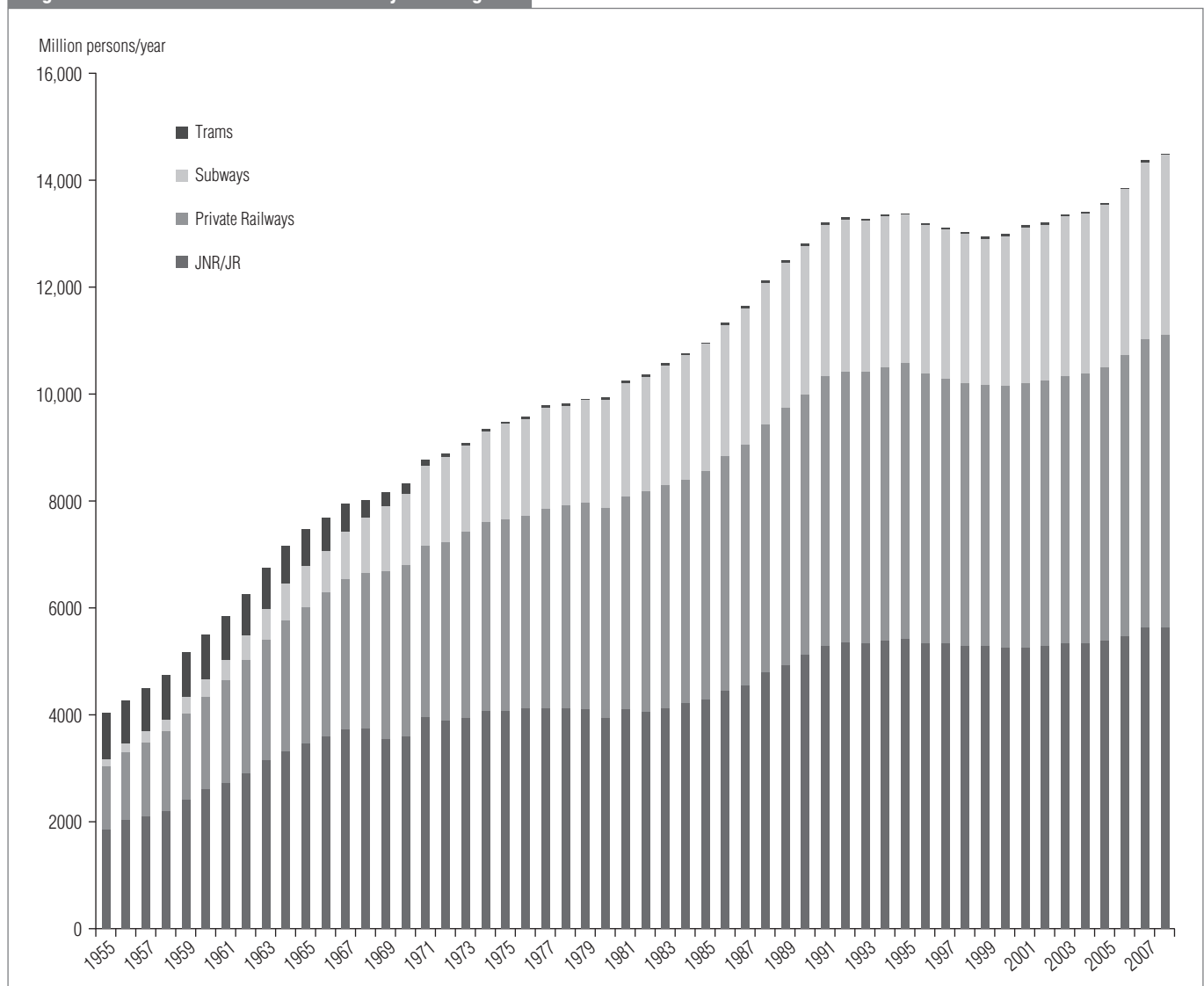
The length of railway tracks (track-km) in Greater Tokyo is 887 km for JR East, 1164 km for other private railways, and 358 km for subways, totalling 2409 km. There is also 17 km of tram tracks. Figure 1 shows the annual number of railway passengers from 1955 to the present. The annual volume was 4 billion (10 million per day) in 1955, and increased

greatly until 1990, levelling off until 2009 when it was 15 billion (40 million per day). Railway transport in Greater Tokyo is very much larger than in Paris (Île-de-France) at about 3 billion people per year and in Greater London at about 2 billion.

### Operators' management style

To understand through service in Japan, it is necessary to understand the management style of Japanese urban railway operators. First and unlike in the West, urban railway services are provided by a large number of entities using a variety of management styles: private sector, mixed public-private, public corporations, Incorporated administrative agencies, and semi-governmental corporations. For example, about 30 companies provide railway services in Greater Tokyo. Typical private-sector corporations include major private railways such as Tokyu Corporation and Odakyu Electric Railway along with JR East, which changed

Figure 1 The Annual Number of Railway Passengers



from a public corporation to private-sector corporation at the breakup and privatization of Japanese National Railways and has a network spanning east Japan.

There is also a style where funds are procured from both the private sector and national and local governments. The Tsukuba Express, which opened in 2005 with 58.3 km of track, is an example; the operator was established with capital from Tokyo Metropolitan Government, Saitama, Chiba, and Ibaraki prefectures, municipalities along the line, and the private sector. This style is often adopted by small-scale railways, new transport systems, and monorails. Subway businesses are run by public corporations in Tokyo and Yokohama. Tokyo Metro is another Tokyo subway operator operating as a semi-governmental corporation with Tokyo Metropolitan Government and the national government as shareholders. It was established originally as Teito Rapid Transit Authority to build railways inside Tokyo's Yamanote loop line, but switched to a stock corporation recently as a first step towards privatization. The Japan Railway Construction, Transport and Technology Agency, which does not operate railways as a rule, is a semi-governmental corporation that constructs and owns railways in some cases.

Subsidy system for investment differs by management style. National and local governments subsidize some percentage of investment or provide interest-free loans for public corporations, mixed public-private companies, and incorporated administrative agencies to construct railways. Government usually does not provide such subsidies for private sector corporations, such as major private railways, including operators in the JR group. Unlike urban railways in the West, railways in Japan are expected to be independent financially.

This background plus differences in facilities and rolling stock standards, regulations, and corporate culture mean widespread debate is needed when planning through service between different operators in Japan.

## Standards

Standards such as track gauge are a key point in planning through service. Most of Tokyo's urban railways run on 1067-mm narrow gauge, but 1435-mm standard gauge and intermediate 1372-mm gauge are also used. The same problem dogged the first debates on through service way back in the 1950s. There are also differences in carriage length, train-set length, and train width, so standardizing when planning through service has been a major issue.

## Developments and Current Through Service

The annual population increase of Greater Tokyo in the 1950s was 300,000 due to the post-war economic boom,

an unprecedented expansion never seen before in Japan. Much of that growing population sought homes in more distant suburbs. In the 1950s, the railway network was composed of JNR's Yamanote Line (loop) and private railway suburban lines using stations on the Yamanote Line as their terminals. There were three lines inside the Yamanote loop: the JNR Chuo Line and the Ginza and Marunouchi subway lines; trams and buses also played a pivotal transportation role inside the Yamanote Line. The harsh overcrowding in carriages carrying large numbers of commuters from suburban housing and the congestion in terminal stations as commuters transferred from railways to trams and buses is hard to imagine now. Moreover, increasing motorization of society was causing chronic urban traffic congestion, impeding tram and bus operations. A white paper on transportation from the then Ministry of Transport (now Ministry of Land, Infrastructure, Transport, and Tourism) suggested the following policies to solve those problems.

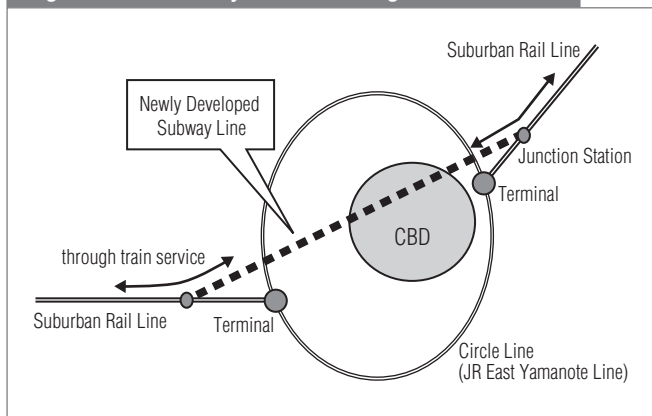
- Switch from trams to subways in inner-city area
- Increase transport capacity of suburban railways
- Run through services connecting city centre to outlying areas

The Ministry of Transport later set up a committee on urban transportation, which drew up the following railway plan for Greater Tokyo in 1956.

- Run new subways, as a rule, through central Tokyo (Marunouchi, Hibiya, Otemachi, Ginza, etc.) and connect with JNR or suburban private railways at both ends.
- Build a transport system where passengers can, whenever possible, go from departure to destination with only one transfer between lines or another transport mode.
- Extend new subway lines to the suburbs or run through service between subways and suburban private railways to connect suburban housing areas directly to the city centre.
- Facilitate through service, decentralize transfer stations, and improve transfer facilities to alleviate congestion in transfer stations.
- Alleviate road congestion.

This plan deals with the layout of urban functions by development of urban sub-centres, suburban business areas, housing areas, and more. It also covers changes in urban structure and congestion of existing lines accompanying such development. It has been revised several times, with partial route changes and line additions. At the end, subway lines were assigned numbers from 1 to 13 along with suburban railway lines they support with through service.

Subways were developed, suburban lines were quadruple-tracked and extended to new housing areas based on the plan. Quadruple tracks added transport

**Figure 2 General System of Through Train Service**

capacity and also allowed express services, greatly shortening journey times.

The first through service in 1960 was between the Toei Asakusa subway running north–south in downtown Tokyo and the Keisei main line running through eastern Chiba Prefecture. At the time, Keisei Electric Railway used 1372-mm intermediate gauge track, but through service required a change to the 1435-mm standard gauge of the Asakusa Line. The Asakusa Line was later extended to the southern part of central Tokyo, starting through service with the Keihin Kyuko main line in 1968. As a result, the outlying core urban areas of Yokohama and Kawasaki and the residential areas of eastern Kanagawa Prefecture and western Chiba Prefecture were connected directly to central Tokyo locations such as Shimbashi, Nihonbashi, and Asakusa. Today, trains linking Tokyo's two international airports at Narita and Haneda directly operate on the line.

The full length of the Tokyo Metro (formerly Teito Rapid Transit Authority) Hibiya Line with through service to the Tokyu Toyoko and Tobu Isesaki lines opened in 1964 (construction started in 1959), the same year as the 1964 Tokyo Olympics. This line stretches from southwest central Tokyo through Kasumigaseki, where the central government functions are concentrated, through Hibiya and Ginza with many businesses to northeast central Tokyo. The through service linked these areas to Yokohama, Kawasaki, and eastern Saitama Prefecture, helping alleviate congestion on the Ginza Line and at Shibuya Station.

The Tokyo Metro Tozai Line was opened in stages from 1966 to 1969. JNR's Chuo and Sobu lines carried large numbers of commuters to the city centre from western central Tokyo, the Tama area, and Chiba Prefecture in the eastern part of Greater Tokyo. To alleviate congestion on these lines, the Tozai Line was built to pass the city centre between the two lines, and provide through service with them.

The Tokyo Metro Chiyoda Line was opened in stages until it was fully opened in 1978. JNR's Joban Line and Odaku Electric Railway's Odakyu Line were responsible for

transport from the northeast and southwest parts of Greater Tokyo, so the Chiyoda Line was built with through service on those lines to alleviate congestion, improve journey times into the city centre, and alleviate congestion on the Hibiya subway line. The Chiyoda Line runs through Kasumigaseki, Otemachi, and other areas that are the home of government agencies, major national facilities, and the headquarters of major companies. Odakyu later branched its line to Tama New Town, a newly developed large-scale suburban housing area, and runs through service to that area.

The Tokyo Metro Hanzomon Line was built between 1973 and 2003 to relieve congestion at the large Shibuya Station terminal and on the Tokyo Metro Ginza Line, Japan's first subway. The Hanzomon Line already ran through services on the Tokyu Den-en-toshi and Tobu Isesaki lines. Through service on the Den-en-toshi Line, which was built at the same time as the new Tokyu Den-en-toshi housing development by Tokyu Corporation, greatly increased the development's appeal, promoting its transformation into one of Japan's largest housing developments.

The full length of the Tokyo Metro Yurakucho Line was opened in 1988 with the line running from southern Saitama Prefecture, through the urban sub-centre of Ikebukuro through Hibiya and Yurakucho in the city centre, and on to the Tokyo waterfront. Some of Japan's most important facilities, such as the Imperial Palace, National Diet Building and headquarters of major companies border the Yurakucho Line. Creating a through service with the Tobu Tojo and Seibu Ikebukuro lines linked central Saitama Prefecture and the Tokyo Tama area to the Tokyo waterfront via the city centre.

The Toei Shinjuku subway line was opened in stages running from Shinjuku west to east through the northern area inside the Yamanote Line to western Chiba Prefecture. Through service started with the Keio main line and Keio Sagami-hara Line from Shinjuku in 1980. This line was first planned to link the Tama and Chiba "new town" housing developments in the southwest and northeast parts of Greater Tokyo to improve accessibility to Tokyo city centre and increase the concentration of housing there. The plan for the Chiba side was later cut, simply connecting to the JNR Sobu Line.

The Tokyo Metro Namboku Line runs north from the Meguro terminal station on the Yamanote Line, passing through central locations inside the Yamanote Line, such as Roppongi, Akasaka, and Yotsuya, to northern Tokyo. Unlike many other subway lines, it avoids the city centre and urban sub-centres. It opened in 2000 with through service to Saitama Railway Corporation, creating a new line through areas of Saitama Prefecture with poor rail access, and with the Tokyu Meguro Line at Meguro Station. It also has through service on the Meguro Line from the Toei Mita Line with which it shares tracks in some sections.

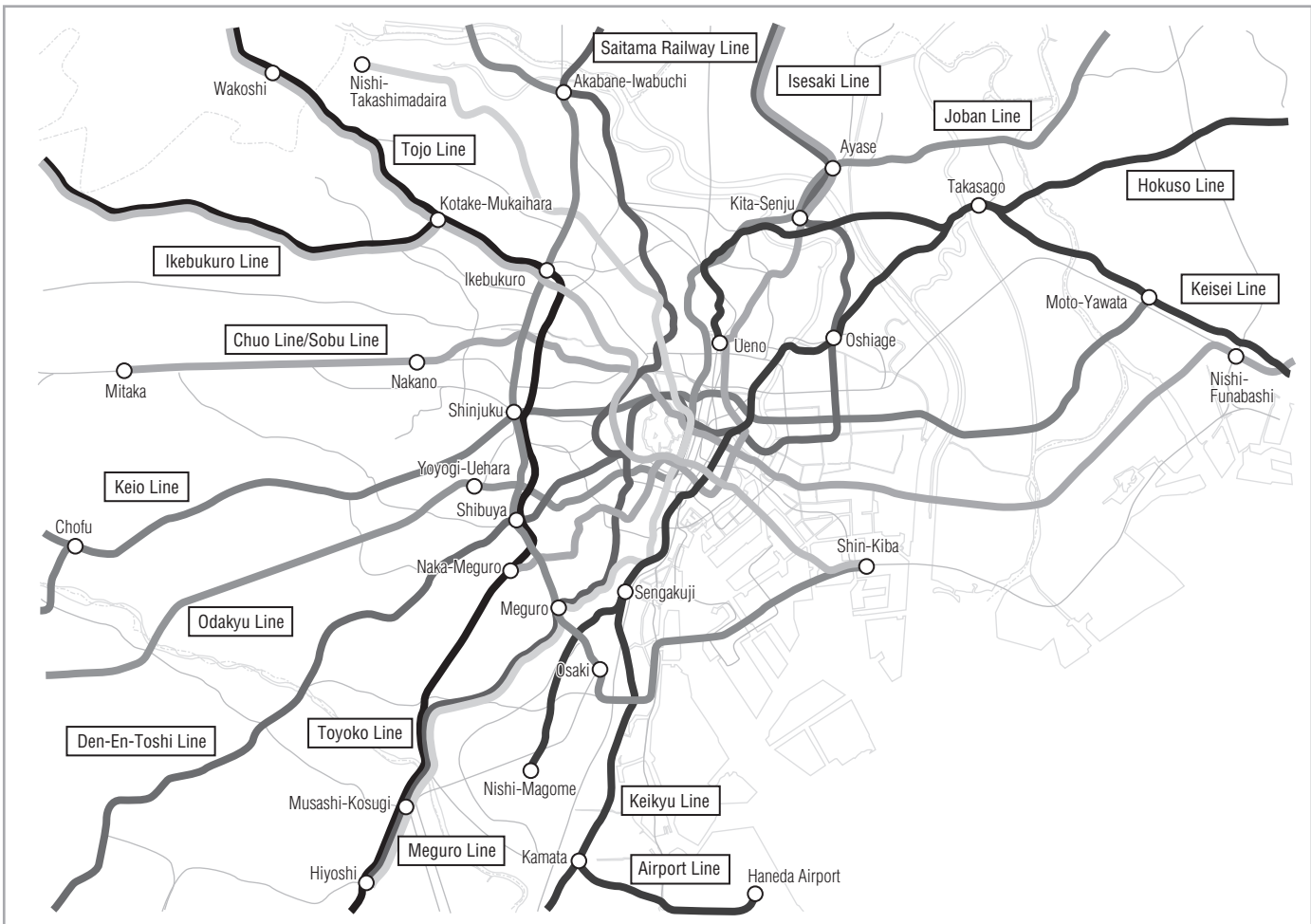
Figure 3 Lines with Through Service



The Tokyo Metro Fukutoshin Line, which connects the three urban sub-centres of Shibuya, Shinjuku, and Ikebukuro, has run through service from 2008 with the Seibu Ikebukuro and Tobu Tojo lines serving suburban housing in the western and northern parts of Greater Tokyo. The underground relocation of Shibuya Station for the Tokyo Toyoko Line in 2013 (see pages 6 to 13 in this JRTR issue) connected to the Fukutoshin Line as well, allowing the start

of through service between five railway operators (Tokyo Metro, Seibu Railway, Tobu Railway, Yokohama Minatomirai Railway, and Tokyu Corporation). Through service has cut travel times from Yokohama and Saitama to urban sub-centres and expanded interaction—mainly as tourism—with areas along the lines.

In addition to the above-mentioned lines, a new form of through service appeared following the 1987 JNR division



and privatization as the JR group of operators when through service started on freight lines passing through the urban sub-centres of Ikebukuro, Shinjuku, and Shibuya to operate passenger trains between the Tokaido main line running in southern Greater Tokyo and the Tohoku and Takasaki lines in the northern area. This Shonan-Shinjuku Line was named after areas alongside the line and increases accessibility to the city centre, helping alleviate congestion on existing lines and increasing the appeal of trackside areas.

A new national government subsidy system has also been created in recent years to alleviate inconvenient transfers by financing connecting lines between lines that are nearby or cross each other. This system aims to increase user convenience by utilizing existing network, with the public sector taking initiative in Japan's current situation where incentives for private sector investment such as increase in passenger demand cannot be expected due to decreasing population. The first example is now under construction to connect the Tokyu Toyoko Line and JR East Tokaido freight line with the Sagami Railway main line.

The figure shows the lines and sections with through service. Currently, through service runs on tracks of 18 companies, making up about 1000 km.

## Planning Through Service

Through service between lines owned by one company is achieved relatively easily just by connecting the lines because the track and rolling stock standards are usually the same. However, various matters must be coordinated to accomplish through service between operators. Many such matters were discussed by the 1955 committee on urban transportation; problems included the fact that future transport demand is almost unchanged by through service between subway lines and suburban private railways because there is no surplus transport capacity on suburban private railways connected to the ends of newly constructed subway lines. Other issues were decisions about connecting stations and procedures for building subways. However, the biggest issue was coordinating track standards so that

suburban lines at both ends used the same standard. As a result, new subways in the city centre were built to the same standard as the connecting suburban lines. Major construction to change the gauge was implemented on some suburban lines.

When planning through service, negotiations are held between the operators to unify the following items:

- Standards  
Gauge, current collection, voltage, rolling stock gauge (height, length, width), platforms (height, length), tunnels (height, width), rolling stock performance
- Construction plans
- Systematic execution of orders for opening in stages, division of construction for connecting stations, division of construction costs
- Transport operation plans  
Through service sections, train operation plans (service interval, train-set length), number of cars, crew sections (which sections to be worked by which company)

## Impact of Through Service

Through service has the following various impacts on trackside entities.

### Effects for users

#### Alleviated line congestion

The number one effect for users is alleviation of congestion in carriages and at terminal stations. Congestion from the suburban railway connection to the terminal station is alleviated by through service to stations on newly built subway lines before the terminal. Also, fewer passengers transfer to buses and trams at terminals, alleviating congestion. Shibuya, Shinjuku, and Ikebukuro stations and the suburban railway lines leading to them are typical examples of this effect.

#### Shorter journeys to city centre

A reduced travel time effect is also seen. Transfer and waiting times are cut because there is no need to transfer to trams or buses at terminals and passengers reach their destinations directly by high-speed subway, reducing travel time. Less troublesome transfers increase the appeal of railways, especially for older members of Japan's aging population.

### Regional effects

The increased appeal of trackside areas helps increase population, concentrate companies, and expand inter-regional interaction.

#### Increased populations in suburban housing areas

Through service seems to promote higher populations along suburban railway lines. For example, the 1964 start of through service between the Tokyo Metro Hibiya and

Tobu Iseaki lines lead to rising population alongside the Iseaki Line. Previously, urban development there had been relatively behind other areas alongside suburban railway lines but through service led to brisk sales of flats and housing lots; large-scale housing projects of more than 5000 units were developed, and commuting to school and work by rail increased year-after-year.

Population also increased steadily in Tama New Town where a suburban line was extended and through service was introduced with a subway line in conjunction with construction and development of the large-scale housing project. Conversely, the similarly sized Chiba New Town development met with local opposition to construction of a suburban line, delaying start of through service to a subway. Today, almost 50 years from the start of development, the resident population is still significantly below that of the original plan.

#### City centre redevelopment and concentration of companies

Various effects are seen on companies along train lines. Reduced travel times result in a larger commercial sphere and increased accompanying revenues plus reduced costs due to higher work efficiency. This results in concentration of companies along such lines. Increased commercial and business functions are seen in Marunouchi, Otemachi, Hibiya, and Ginza where many subway lines converge, and the area's position as the centre of Greater Tokyo remains unwavering. Areas around subway stations start to redevelop as new commercial buildings are built one after another. For example, the opening of the Oedo subway line and Namboku subway line saw many office buildings such as the high-rise Roppongi Hills and Mid Town, as well as hotels and museums spring up in the famous Roppongi nightspot, transfiguring it into a new city sub-centre.

#### Expanded interaction and community rejuvenation

Trackside residents have seen an effect of increased choices in day-to-day life. Expanded commuting areas are a typical example. Comparing the ratio of residents commuting to the city centre, urban sub-centres, or other areas inside the Yamanote Line for people living alongside through-service lines and those living along lines without through service, the ratio of commuters to the city centre is larger for the former group. Residents along through-service lines have more choices about where to work and study.

Shopping choices also increase with through service. According to Tokyo Metro, the number of people exiting trains at the urban sub-centre of Shinjuku-Sanchome Station where there is a concentration of department stores and other commercial facilities increased greatly with the start of through service between the Tokyu Toyoko, Tokyo Metro Fukutoshin, Tobu Tojo, Seibu Ikebukuro and Minatomirai lines. This was due in part to an increase in shoppers from areas along suburban lines.

Choices of leisure spots also increase. Residents along through-service lines get easier access to places they would otherwise avoid due to long journey times and multiple transfers. This effect has been seen for the aforementioned through service between five companies. Kawagoe on the Tobu Tojo Line is a tourist destination nicknamed “little Edo” (Edo is the old name for Tokyo) due to the old townscape dating back to the Edo period. Tourists and shoppers getting off at stations for accessing leisure spots have increased greatly after the March through service start. The string of public “Golden Week” holidays in May saw a 26% increase in visitors. Similar effects were seen at leisure spots in Yokohama. For example, Yokohama Minatomirai Railway reported that visitors to Minato Mirai with many commercial and amusement facilities, and to Yokohama Chinatown—one of the largest Chinatown communities in the world—increased greatly. These expansions help rejuvenate communities.

### Effects for railway operators

Through service has major effects for railway operators too. It creates increased transport demand and revenues for suburban railway operators with increased service levels due to relief of congestion at stations and in carriages as well as shorter travel times to city centres. Construction costs such as quadruple tracking to increase transport capacity can be reduced because an operator does not bear costs individually because the through service subway partner is responsible for the more expensive sections closer to the city centre.

The subway operator can expect substantial demand and revenue from the start of through service, so it benefits from being able to reduce investment risk from expensive investment in building new lines. The subway can also build rolling-stock depots along the line of the suburban railway instead of in the city centre where land costs are high, greatly cutting infrastructure costs.

For a pair of railway operators, the burden of construction costs can be spread out by sharing station facilities, and they can reduce time and labour related to turn-back operation.

### Effects for local governments and environmental improvements

The above effects also bring increased tax revenues to local governments. Moreover, the improved railway service drives a modal switch from automobiles to railways, cutting road congestion and reducing environmental burdens.

## Conclusion

Japan’s traditional through service style between different railway operators’ suburban lines and subway lines started

about 50 years ago. Today, 18 railway operators run through service in Greater Tokyo with those sections covering about 1000 km of lines. This method started in Greater Tokyo, expanding later to Osaka, Nagoya, and Fukuoka. Additionally, a new method of through service with suburban lines using urban freight lines also has appeared.

As mentioned, through service has various impact for various groups. For railway users, the ability to use railways from the suburbs to the city centre without inconvenient transfers shortens journey times. Areas along suburban lines see promotion of housing, increase in population, and expansion of choices in day-to-day life. Areas along subway lines see an influx of commercial and business buildings relocating.

However, train delays have become more frequent in recent years, especially in Greater Tokyo during the morning peak hours, threatening the long-held belief that Japan’s railways always run on time. Through service between different operators has been pointed out as factors in expanding delays and impeding recovery to normal time schedule. Coming up with measures against delays, such as the timing to terminate through service, and where to terminate it, has become a major issue for those involved in railways.

In urban areas of Europe, a tram–train method for operating trams on conventional lines has been promoted, starting in Karlsruhe, Germany. There are high hopes for expansion of this and other through-service methods, which alleviate the bother of train transfers and expand destination choices for aging populations in cities around the world. ■



**Makoto Ito**

Mr Ito is a Distinguished Research Fellow at Intsitution for Transport Policy Studies (ITPS).