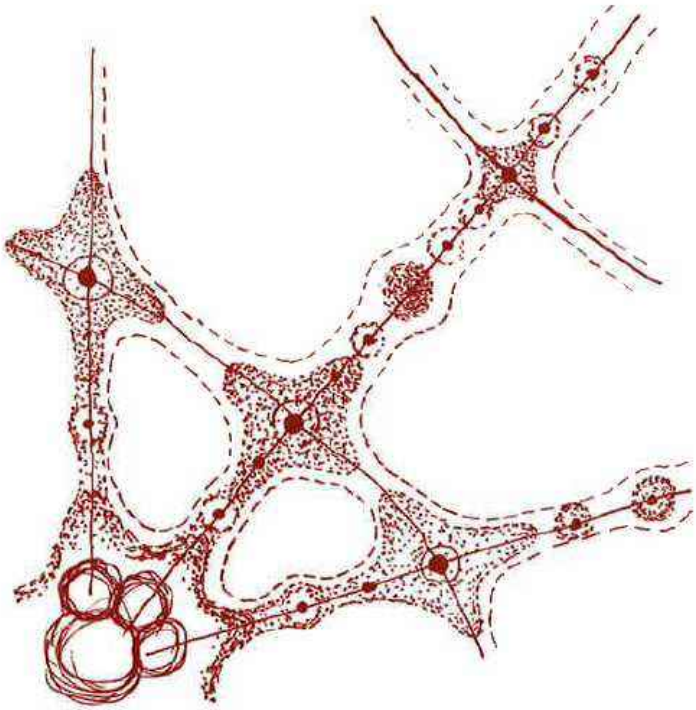
TOD Practice in Japan

Tokyo, A Global City Created by Railways



This is a partial English translation of a book titled as “TOD Practice in Japan; Tokyo, A Global City Created by Railways”. (Edited and written by Takashi Yajima and Hitoshi Ieda. Published by The Institute of Behavioral Sciences)
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The contents of the original are as below. The sections considered necessary in order for persons from overseas to gain an understanding of Japan's practice on TOD were selected for translation. Specifically, those are the sections that give an overview of Japan's urban development and transportation, and sections relating to the former Japanese National Railways/current East Japan Railway Company as well as Tokyu Corporation as typical examples clearly illustrating TOD practice in Japan. Translated sections are indicated in the contents with an asterisk (*).

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Chapter 1　Unique Transit Metropolis Tokyo

1. Metropolis Tokyo, supported by railways

(1) Movement of people, substantially dependent on railways

Many people that live in the Tokyo metropolitan area mainly move by railway. According to the findings of the year 2008 origin-destination survey on a person-trip basis, more than 53% of commuters used railways including trams and monorails, and more than 31% of students used railways to go to school. There are 12% of people who use railways for such personal purposes as shopping, meeting up with friends, and going to the hospital. The percentage of railway use for all the purposes was over 30%, with the percentage of the public transport combined with buses reaching 33%, which exceeds the percentage of automobile use at 29%.

However, automobile use is essential in case of regional cities. In the Sendai metropolitan area, a regional core city in northern Japan, automobile use is 53%, while railway use is only 9% for all purposes of daily trips. Even when the use of public transport includes the use of buses, this figure only slightly increases to 13%. In regional cities with much smaller populations, the proportion of railway use and public transport is even less. In such regional cities, cars are needed for all urban activities, including daily life. Family members cannot go to the place where they need to go, and when they need to go, unless a family owns two or three cars. One of the roles of the mother in a family is driving and picking up family members by car. By contrast, in the Tokyo metropolitan area in recent years, there is an increasing number of young people who do not own or want to own a car. In fact, the rate of young people (aged 20 to 29) who have a driving license has decreased from 86% in 2006 to 82% in 2010. Young people say they are able to sufficiently go about their daily lives without a car; instead they use public transport, including railways. They say that when you consider the purchasing and maintenance costs of a car, it is more economical to use a rental car, when necessary. In other words, from the perspective of the daily trips of the people, the Tokyo metropolitan area is a railway-based transit metropolis.

(2) Movement of goods, dependent mostly on automobiles

Freight transport is the second pillar of urban transport, alongside the movement of people. Similar to the person trip survey, detailed surveys on freight (material flow surveys) had also been carried out in the Tokyo metropolitan area, including origin/destination points. Of all freight (based on weight), only 3% is transported by railway, with 60% transported by trucks, and the remaining amount by ship or other means. Rail freight originally played an important role in intercity transportation. However, as a result of full-scale motorization which started in the 1960s, the role of automobiles has increased drastically even for intra-city transportation, while the proportion of

railway freight is about 5%, as shown in Figure 1 (ton/kilogram base, 1990). This is a pole apart compared with the percentage in 1955, which was about 50%.

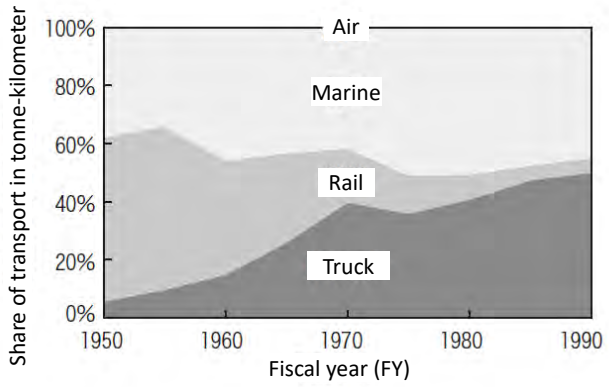


Figure 1: Share of domestic freight transport by means

(3) Transit Metropolis Tokyo

Railways support the movement of people in the Tokyo metropolitan area. When we compare this with regional metropolitan areas in Japan, Tokyo stands out as a transit metropolis. However, how can we compare Tokyo with the other cities around the world? It is not easy to accurately compare urban transport around the world side-by-side. This is because the urban transportation survey methods, and classifications and definitions of survey items used in each city/country are not uniform. Figure 2 shows the percentages of public transport in major metropolitan cities around the world, taking such limitations into account. The proportion of public transport is high in cities such as Tokyo, Madrid, and Singapore. Madrid is known for the systematic planning and operation of its rapid bus system as a means of transport from the suburbs to the city center. The proportion of public transport shown in Figure 2 reflects that buses are used to a considerable degree. As mentioned in (1) above, since high percentage of public transport in Tokyo is covered by railways, we can say that Tokyo is more railway-based transit metropolis than Madrid.

With railways (with subways in the city center) as its main lines, Singapore is known for the systematic development and operation of trams and new transit systems as branch lines which serve residential areas from nearby suburban stations. The public transport usage rate in Singapore shown in Figure 2 may be covered mostly by the combination of railway, transit and buses. However, the city size is substantially different between Singapore and Tokyo; Singapore has 5 million people in an urban area of 700 km^2, while the Tokyo metropolitan area has a population of 35 million in an area of 13,000 km^2. This means that the Tokyo metropolitan area can be called as the transit “megalopolis” as compared with Singapore in the sense that the movement of the people is substantially supported by railways.

It can be said that Tokyo is the unique transit metropolis, when viewed from a global perspective.

The points can be raised as the reason why Tokyo has been famed up as the unique transit metropolis. First of all, prior to World War II, railways were intensively constructed in Tokyo to form networks. During the period of rapid urbanization after the war, the transport capacity of the existing railways increased significantly, with outer loop lines and new lines for new towns being added to enhance and improve the railway network. This was done not only by the national railway, but also by many private railways as well. The fact that private railways exist in a large city and have survived soundly for 80 to 100 years is not a common sight in the other parts of the world. Secondly, these private urban railways pursued the development of suburban residential areas as one of the main business activities, spending many years working on systematic suburban development and phased suburban railway development. Tokyo has become a unique global transit metropolis as a result of their efforts of both railway development and suburban development.

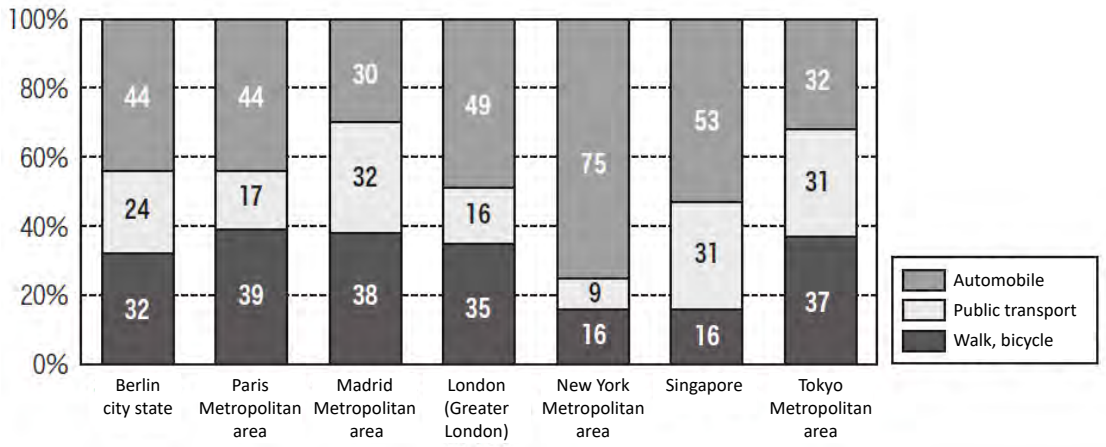


Figure 2: State of use of different transport means in large cities worldwide

(Source: THE MILLENNUM CITIES DATABASE FOR TRANSPORT, Jan. 2001)

In contrast, the cities in Europe and the U.S. witnessed suburban development along railways in earlier years. However, during the subsequent period of urbanization, motorization concurrently progressed and the suburban development had shifted to be dependent on automobiles with extensive construction of roads.

2. Transit Metropolis Tokyo, outpacing Paris

The Urban Mobility Technical Committee of the World Road Association (PIARC, secretariat in Paris) worked on an international comparison of populations, employment, urban transport, and urban transport facilities in major cities in Japan, the United States, and Europe for four years from 2008 to 2011. This committee also conducted multiple studies on how to achieve multi-modal mobility using multiple means of transport in major cities in the future in order to rectify the excessive dependence on road transport. Particular attention was focused on how Tokyo has created an urban structure that depends on railways and does not excessively depend on automobile transport, and a thorough analysis was carried out on the databases for Paris and Tokyo. The results of the analysis are introduced below; it looks to emphasize the wonder of the transit metropolis of Tokyo.

Figure 3 shows the size of the Tokyo and Paris metropolitan areas on the same scale. Tokyo is about two times larger than Paris on the entire areal area. Commuting traffic, which comprises a large proportion of urban transport, is determined by the relationship between the configuration of the nighttime population and the location of work places. For the purpose of the comparative analysis, city centers of both metropolitan areas are first defined, and then the suburbs are divided into two concentric suburban areas. Let us compare the sum of the density of the nighttime population and the density of the working population (the sum referred to as “density”) for these three areas. As shown in Figure 3, the areal size of the seven central wards in the Tokyo city center (intention area of the inner ring Yamanote line) is equivalent to the size of city of Paris. In Paris, the areas within 15 km from the city center were designated as “inner suburbs” and other areas as “outer suburbs”. In Tokyo, the 20 km-radius area, which covers Tokyo’s outer 16 wards and the midtown areas of Yokohama and Kawasaki was designated as “inner suburbs” and the outer ring as “outer suburbs.” The area classification between Paris and Tokyo is slightly different; however, they were classified as such in consideration of the approximate distance from the city center and similarities in the characteristics of each area. According to Table 1, the density of the working population in the seven wards in the city center of Tokyo is 1.8 times higher than Paris (34,700 versus 19,000 people/km^2). However, the nighttime population density is only a half of Paris (12,700 versus 24,400 people/km^2). Then, If we add these figures together, they are equivalent in terms of density (47,500 versus 43,500 people/km^2). The density in the Tokyo suburbs is about 2.3 times that of the density in Parisian suburbs (19,400 versus 8,500 people/km^2).

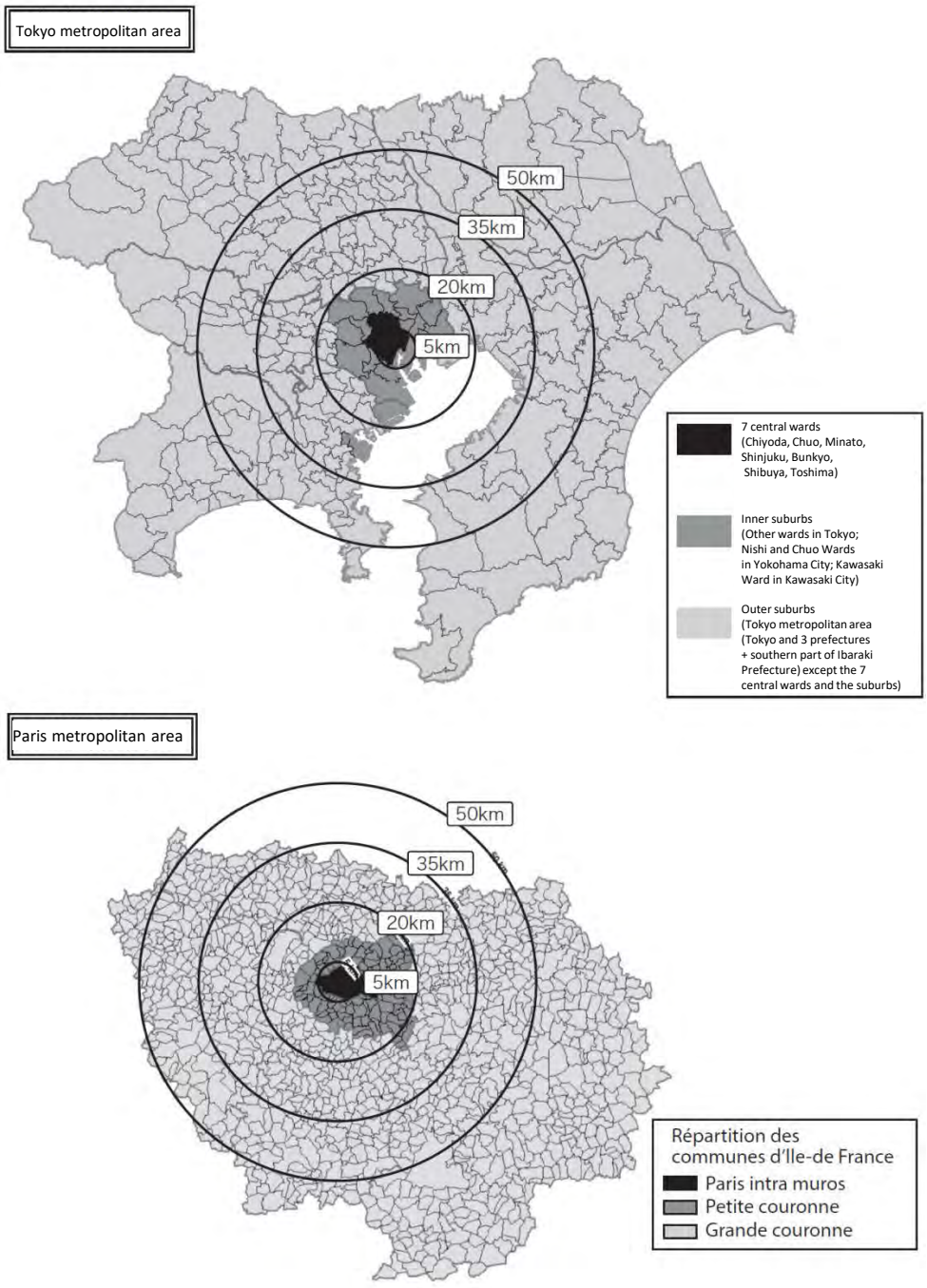


Figure 3: Sizes of Tokyo and Paris metropolitan areas

Table 1: Population density in Tokyo and Paris metropolitan areas

District		Radius (km)	Area (km^2)	No. of municipalities	Population		Population density		
					Nighttime population (10,000 persons)	Working population (10,000 persons)	Nighttime population density (Persons /km^2)	Working population density (Persons /km^2)	Nighttime + working population density (Persons /km^2)
Tokyo	7 central wards	5	100	7	128	347	12,780	34,725	47,505
	Inner suburbs	20	584	19	764	368	13,091	6,311	19,402
	Outer suburbs	70	15,050	249	2,717	1,038	1,805	690	2,495
	Total for Tokyo metropolitan area	70	15,734	275	3,608	1,753	2,293	1,114	3,408
Paris	Paris itself	5	87	20	213	166	24,428	19,035	43,463
	Inner suburbs	15	675	123	404	174	5,984	2,580	8,564
	Outer suburbs	60	11,311	1,157	479	165	423	145	569
	Total Paris Region	60	12,073	1,300	1,095	504	907	418	1,325

* 7 central wards: (Chiyoda, Chuo, Minato, Shinjuku, Bunkyo, Shibuya, Toshima)

* Inner suburbs: other wards in Tokyo, Chuo and Nishi Wards in Yokohama City, Kawasaki Ward in Kawasaki City

* Outer suburbs (Tokyo metropolitan area (Tokyo and 3 prefectures + southern part of Ibaraki Prefecture) ,excluding the 7 central wards and the Inner suburbs)

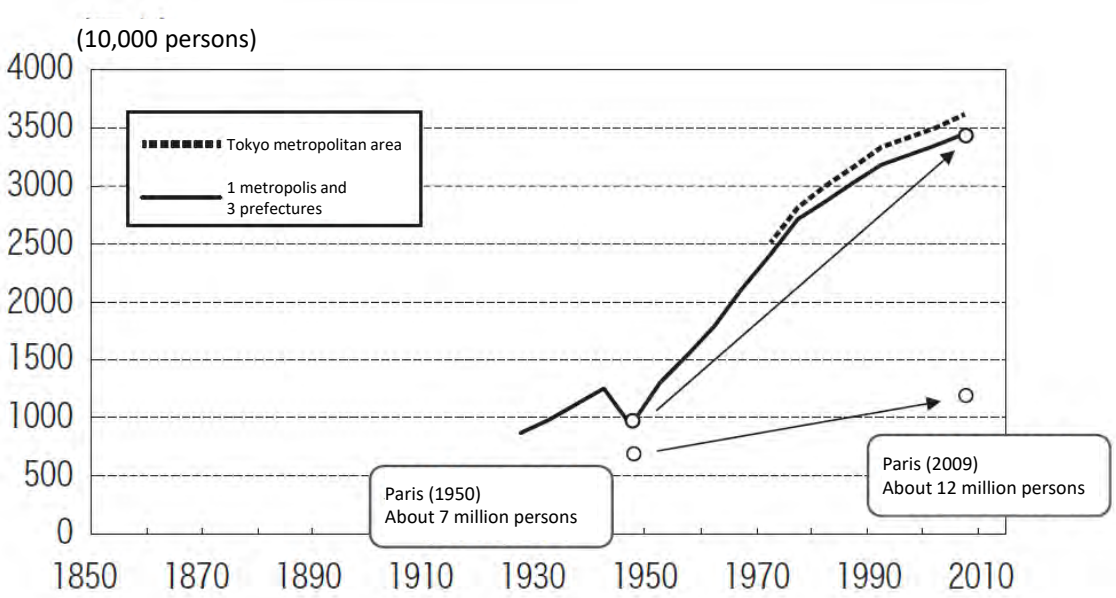
* Population of Tokyo as of 2005

* Population of Paris as of 1999

Clear difference can be seen between Paris and Tokyo in terms of the overall urban structure by using the figures in Table 1. The density of the central area of Paris is quite high, with low density in the inner and outer suburbs. In contrast, in the Tokyo metropolitan area, the medium- to high-density inner suburbs, of which the density is double that of the inner suburbs in Paris, surround area outside of the central seven wards which have the same high density as that of Paris, comparing relatively low-density outer suburbs, the density in Tokyo is still four times higher than that in the outer suburbs of Paris. The density of the suburbs of Tokyo is generally high compared to that of Paris. If we compare the density of the two metropolitan areas with using the shape of a mountain, Paris would be shaped like Mt. Fuji with a long base drawn from near sea level and a summit with sharp peaks. Tokyo would be similar to Mt. Kilimanjaro having a long mountain base in the plateaus in the central part of Africa, with a summit in the shape of a round-bottomed pot turned upside down.

Why and when were these differences in the density compositions of these metropolitan areas formed? These differences can be thought as being caused by the differences in the progression of urbanization after World War II, especially by the rapid urbanization of the Tokyo metropolitan area since 1960s, namely, rapid development of the suburbs and the concentration of populations and industries in suburban areas. Figure 4 shows that in 1950, the Paris metropolitan area and the Tokyo metropolitan area (in this figure, consisting Tokyo and three prefectures) were comparable in terms of population. However, by 2010, the population in Tokyo had increased to three times that of Paris. Figure 5 clearly shows that this increase is alongside the railways. Tokyo takes on the shape of a hand with a “palm and fingers,” centered on the concentration of a huge population in the

areas consisting of the 23 wards (palm), and high-density population corridors along the railway lines (fingers) extending in all directions. Wedge-shaped, low-density areas are found in the areas between the “fingers.” In contrast, as we can see in Figure 6, the same population-density regions in Paris expand concentrically as a whole. The type of “palm and finger” shape is not clear in Paris. The said difference in urban patterns is more or less the same for the employment density as shown in Figures 7 and 8.



* Tokyo metropolitan area: Saitama Pref., Chiba Pref., Tokyo Metropolis, Kanagawa Pref. and Southern part of Ibaraki Pref.
* 1 metropolis and 3 prefectures: Saitama Pref., Chiba Pref., Tokyo Metropolis, Kanagawa Pref.

Figure 4: Changes in the nighttime population in both metropolitan areas (Source: Population Census)

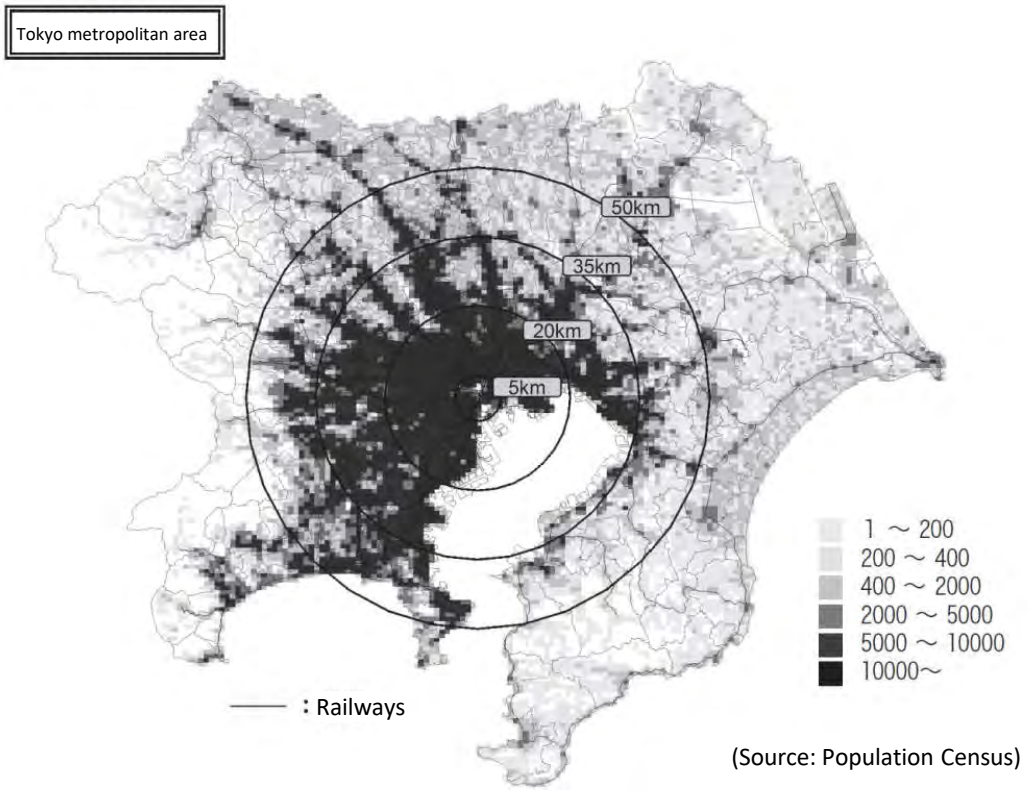
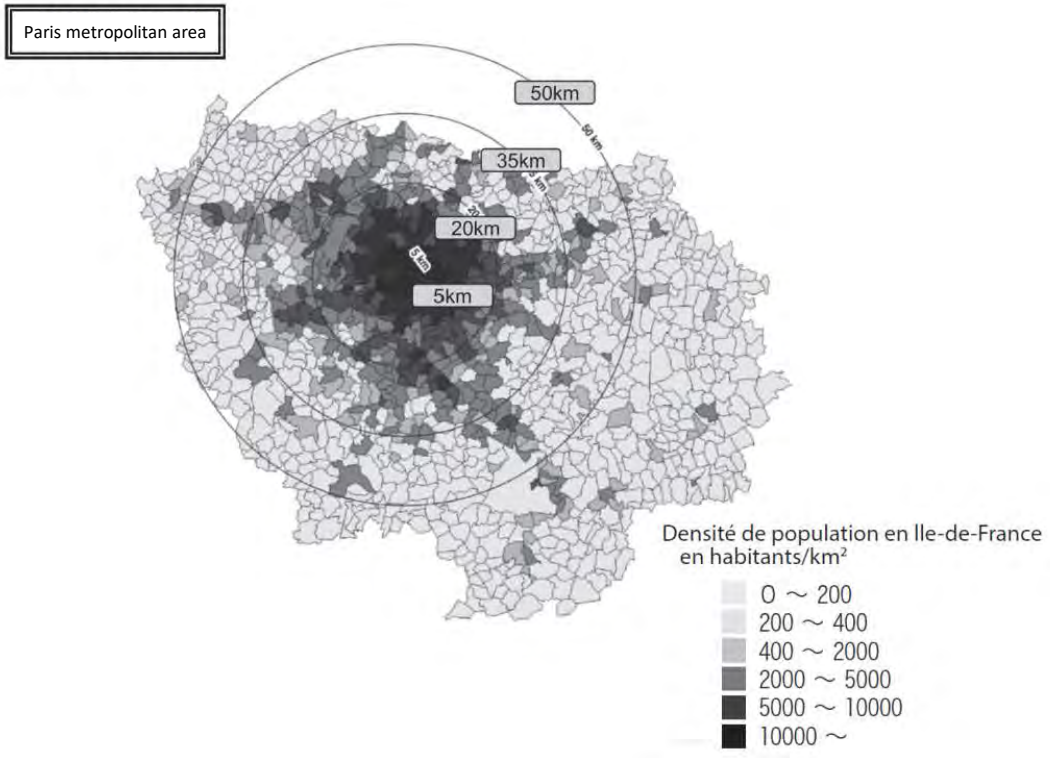


Figure 5: Distribution of nighttime population (Tokyo metropolitan area in 2006; 1-km^2 grids)



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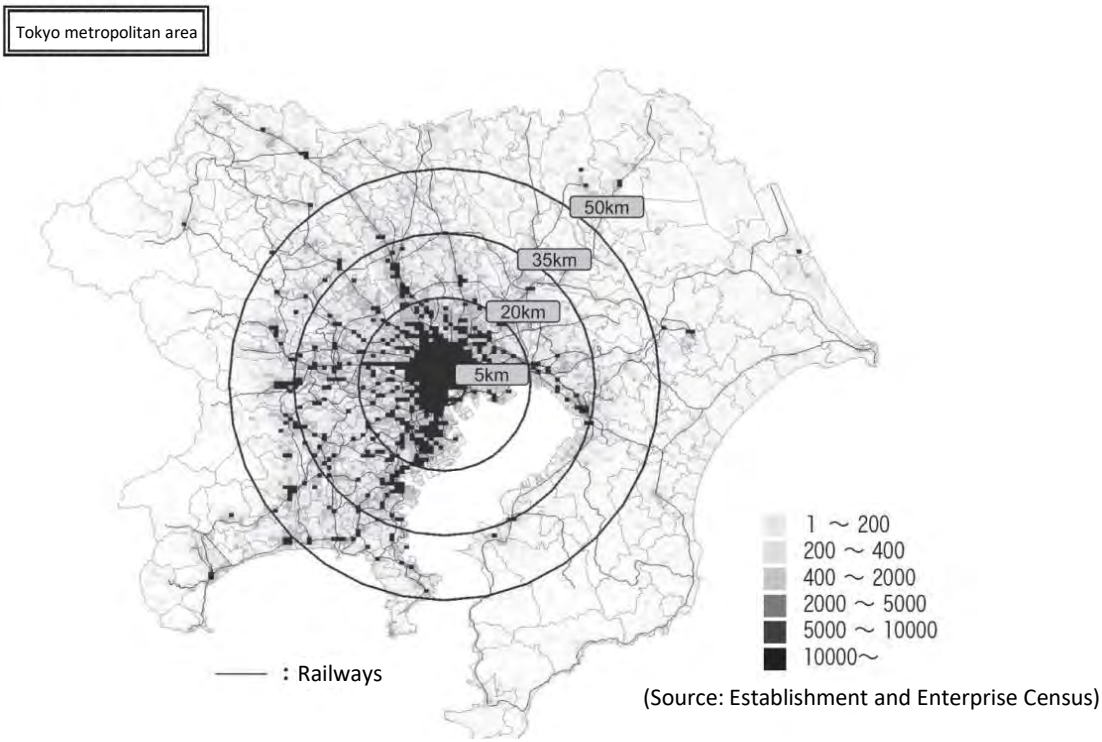

(Source: Establishment and Enterprise Census)

Figure 7: Distribution of working population (Tokyo metropolitan area in 2006; 1-km^2 grids)

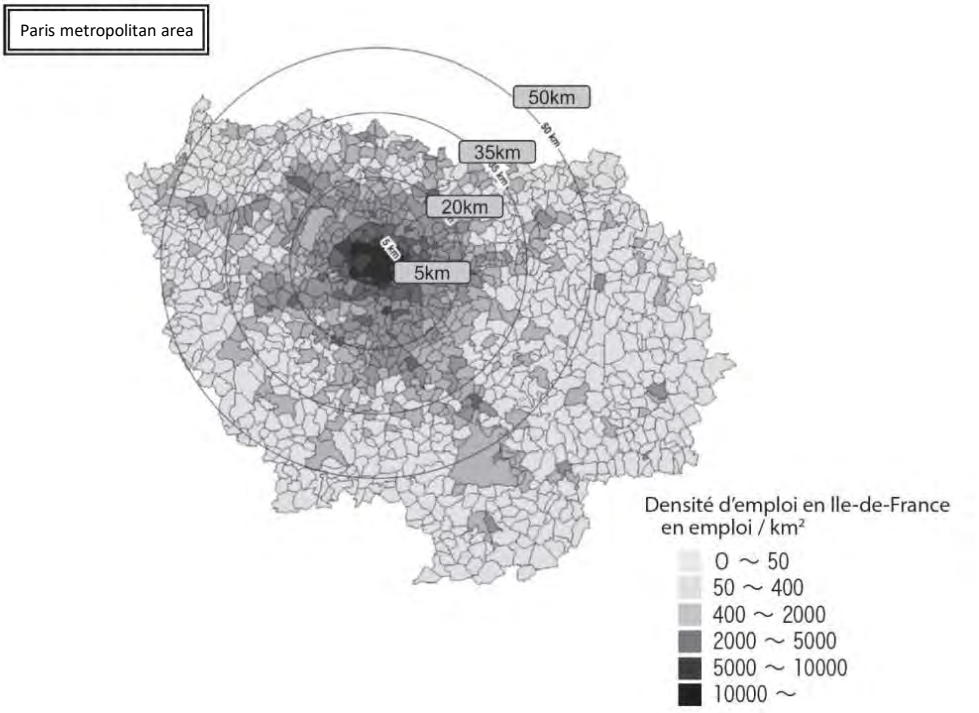

Figure 8: Distribution of working population (Paris metropolitan area)

Now, let us look at the compositions of the nighttime population and working population separately. The working population of Tokyo's seven central wards is 2.7 times that of its nighttime population. In Paris, the nighttime population is more than its working population. In other words, the image of the central Tokyo is a dark and lonely place at night, in comparison to the night in Paris which is bright and lively with lots of people. Commuters in Tokyo, living in the densely populated suburbs, move all at once in the morning to the city center and to the outer 16 wards, and return to the suburbs from the evening to late night. Commutes from the suburbs to the city center in Tokyo are massive and they make a long distance trip. The commuting traffic in the Paris metropolitan area is quite different. Since many people live in the city of Paris, in which work places are also located, the commuting distance is much shorter. Workers living in low-density suburbs of Paris commute to Paris or the inner suburbs, but the commuting distance is not very far and the commuters are quantitatively less than in Tokyo.

The Tokyo metropolitan area had developed sequentially from the inner suburbs to the outer suburbs as a result of urbanization in the 1960s and later, and travel time as a whole had increased over time. Figure 9 shows that the average trip time per person per day increased to 120 over the last 30 years to 2008 on the indicator basis of 1978 as 100. Figure 10 clearly shows that this increase in time is caused by the dependence on railways. When we look at this increase by trip purpose (Figure 11), the increase is due to commuting, followed by private purposes such as shopping. When we look at the degree of use for different modes by time zones at peak hours shown at Figure 12, we can see that railway use makes up half of the total for 20 to 30-minute commuting time zones, and that the other half is comprised of automobiles and buses. Railway use becomes more prevalent for longer time zones.

It is disappointing that a direct comparison between Paris and Tokyo could not be made because Paris does not use trip time and uses trip distance as an indicator for analysis. However, overall travel distance in Paris has been increasing as well. As shown In Figure 13, the average travel distance per person per day has increased to 150 in 2001 as compared with the figure 100 at 1976 as the baseline. The reasons for this are an increase in commuting (House-Work) as shown in Figure 14. However, the increase in distance shown at Figure 15, is mainly due to the travel by automobiles. From this observation, it is clear that travel time (or distance) in both metropolitan areas has become longer, mainly due to longer commuting. In terms of the modes of transportation in Tokyo, we can identify that longer commuting time is given rise to by railway.

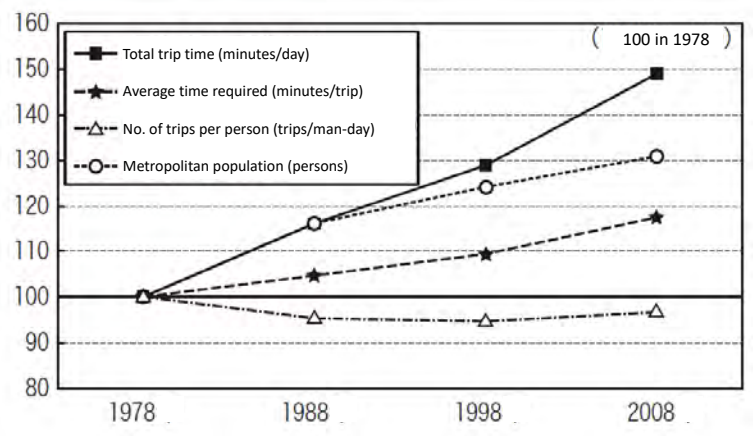

Figure 9: Travel behavior characteristics of the whole metropolitan area (Tokyo metropolitan area)

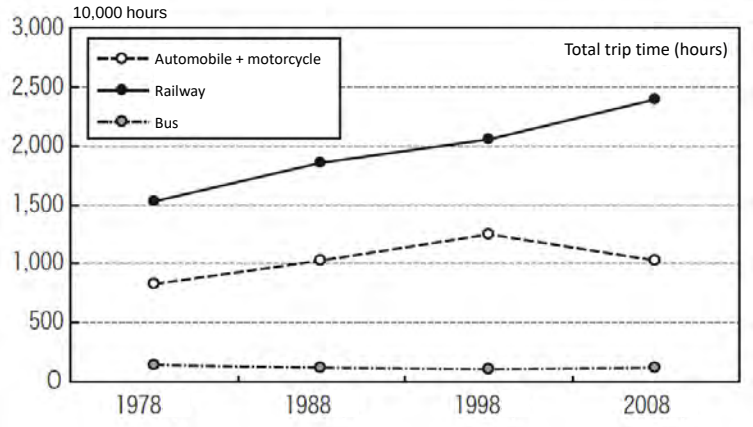

Figure 10: Trip characteristics by typical transport means (Tokyo metropolitan area)

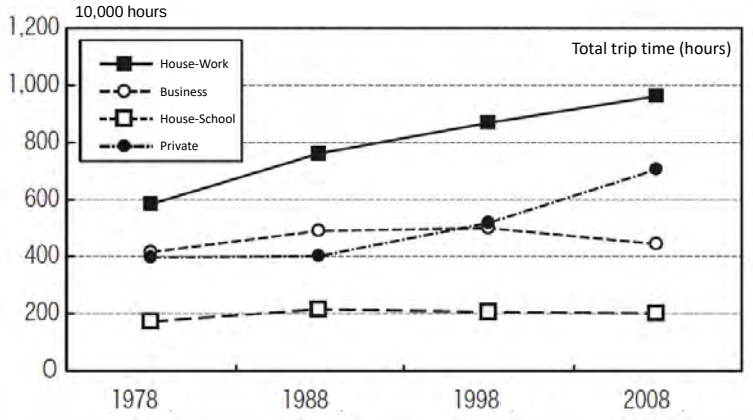

Figure 11: Trip characteristics by purpose represented by the sum of travel time by means of railways, buses and motorcycles (Tokyo metropolitan area)

(Source: Tokyo Person Trip Survey)

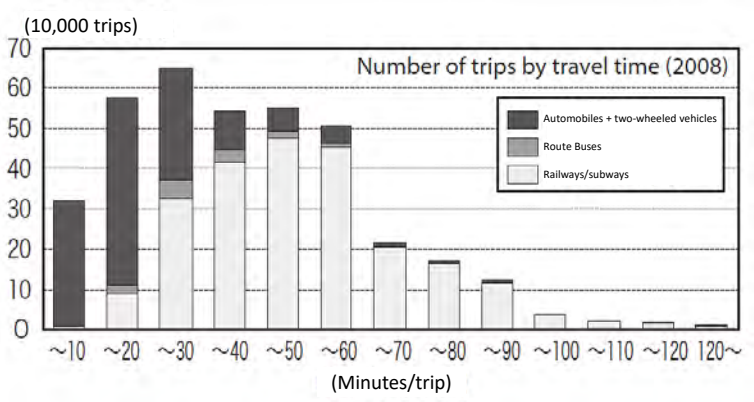

Figure 12: Number of trips during peak hours (7:00 to 10:00 a.m.) classified by travel time and modes

(Source: Tokyo Person Trip Survey)

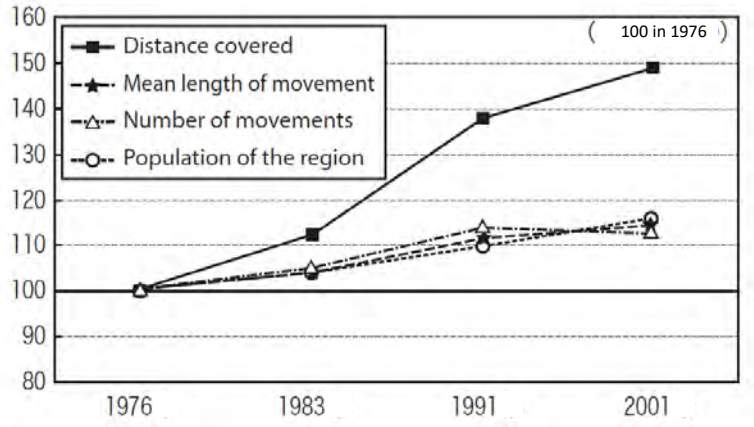

Figure 13: Travel behavior characteristics in the whole metropolitan area (Paris metropolitan area)

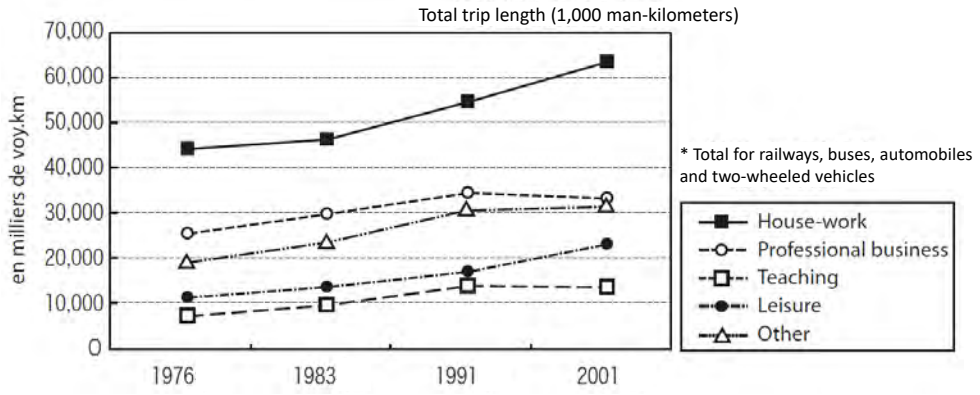

Figure 14: Travel behavior by purpose represented by the sum of travel time by means of railways, buses and motorcycles (Paris metropolitan area)

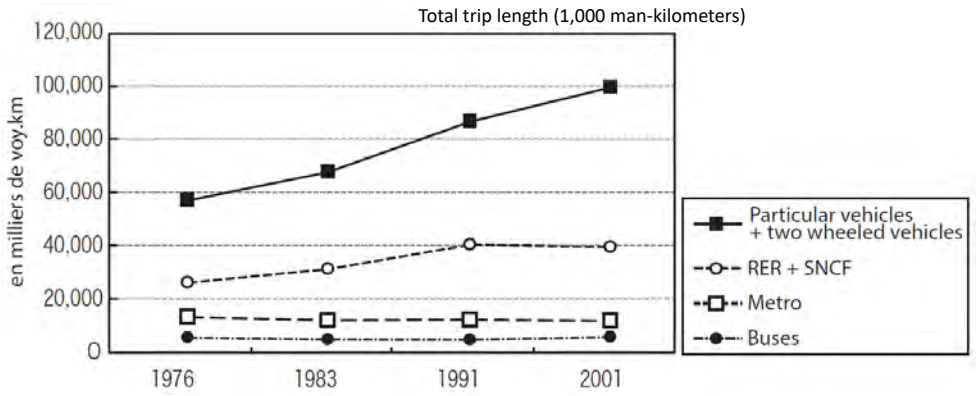

Figure 15: Movement behavior by typical modes (Paris metropolitan area)

The difference between the two cities in the above-mentioned commuter demand structure, and time on distance required for commuter travel are related, also to the difference in the degree of development of the railway network in both metropolitan areas. Figures 16 and 17 show the current status of the railways in both metropolitan areas on the same scale. In the Tokyo metropolitan area, the JR and private railways extend in all directions into the far outskirts, forming a high-density suburban railway network. On the other hand, it is obvious that the density of the suburban railway network in the Paris metropolitan area is low. However, the railways including subways in the city center are almost equal. Table 2 shows that the density of railway line extensions in the inner suburbs of Tokyo is about double that of Paris (1.02 versus 0.59 km/km^2). However, the railway density in Tokyo's seven wards and Paris are almost the same, at 3.15 and 3.14. For a more detailed comparison, it is necessary to take into account such differences as operation on single or multiple tracks, train operation intervals, and number of passengers transported per train, for example. PIARC's studies have not yet covered this. However, even by using the simple comparison above, the population and employment structure in the Tokyo metropolitan area are supported by railway networks more strongly than in Paris. We can also understand that the remarkably developed suburban railway networks support urban functions in Tokyo. In this sense, Tokyo outpaces Paris as a transit metropolis.

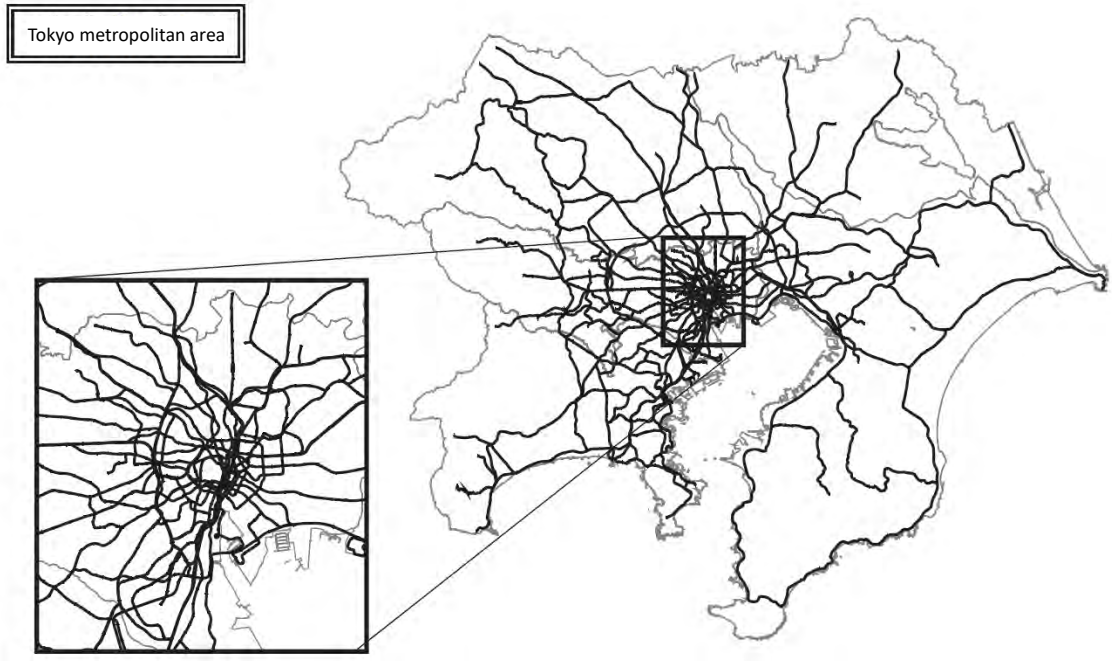

Figure 16: Railway network (Tokyo metropolitan area) (2008)

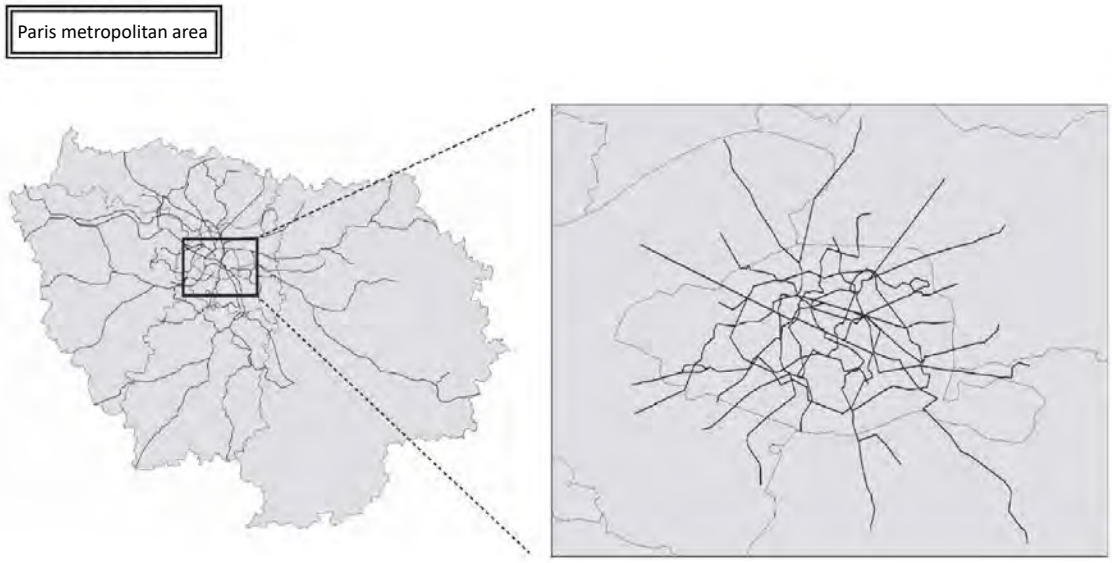

Figure 17: Railway network (Paris metropolitan area)

Incidentally, expressway networks in Tokyo and Paris are shown in Figure 18 and 19. As shown in Table 3, the extension density of Tokyo is 1.5 times that of Paris in the city center (0.58 versus 0.41 km/km^2), and 1.2 times that of Paris in the inner suburbs (0.30 verses 0.25 km/km^2). However, the figures are equal in the outer suburbs. Tokyo has more expressway networks than Paris and moreover, has a suburban rail network which far exceeds Paris.

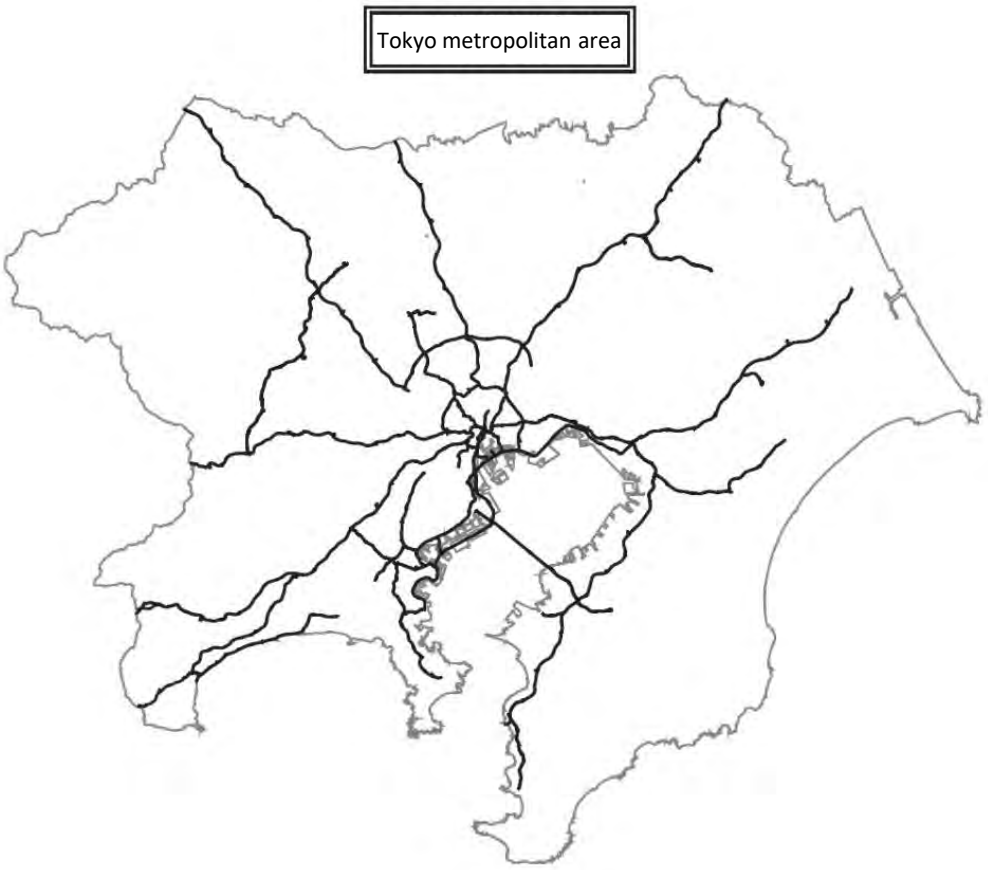

Figure 18: Expressway network (Tokyo metropolitan area)

Figure 19: Expressway network (Paris metropolitan area)

Table 2: Density of railway line extensions in Tokyo and Paris

	Tokyo metropolitan area		Paris metropolitan area	
Density of railway line extensions (km/km2)	7 central wards	3.15	Paris itself	3.14
	Inner suburbs	1.02	Inner Suburbs	0.59
	Outer suburbs	0.19	Outer Suburbs	0.09
	Total	0.24	Total	0.14
Station density (no. of stations/km2)	7 central wards	2.86	Paris itself	3.37
	Inner suburbs	0.78	Inner Suburbs	0.31
	Outer suburbs	0.08	Outer Suburbs	0.03
	Total	0.13	Total	0.07

Table 3: Density of expressway line extension in Tokyo and Paris

Road distance density — Tokyo metropolitan area

	Expressways			Other motorways	Total
		Arterial High-standard highways	Urban expressways		
7 central wards	0.58	0.00	0.58	0.00	0.58
Inner suburbs	0.29	0.02	0.27	0.01	0.30
Outer suburbs	0.04	0.04	0.00	0.01	0.05
Tokyo metropolitan area	0.05	0.03	0.02	0.01	0.07

Road distance density — Paris metropolitan area

	Expressways + motorways	Other motorways	Total
7 central wards	0.41	/	0.41
Inner suburbs	0.25	0.04	0.29
Outer suburbs	0.05	0.03	0.08
Tokyo metropolitan area	0.06	0.03	0.09

Road distance — Tokyo metropolitan area

	Expressways			Other motorways	Total
		Arterial High-standard highways	Urban expressways		
7 central wards	57	0	57	0	57
Inner suburbs	168	11	157	4	172
Outer suburbs	594	528	66	215	809
Tokyo metropolitan area	820	539	281	219	1,039

Road distance — Paris metropolitan area

	Expressways + motorways	Other motorways	Total
7 central wards	36	/	36
Inner suburbs	168	28	196
Outer suburbs	580	296	876
Tokyo metropolitan area	784	324	1108

3. The creation of Tokyo by railways

The fundamental reason for the Tokyo metropolitan area being a transit metropolis which is unparalleled anywhere in the world is based on the efforts to develop the area ever since the railways were introduced after the Meiji Restoration (1868). Of course, the present-day Tokyo metropolitan area is equipped with a modern road network (although it is not yet complete) and is supported by automobile traffic. However, modern road improvements started in the 1960s in the post-war era with the arrival of motorization in Japan. The details on the process and measures taken by Transit Metropolis Tokyo will be looked into in the following Chapters 2 and 3. Below is a description of its outline and its earlier history.

(1) Steam locomotives, hated at first by the people in cities

At the time when railways first began to be constructed in the Meiji Era, the source of power for railways was the steam engine. Rolling stocks towed by steam locomotives (SL) transformed the past inland transport of freight and passengers which had used river boats, cattle carts, wheelbarrows, and walking, into a form of high-speed, mass freight and passenger transport. The emerge of the first railway operated between Tokyo and Yokohama was an amazing innovation in transport, which shortened travel time between the two cities, from an entire day on foot to only 53 minutes by rail. The new Meiji government, which was uncertain about its financial base soon after coming into power, launched railway development and operations as an official government administration, not only as a mere innovative means of transport, but also as the symbol of Japan's westernization movement during the Meiji era, changing the previous Tokugawa shogunate system and unifying the nation. Afterwards, the government shifted its policy to allow private railways, mobilizing private capital to the construction of trunk rail lines on the condition that the government railways standard should be applied. For example, the Takasaki line (between Ueno and Takasaki) and the Tohoku line (Omiya to Aomori) were constructed and operated by the Nippon Railway, a private railway, before the trunk railways were nationalized in 1906.

However, the thick smoke and fumes from the steam locomotives were disliked as they were a potential cause of fires in densely built-up city areas with wooden buildings, and railway stations could only be located away from the city centers. Especially, railway stations were built away from the traditional city centers in many regional castle towns. The western section of the Yamanote line (Shinagawa to Ikebukuro) in the Tokyo metropolitan area was one of the first lines constructed as a government-run railway (completed in 1885). However, the Yamanote line could not pass along the densely populated areas along the Meguro River at that time, and so present-day Meguro Station was constructed by cutting through a plateau on the eastern side of the river. The current-day Chuo line was constructed by Koubu Railway, a private railway company, but this route could not pass along the busy Koshu Kaido at that time, and instead was constructed along a straight line through

the low-populated plateau area to the north. As railway construction gradually progressed and reputation of railway became more highly appraised, the tendency of the citizens to dislike the railways declined, and conversely, they tended to invite railway stations.

(2) Construction of private railways in major cities

With the construction of trunk lines promoted by the government and private railways, a network of 7600 km, covering all major cities in the country was completed by the beginning of the 20th century. Against the background of the highly evaluated efficiency of railways as wartime transport during the Sino-Japanese and Russo-Japanese wars, many private railways that constituted the nationwide trunk line railway networks were purchased by the government under the Railway Nationalization Act of 1906, when the railway board was established to unify the countrywide rail network construction and operation.

It was around this time that the Japanese economy finally began to take off, and increases in the population and industry around major cities began to become noticeable. In addition to the private railways that had escaped nationalization in major cities (for example, Nankai Electric Railway in Osaka), new private railway lines were constructed, which provided metropolitan freight and passenger transport or transport for pilgrimages to famous temples and shrines. The background for this was the clarified division of roles between nationwide trunk lines run by government railways and local transportation run by private railways, is stipulated by the National Railway Nationalization Law. In addition to this, legal and fiscal measures were effective to foster private railways, through the enactment of the light railways law (1910) and its assistance law (1911).

(3) Disaster reconstruction after the Great Kanto Earthquake and looping of the Yamanote line

Even in the early 1920s, populations and industries continued to be concentrated in Tokyo. The present-day Yamanote line was formed in the shape of a letter C, leaving the section between Akihabara and Tokyo station unfinished. From 1919, direct connections between the C-shaped Yamanote line and a part of the Chuo line between Nakano, Shinjuku, Iidamachi, Tokyo was enabled and a through service was operated (Ueno to Akihabara was operated on a single track for freight), and ran in the shape of the Japanese character "の" as seen in Figure 20. By this point of time, the inner areas of the Yamanote line and the eastern downtown area had been built-up, and the area from Ueno to Akihabara, Kanda, Tokyo, and Shinbashi had formed the city's busiest central area. In other words, the Yamanote line could not pass through the core part of Tokyo's busy downtown area. Under such situation, the Great Kanto Earthquake struck Tokyo in 1932. Reconstruction work named as the "Imperial City Reconstruction Project" was promoted under the direct control of the government. As a result, wide streets such as Showa Dori with wide sidewalks and spotted parks were constructed through land readjustment projects mainly in the disaster-affected areas. This

formed the skeletal urban infrastructure of downtown areas up to the present day. In terms of the railways, the unfinished sections of the Yamanote line and the Sobu line (Ochanomizu to Ryogoku), which terminated on the outskirts of the traditional busy downtown areas were constructed as a result of land readjustment projects, and the looping of the Yamanote line, which had been a longstanding issue, was finally achieved. The looping of the Yamanote line and other developments were realized as a result of the catastrophe of the Great Kanto Earthquake (Figure 21).

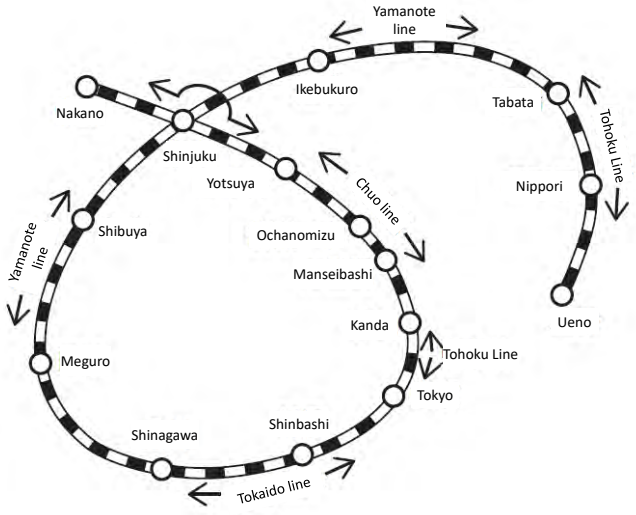

Figure 20: Yamanote Line in Tokyo, running in the shape of the Japanese character "の" (1919)
(Source: Kenji Nakamura, "Birth of the Yamanote Line," Ikaros Publications)

Around 1940 Around 1908

Figure 21: Area around Akihabara Station before and after the Kanto Earthquake Restoration

(4) Progress of suburban habitation after the Great Kanto Earthquake

The Great Kanto Earthquake was an epoch in terms of suburban development. Before the earthquake, Den-en Toshi Company, which was influenced by Britain's garden city concept and established by Eiichi Shibusawa, a leader in the business world at that time, planned to develop new residential land in the southwestern suburbs of Tokyo and to construct an electric railway for suburban residents to commute to downtown areas. After the earthquake, many people moved out from the damaged downtown to the green and healthy suburbs where the ground was high, stable, and safe, and new suburban lifestyle of commuting to city center became popular. From that time, private railways in the Tokyo metropolitan area started to widely implement a system that integrates construction and extension of railways to the suburbs, and development of suburban areas.

(5) Integrated development of suburban development and suburban railways

The planned and integrated development of the suburbs and suburban railways in the Tokyo metropolitan area that implemented by the Den-en Toshi Company (now, Tokyu) was originated and executed by Ichizō Kobayashi, the president of the Minoo Arima Electric Railway Company (current-day Hankyu) in Kansai. At that time, the licensed lines of the company passed through forests, fields, and small towns and villages, which spread to the northern suburbs of Osaka. As such, passenger demand from existing municipalities along the railway line would not be high enough. This handicap be the background of the simultaneous creation of new residential areas and railway construction; in other words, it became a source of ideas for the railway company itself to create passenger demand. In 1910, the company developed a housing complex of about 11 hectares as shown in Figure 22, near the Ikeda Muromachi Station on the Takarazuka line (about 20 km from the center of Osaka) and sold wooden houses packaged together with housing sites immediately after the opening of the railway. The company employed effective advertisement to attract people's attention and distributed pamphlets that extensively advertised a new lifestyle in which people could leave the contaminated air in Osaka, and move to the greenery and healthy suburbs, and could commute instead to Osaka by train. With its effects, the Ikeda development was a great success. The company actively promoted this system and developed 885 hectares of suburban residential areas alongside the railway during the pre-war period. For comparison, Nankai, a long-established private railway company in the Keihanshin area, lacked the motivation to create passenger demand on its own, because its licensed lines were located between southern Osaka and Sakai, which were already urbanized. The Nankai carried out only a small amount of suburban development in the pre-war period.

This type of suburban development and integration of suburban railways was also carried out by Seibu and Odakyu, as well as Tokyu, in the Tokyo metropolitan area during the pre-war period. This

approach was again in full-bloom during the period of urbanization from the 1960s after the war. Table 4 shows the size of the suburban development areas carried out by each private company in comparison with the Tokyo and Keihanshin metropolitan areas.

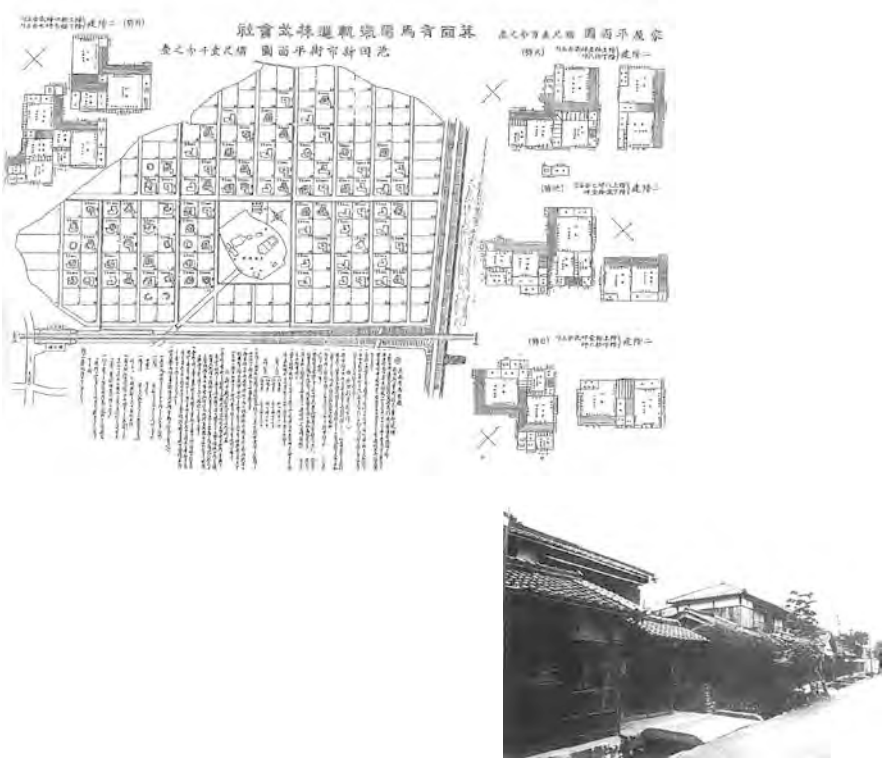

Figure 22: Earliest plan of suburban housing development

(Source: Urban Developers' Association of Japan,

“List of Private Railway Groups’ Urban Development Projects,” 2003)

Table 4: Suburban housing developments by the main private companies

Metropolitan area	Company	Area of development (ha)		
		Prewar	Postwar	Total
Tokyo	Odakyu (Note 1)	145	912	1,057
	Keio (Note 1)	0	333	333
	Keisei	25	256	281
	Keikyu (Note 1)	70	1,616	1,686
	Seibu (Note 1)	(Note 2) 1,172	2,051	3,223
	Tokyu (Note 1)	(Note 2) 138	6,785	6,923
	Tobu	(Note 3) 43	402	445
	Subtotal	1,592	12,355	13,947
Keihanshin	Kintetsu (Note 1)	0	2,284	2,284
	Keihan	0	918	918
	Nankai	25	1,248	1,273
	Hankyu (Note 1)	885	1,376	2,261
	Hanshin	(Note 3) 92	137	229
	Subtotal	1,002	5,962	6,964
Total		2,595	18,317	20,912

(Source: Urban Developers' Association of Japan, “List of Private Railway Groups’ Urban Development Projects – from 1910 to 2003,”

(Note 1) Including the lands developed by the affiliated real estate companies
(Note 2) Including the lands in the areas other than those alongside the railway lines; they were developed by the former Hakone Tochi Co. and others
(Note 3) The reference does not include the areas of Tokyu’s 40 lots, Tobu’s 11 lots and Hanshin’s 2 lots because the areas of them is not identified.

4. Evolvement of Japanese-style TOD

(1) Japanese-style TOD and its features

Transit-oriented development (TOD) means the development oriented around public transport. This is a relatively new concept proposed in the 1990s with criticism and reflections in the United States with its suburban areas that depend almost entirely on automobile transport and have a low-density spread. In the case of suburban development, TOD is intended to be used to carry out high-density development centered around stations for public transport (railways, bus rapid transit (BRT) systems), and carry out urban development that reduces the reliance on automobiles as much as possible.

Suburban development and the integration of suburban railways by private railways in Japan's metropolitan areas mentioned in the previous section are consistent with the concept of TOD in the sense that high-density development is carried out around public transport stations (in Japan's case, around railways). However, while the concept proposed in the U.S. is based on an awareness of restricting automobile traffic, integrated development in Japan is not based on this. In the pre-war period after 1910, which was the start of integrated development in Japan, motorization was still in the embryonic stage. Automobiles themselves were rare and integrated development in Japan was based on ideas completely unrelated to automobile traffic. Therefore, suburban development and the integrated development of suburban railways that implemented by private railway companies in major cities in Japan are said to be a Japanese-style TOD or to have originated in Japan, or a form of TOD that corresponds to the situations in major cities in Japan in the 20th century. In other words, in order to respond to urbanization through the 20th century, private railway companies carried out suburban development and the integrated development of suburban railways, coupled with the development of central terminal stations described in the next section. The structure of metropolitan areas was created, as a result, by the railways. This was the first core part of Japanese-style TOD. Secondly, at the center of this, the effects of internal cross-subsidies, in which development profits were transferred to railway development, worked to contribute to improving the efficiency of railway management and strengthening the financial base of private railway management. In other words, integrated development functioned as a business model for private railways for a long time.

One example case where TOD has been carried out along the axis of railways is in Hong Kong. The case in Hong Kong involved the development of a space above the station by a pubic railway operator. The fact that profits from a station development could be fed back into railway projects can be assessed as the integration of railways and development. However, since this integrated development is only used for station development, it has limited impact on regulating the structure of the metropolitan area.

Although we have touched upon private railways in major cities as a typical type of Japanese-style TOD, there are also the other players, i.e. JR (former national railway) and public entities (See Table 5).

Table 5: Types of Japanese-style TOD

Entity	Location of development		Remarks
	(A) Suburb	(B) Station	
Metropolitan private railways	○	○	In the case of (A), corridors are developed one by one over the medium or long term
JR	×	○	
(Former National Railway)	×	△	
Public corporations	○	×	In the case of (A), the New Town Designation is applied and a cluster of lots is developed over the short or medium term.

(2) Business model for private railways in major cities

Japanese-style TOD by private railway companies in major cities that was consistently implemented throughout the 20th century and helped the success of these companies can also be said to be a business model. At the core of the business model there are two major policies for railway line management. First is the exclusive operation of the railways in a certain corridor (referred to as a “transit corridor”) in the form of a half-opened folding fan heading out from the city center (Yamanote line in the case of Tokyo) to the suburbs, providing new stations and successively extending railway lines to keep pace with suburban development. Since railways require a huge investment, it is inevitable that companies may fall into management difficulties if they make excessive capital investments without demand. It is important to sustainably manage the railway and the corridor development by acquiring appropriate profits from development through upfront investments on an appropriate scale, and reinvesting these profits in further development and in railway extension. Second is the creation of a scheme for land use where both sides can gain synergistic benefits from the integration of railways and development. Generally, there is always railway transport demand to and from suburban residential areas that are biased in one direction: home to work flow towards the city center in the mornings and then in the other direction work to home flow towards the suburbs in the evenings. This means that the railway carries no passengers in the opposite direction, which is extremely inefficient for railway management. As shown in Figure

23, it is necessary to stimulate commuting demand to-and-from work and school in the opposite direction on weekdays by attracting the development of industrial parks, research institutes, and universities, as well as houses in the suburbs.

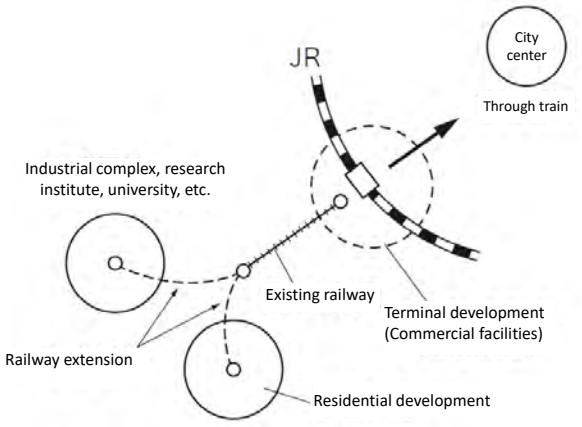

Figure 23: Land use scheme for developments alongside a railway line

While it is important to develop commercial and entertainment facilities in central terminals (such as movie theaters) to stimulate railway transport demand to the cities from the suburbs on holidays, it is also important to develop leisure areas and sports/recreation facilities in the suburbs in order to stimulate transportation demand towards the suburbs. These two major policies formed the framework for the business model that Mr. Ichizo Kobayashi, president of Minoo Arima Electric Railway Company (now Hankyu), originated during the pre-war period. In fact, Mr. Kobayashi opened an opera house for girls at the suburban terminal of Takarazuka in 1911 to 1913, in addition to carrying out the development of suburban areas and railway line extensions, as mentioned above. He also founded the Hankyu Department Store at Umeda terminal in Osaka in 1929.

Hanshin Corporation (now Hankyu) in Kansai constructed the Koshien including a baseball stadium, leisure areas, and residential areas in the suburbs in 1924, and in 1933, and opened Hanshin Mart (now the Hanshin Department Store) in the Umeda terminal in Osaka. This business model was also applied in the Tokyo metropolitan area. In 1953, the Tokyu Company opened the Futako Tamagawa amusement park in Futako Tamagawa (now Tamagawa). The site of this amusement park is now being transformed into a high-rise residential building and a large-scale commercial facility.

This business model creates a highly successful form of business combining railways and real estate, which became an important pillar for the management of private railway companies. Non-railway revenue accounts for 30% to 50% of the total revenue for half of the major private railway companies in the Tokyo metropolitan area. Table 6 deliberately shows figures for fiscal 1996 where JR East's non-rail revenue is less than 5%, illustrating the situation faced by JR East

immediately after privatization.

Table 6: Revenue bases for railway companies

Financial Position (1996FY)				
Company	revenue (\mill) (A)			B/A(%)
	fare	subsides	non-rail and others (B)	
JR East	1,895,600	0	94,100	4.7
Tobu	156,075	0	64,659	29.3
Seibu	93,712	0	97,969	51.1
Keisei	53,024	0	7,788	12.8
Keio	78,370	0	22,876	22.6
Odakyu	107,954	0	50,571	31.9
Tokyu	122,352	0	161,908	57.1
Keikyu	66,093	0	48,427	42.3
Sotetsu	32,196	0	80,882	71.9
Shin-Keisei	11,844	0	2,986	19.7

(Source: Statistics from the Ministry of Transport; figures for JR East are those for the whole group)

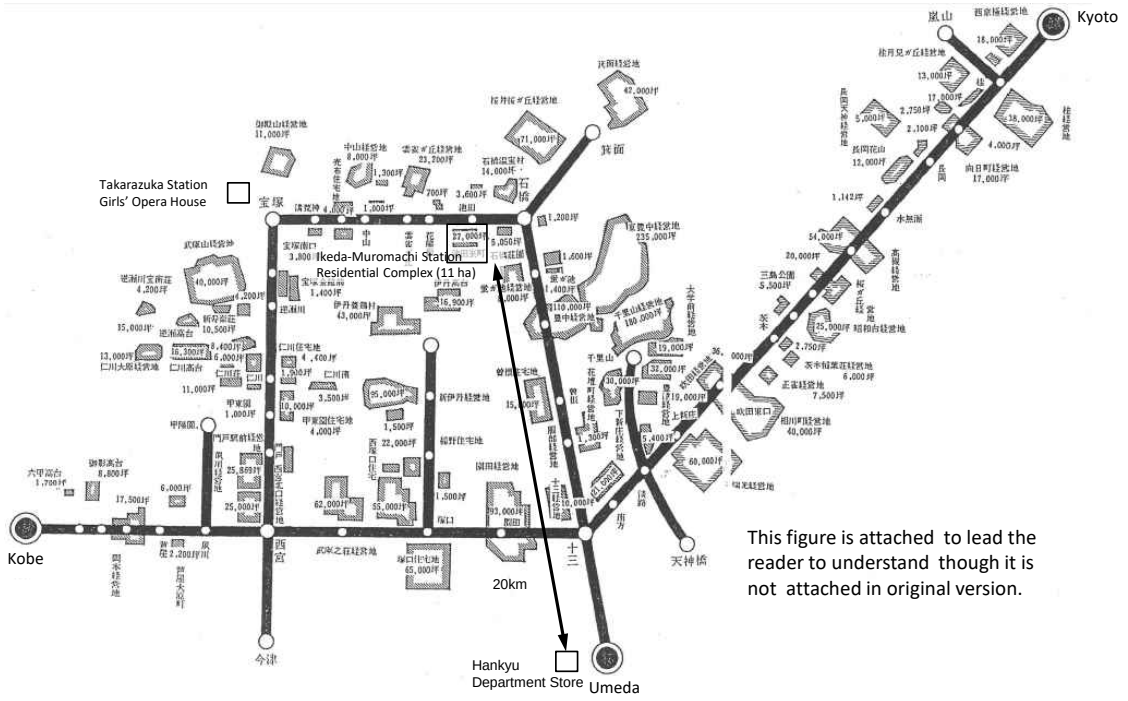

Figure: Development alongside the railways of Minoo Arima Electric Railway Co.

(Source: Urban Developers' Association of Japan,

"List of Private Railway Groups' Urban Development Projects – from 1910 to 2003," 2003)

(3) Development of JR (national railway) terminals

From the pre-war period throughout the 20th century, private companies in major cities succeeded in comprehensively executing suburban development, terminal station development and the construction/extension of suburban railways. However, the former national railway did not carry out suburban development or development integrated with railways. The reasons for this are as follows. First, in the pre-war period, the Ministry of Railways undertook the construction and operation of trunk railways nationwide. Freight transportation was the primary source of earnings. Although passenger transport was carried out in the inner suburbs of major cities, it was not regarded as a primary focus for management. Second, the scope of operations of the Japan National Railway (JNR), established as a post-war public enterprise, was limited by the law to railways and related transport (ships, buses, etc.), and the JNR could not deal in real estate or commercial business. Third, after the financial deterioration of the JNR was revealed in the late 1960s, it became possible to invest in the development of station buildings that were integrated with passenger terminals (as an amendment to the enforcement ordinance of the National Railway Act in 1971). But suburban development was, even so, out of the scope of the JNR operation.

One of the main causes for the financial deterioration of the former JNR was that railway freight operation, which was a source of revenue, fell into the red as a result of the progress of motorization. In the process of privatizing the former JNR in 1987, land assets reverted to JR were restricted to land required directly for passenger railway operations. Land assets, such as the former sites of freight yards and corporate housing, were attributed to the Japanese National Railway Settlement Corporation and were simply sold or sold after development as residential land in order to payback the long-term debt of the former JNR. For this reason, JR companies have concentrated on developing the spaces above their stations. This is now known as “in-station development” at JR terminal stations. The proportion of non-rail revenue as shown earlier has since increased sharply at JR East, with businesses using station space and the other related businesses accounting for about 30% of operating revenue. Although JR’s “in-station development” is not suburban development per se, it is a major type of Japanese-style TOD.

(4) Public support for TOD and development of “new towns”

The public sector played two roles in the development of Japanese-style TOD. The first is their role in support TOD carried out by private railway companies and by JR in major cities. This is summarized by the following three points.

①Enabling exclusive railway operation by private companies in certain railway corridors with the authorization of the national government

②Proper application of urban planning and land use control by the national and local

governments, such as development permission, land use and volume regulations so that TOD can be realized.

③Implementation of wide-area and fundamental urban infrastructure by the public sector in cooperation for the development of TOD

The second is that the public corporations and companies themselves carried out large-scale development of new towns integrated with railways during the period when populations were concentrated in major cities after the war. This also can be referred to as TOD by the public sector. The background for the large-scale development of new towns was that the demand for suburban residential areas rose due to the rapid concentration of populations in large cities and the sharp rises in land prices, which made it difficult for general workers to purchase houses (said to be about four to five times a general worker's annual income at the time). For this reason, the government planned to encourage public corporations to create large-scale new towns in the suburbs and make the prices of residential areas affordable, relied on a scale of merit for new towns. Public corporations and companies themselves are required to develop the new towns as well as access railway lines as a means of commuting to the central cities.

Two private railway companies, Keio and Odakyu, were asked to extend each branch line to access Tama New Town in the Tokyo metropolitan area (opened in 1975). This was an opportunity for the national government to establish an access railway construction subsidy scheme known as the "P-line scheme". Based on this, the Housing and Urban Development Corporation and the Tokyo Housing Supply Corporation, which are the development entities for the new town, provide right of way for access branch lines and railway construction expenses to reduce the burden on the two private railway companies.

In the case of Chiba New Town, the P-line scheme was applied to the Hokusou line (Shin - Kamagaya to Komuro). Moreover, the Housing and Urban Development Corporation itself also constructed and operated an extension line on the Hokusou railway (Komuro to Inba-nihon-idai). The extension line has been transferred to Hokusou railway afterwards.

Currently, the population in metropolitan areas has stagnated or is slightly decreasing, and the Housing and Urban Development Corporation was reorganized as an Urban Renaissance Agency, and has retreated from new town business. The public sector's own TOD practice has become a thing of the past.

5. Fall from bright and promising suburbs to suburbs in twilight

(1) Urbanization and bright suburbs

The 20th century was an era of economic growth throughout the pre-war and post-war periods, an era of increasing population throughout the country, and the "era of urbanization." The main and most urgent task of urban planning was to build residential and industrial cities for the increasing population and industries that were especially concentrated in large cities. Other major and urgent tasks included the establishment of relevant industrial infrastructure, transport infrastructure, daily life infrastructure, and disaster prevention infrastructure. As land prices in large cities continued to soar together with urbanization, it was natural that residential areas and industrial sites were developed in the inexpensive outer suburbs or on reclaimed land. With rising land prices, it was also each worker's dream to own a block of land in the suburbs and buy a detached home with a garden, because that was the most promising asset. At that time, the residential housing lots of the Housing and Urban Development Corporation were extremely popular and residents were decided by drawing lots. It was said that winning a housing lot was like a winner of the lottery. Raising children in the rich and healthy suburbs and having the family breadwinner commute to work by rail was also an attractive lifestyle that started before the war and continued on afterwards. In response to a surge in the number of suburban residents, railway companies increased their rail transport capacity and extended lines, which made it possible to develop further into more distant suburbs.

On the other hand, the high economic growth after the war brought about an increase in income around the country, which allowed people to purchase cars, another worker's dream. This was the arrival of motorization. In response to rapidly increasing automobile traffic, road improvements began to progress rapidly from the 1960s, even though it was still falling behind. In order to cope with congestion in the city centers of major cities and the surrounding areas, main streets were expanded and constructed, and the development of urban expressways were strongly promoted. In the suburbs, the development of roads and streets progressed rapidly in connection with the development of residential complexes, industrial complexes, and other related infrastructure.

It became possible to use road traffic, such as buses, cars, and bicycles as an access modes to suburban railway stations. Conversely, it became commonplace to find suburban shopping centers and hospitals located away from stations based on road traffic. As a result, suburban development has not only spread along railway corridor, but it has also seen low-density spread in the "regions between" corridors.

Living in the suburbs meant increased convenience through the ownership of a car. The suburbs were bright and promising.

(2) New mega trends and suburbs in twilight

In the 20th century, however, population concentrations in the large cities rapidly ceased in the 1970s. The Japanese economy shifted from high growth to stable growth. As urban areas along the railway expanded from the inner to outer suburbs, the negative aspects of suburban development started to be revealed, including long-distance and long-hour commutes of over one and one-half hours each way, and congestion during morning peak hours, were referred to as “painful commutes”. In the 1980s, however, the population in the Tokyo metropolitan area resumed increasing, but its extent was different from its 1960s boom. It was small in scale and only moderate in pace. Thus, urbanization trends also began to change.

Due to the collapse of the bubble economy in the 1990s, land prices nationwide dropped sharply, and of course, the asset value of suburban residential areas drastically decreased. The brightness of the suburbs were cast a shadow, and high-rise condominiums built on former industrial sites in convenient city centers or on reclaimed land were touted as affordable residence in the city center for young workers, due to declining land prices in the city centers. This was a return of the population to the city centers where the problem of a hollowing out of the nighttime population, had been a problem in the past. In some parts of the city center, some issues caused by the increasing population surfaced as a problem. The number of elementary and junior high school classrooms in city centers had once been reduced, but now needed to be increased again. The mega trends, in which urbanization was equal to suburban development, now changed dramatically.

The new mega trend that emerged in the 21st century is the declining and aging trend of the nation’s population. In 2002, the Ministry of Health, Labour and Welfare published its White Paper on Health, Labour and Welfare, which revealed that the national population had started to decline after reaching a peak in 1995 and that it was forecasted to continue its long-term decline. This forecast was an extrapolation of the declining trend in total fertility rates in the past. The impacts from this forecast were significant, and policy measures, such as improving birthrates and improving environments to raise and foster children, have been taken. However, no significant effects have been so far observed.

On the topic of the aging population, the White Paper also predicted that the percentage of the population over the age of 65 will exceed 30% by 2035, based on intermediate estimate of the “Estimated Future Population of Japan” as reported by the National Institute of Population and Social Security Research in January 2002. This estimation is an inevitable result in the sense that without a remarkable change in the mortality rate, people will certainly continue to age. Together with the decreasing population nationwide, this will have a significant effect on the future economic and social trends in Japan.

The degree of the decrease in the total population of the Tokyo metropolitan area is milder

compared with the other urban areas. However, it is still impossible for Tokyo to escape the effects of these two mega trends.

Another major mega trend is the hollowing out of the manufacturing industry. In order to find cheaper labor for rapidly growing China and for Southeast Asian countries, and to avoid foreign exchange losses due to the appreciation of the yen, the trend of relocating domestic manufacturing factories overseas is on the significant rise. For this reason, former factory sites are starting to emerge in the suburbs and at reclaimed sites in the Tokyo metropolitan area.

Looking at these mega trends, the contraction of urban areas is expected to occur even in the Tokyo metropolitan area. However, will the contraction be uniform across every area within the metropolitan area, or will only the outer areas be affected? Since residential areas occupy the majority of the urban areas, future trends in people's way of living will be the key to the trends in urban areas. Those who pursued suburban life in the era of the above-mentioned bright suburbs were the post-war baby-boomer generation. Many people in this generation have now reached retirement age and are joining the ranks of senior citizens.

The future way of living for these generations diverges in two different directions: either they abandon the suburbs and choose a more convenient residence in the city center, or they choose to have multiple habitats by owning both a suburban and a city center home. In particular, for those residential complexes located on the hills of the outer suburbs, it can be hard for the elderly (mostly baby boomers) who all moved in at almost the same time, to go up and down the steep slopes, and so the number of vacant houses is increasing. These areas are known as "cool areas." However, in the inner suburbs, there are some residential complexes that are being transferred over to the younger generation. Situated in relatively convenient locations, the development of new residential areas in former factory sites is highly popular, especially for the younger generation. These areas are, so to speak, "hot spots." In conclusion, the trends of decreasing and aging population invites mottled hollowing out of the in urban areas in large cities, with contraction progressing from the outer suburbs as a whole.

Japanese-style TOD centered on the railway corridors was a major driving force in forming the bright and promising suburbs. What new significance can be found in TOD in the future to rebuild the suburbs which have lost their brightness?