The Research on Integrated Urban Rain and Urban/Regional Development

Final Report
Summary

November 2017

Japan International cooperation Agency (JICA)

Almec Corporation
Tokyo Metro Co., Ltd.

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Table of Contents

1 INTRODUCTION 1-1

2 WORLD'S CITIES AND URBAN RAIL DEVELOPMENT 2-1

3 DEFINITION AND ROLE OF TRANSIT-ORIENTED DEVELOPMENT 3-1

4 URBAN RAILWAY DEVELOPMENT AND TOD IN DEVELOPING COUNTRIES

4.1 Selection of Urban Railway Cities of Case Studies 4-1
4.2 Viewpoints 4-2
4.3 Metro Manila, Philippines 4-1
4.4 Bangkok Metropolitan Area, Thailand 4-4
4.5 Delhi NCR, India 4-7
4.6 Jakarta, Indonesia. 4-10
4.7 HCMC / Hanoi, Vietnam 4-12
4.8 Greater Yangon, Myanmar 4-15
4.9 Ulaanbaatar, Mongolia 4-17

5 VIEWPOINTS ON RAIL DEVELOPMENT IN DEVELOPING COUNTRIES..... 1

6 EXPERIENCE OF CITIES IN JAPAN AND OTHER DEVELOPED COUNTRIES LESSONS FOR DEVELOPING COUNTRIES

6.1 Japanese Experiences of Development Around Stations and Along Railway Lines..... 6-1
6.2 Case Study of Hong Kong and Singapore 6-10

7 WAY FORWARD 7-1

Appendix

Transit Oriented Development Tokyo, a Global City Created by Railways

List of Tables

Table 2.1 World's Most Populated Cities and Their Urban Rail Development 2-1
Table 2.2 World's Most Populated Cities with Urban Rail by Population and Region 2-2
Table 2.3 Cities in Low-income and Lower-middle-income Countries with Urban Rail 2-2
Table 2.4 Cities in Upper-middle-income Countries with Urban Rail.....2-3
Table 2.5 Most Populated Cities without Urban Rail 2-5
Table 2.6 Distribution of Urban Rail Projects in Developing Countries by Mode.....2-6
Table 4.1 Profiles of Cities of Case Studies.....4-3
Table 5.1 Contrasting Viewpoints about Urban Railway Development 5-1
Table 6.1 Type of Development Around Station and Along Railway Lines 6-3
Table 6.2 Case examples of development around station and along railway in Japan 6-5
Table 6.3 Examples of development along railway in Japan.....6-7
Table 6.4 Examples of development along railway 6-9
Table 7.1 Project Implementing Organizations for Ekimae Ensenkaihatsu.....7-2
Table 7.2 Type of Railway Organization and Characteristics.....7-3
Table 7.3 Funding Source for Urban and Infrastructure Development 7-3

List of Figures

Figure 3.1 Concept of Transit-oriented Development 3-1
Figure 3.2 Target Areas for TOD 3-2
Figure 3.3 Concept of Ekimae Ensenkaihatsu.....3-2
Figure 4.1 Map of Metro Manila 4-1
Figure 4.2 Population Growth of Metro Manila / Mega Manila 4-1
Figure 4.3 Map of Bangkok Metropolitan Area.....4-4
Figure 4.4 Map of Delhi NCR.....4-7
Figure 4.5 Map of Greater Jakarta.....4-11
Figure 4.6 Landuse plan and Urban Railway Plan in HCMC, and Hanoi 4-13
Figure 4.7 Map of Greater Yangon 4-15
Figure 4.8 Map of Ulaanbaatar and Urban Public Transport Network Map.....4-18

1 INTRODUCTION

1) Study Background

1.1 Urbanization in developing countries has been accelerating in association with economic growth and rapid motorization, resulting in heavy traffic congestion and air pollution especially in large urban areas. It is in this context that the Japan International Cooperation Agency (JICA) has provided many cities with various support solve these urban problems. One such assistance is in the area of urban rail development. Urban rails will not only ensure public mobility but also contribute to effective land use development by building a transport backbone, promoting the growth of central business districts (CBDs), and hastening urban development in its influence areas. An integrated development induces rail ridership and provides opportunities to capture the development benefits from railway projects. An integrated development can realize a win-win solution between transport and urban development, such as promoting compact urban areas, reducing transport costs, improving air quality, and enhancing the value of urban space.

1.2 However, sufficient efforts have not been made in developing cities in coordination with urban and transport master planning, such that proper transport modes were not selected to match the land uses along a corridor or access to rails is poorly provided. It is important to integrate both land uses and rail not only from the urban planning point of view, but also to ensure profitability of the rail business.

1.3 In Japan, integrated rail development with urban/regional development has been practiced for a long time now and provides various cases of integrated development by private rail companies. Lately, there have been cases of integrated development through land readjustment which enhances the development effects. These include the Tsukuba Express and Minatomirai Line, to name a few. However, in integrated development and planning, there are issues among project implementing bodies on development objectives, implementation schedule, and interests of stakeholders.

2) Study Objective

1.4 In the developing countries to whom JICA is providing assistance, organizations and institutions related to land use varies from one other. In addition, urban rail is constructed in already heavily built-up areas unlike in Japan where railways were developed in areas that were sparsely populated. Therefore, successful cases in Japan must be applied in consideration of the conditions in developing countries. The objective of this study therefore is to explain the opportunities of and constraints to developing urban rails in integration with urban/regional development and extract lessons from the case studies to be presented.

3) Definition of Urban Rail

1.5 Urban rail refers to all modes of mass transit with exclusive right of way in urban areas and include those with rubber tires among others. However, this study does not aim to specify the level of carrying capacities of rail, or if the right of way includes crossings, or the coverage of urban areas. Urban rail includes the construction of subways, light rail, monorail, automated guideway transit (AGT), linea, and the upgrading of conventional railways to urban rails. Bus systems, such as the bus rapid transit (BRT), are not part of urban rail.

2 CITIES AND URBAN RAIL DEVELOPMENT IN THE WORLD

1) Urban Rail Development

2.1 Cities with a million population are more or less the size of urban areas where the introduction of rails (often subways) were considered. It seems many cities in developing countries with this population size start discussing urban rails. Table 2.1 shows the distribution of cities with more than a million population by region. The table indicates the following:

(i) There are 503 such cities in the world, 151 of which have urban rails (e.g., subways, MRT, light rail, commuter rail, monorail, AGT). About 230 of these cities are in Asia (of which 56 have rail), 57 are in Africa (seven have rail), 110 are in the Americas (of which 47 have rail), 62 are in Europe (of which 27 have rail), and 44 are in Oceania and the Middle East (of which 14 have rail).

(ii) Of these 503 cities, those in high-income countries (with GNIs of at least USD12,476) number 127, of which 72 have urban rail. Those in upper-middle-income countries (with GNIs of USD4,036-12,475) total 209, of which 66 have rail. About 141 cities are in lower-middle-income countries and 11 of these have rail. In low-income countries, such cities with more than a million population number 26, of which only two have rail. The development or urban rails in the latter grouping is lagging behind.

Table 2.1 World's Most Populated Cities and Their Urban Rail Development

Region		Income Class[1]				Total
		Low[2]	Lower-middle[3]	Upper-middle[4]	High[5]	
Asia	No. of Cities	2	101	107	20	230
	With Urban Rail[6]	1	8	31	16	56
Africa	No. of Cities	22	26	9	0	57
	With Urban Rail[6]	1	2	4	0	7
America	No. of Cities	1	6	52	51	110
	With Urban Rail[6]	0	0	18	29	47
Europe	No. of Cities	0	3	19	40	62
	With Urban Rail[6]	0	1	5	21	27
Oceania and Middle East	No. of Cities	1	5	22	16	44
	With Urban Rail[6]	0	0	8	6	14
Total	No. of Cities	26	141	209	127	503
	With Urban Rail[6]	2	11	66	72	151

Source: Demographia World Urban Areas 12th Annual Edition: 2016.04、Urban Rail. Net

1 Income class: High=USD12,476-, upper-middle=USD 4,036–12,475, lower-middle=USD1,025–4,035; low=- USD1,026.
2 Low-income countries:
3 Lower-middle-income countries:
4 Upper-middle-income countries:
5 High-income countries:
6 Includes MRT, subway, light rail, monorail.

2) Cities with Urban Rail by Population Size

2.2 Cities with more than a million population were further classified by population size, as shown in Table 2.2 and described below.

(i) As their populations increase, cities start to own rails. Of the 77 cities with populations of 3 million to 5 million, 40 (52% of the total)) own rails. Of the 43 cities with populations of 5 million to 10 million, about 28 (65%) own rails. And among those with populations of more than 10 million, 29 (81%) out of 36 cities have urban rails.

(ii) In America and Europe, there are 22 cities with more than 3 million populations and 20 of them have urban rails. In Asia and, particularly, in Africa, the availability of urban rails is low.

(iii) In cities with populations of 1 million to 3 million, about 84% do not have urban rail. These cities include those in developing countries where tram services are available. But because the tram is not included in the study, such data was not considered. It can be said that these cities have other options in managing urban transport, and these include trams.

Table 2.2 World's Most Populated Cities with Urban Rail by Population and Region

Region		Number of Cities by Population				Total
		1-3 million	3-5 million	5-10 million	>10 million	
Asia	No. of Cities	159	27	23	21	230
	With Urban Rail	14	11	15	16	56
Africa	No. of Cities	34	16	4	3	57
	With Urban Rail	1	5	0	1	7
America	No. of Cities	76	17	10	7	110
	With Urban Rail	16	15	9	7	47
Europe	No. of Cities	50	5	4	3	62
	With Urban Rail	15	5	4	3	27
Oceania and Middle East	No. of Cities	28	12	2	2	44
	With Urban Rail	8	4	0	2	14
Total	No. of Cities	357	77	43	36	503
	With Urban Rail	54	40	28	29	151

Source: Demographia World Urban Areas 12th Annual Edition: 2016.04、Urban Rail. Net

2.3 Table 2.3 shows that in developing countries (those with low to lower-middle incomes) there are only 13 cities with urban rail. Six of these are in India, and their total length is 955 km, or three-fourths of the total length or rail routes in the 13 cities.

Table 2.3 Cities in Low-income and Lower-middle-income Countries with Urban Rail

Location				Urban Indicator[1]			Urban Rail Indicator[2]			
Region	Subregion	Country	City	Area (km)	Pop. (000)	Pop. Density (no./ha)	No. of Routes	Route Length (km)	Mode[3]	Opening Year of 1st Line
Asia	East Asia	North Korea	Pyongyang	176	2,860	162.5	2	23	RT	1973
	Southeast Asia	Philippines	Metropolitan Manila	1,580	22,930	145.1	3	50	RT, LR	1984
	Central Asia	Uzbekistan	Tashkent	531	2,785	52.4	3	39	S	1977
	South Asia	India	Bangalore	1166	10,165	87.2	2	32	RT	2011
			Chennai	971	9,985	102.8	6	240	RT, SR	1931
			Delhi (NCR)	2072	24,998	120.6	7	195	S, RT, AE	2002
			Jaipur	414	3,485	84.2	1	10	RT	2015
			Kolkata	1204	14,810	123.0	1	30	S	1984
			Mumbai	546	22,885	419.1	7	448	S, M, SR	1853
Africa	East Africa	Ethiopia	Addis Ababa	440	3,465	78.8	2	34	LR	2015
	North Africa	Egypt	Cairo Metropolitan Area	1,761	15,910	90.3	3	78	S, CR,LR	1987
		Tunisia	Tunis	363	2,240	61.7	8	32	LR	1985
Europe		Ukraine	Kiev	544	2,800	51.5	3	68	RT	1960
Total				11,768	139,318	-	48	1,279	-	-
Average				905	10,717	118.4	4	98	-	-

[1] Sources: Demographia World Urban Areas 12th Annual Edition: 2016.04, various sources.
[2] Source: Urban Rail.net
[3] S=subway, RT=rapid transit, M=monorail, SR=suburban rail, AE=airport express, LR=light rail, CR=commuter rail.

2.4 Table 2.4 shows the development of urban rails in developing countries with upper-middle incomes. Out of 66 cities in these countries, 28 are in China with a total route length of 4,036 km. Of this figure, Shanghai accounts for 617 km (15%). Other Chinese cities with with more than 100 km of rail routes include Beijing, Chengdu, Dalian, Guangzhou, Hong Kong, Nanjin, Shenzhen, Tiangjin, and Suzhou.

2.5 Other cities with more than a hundred kilometres of urban rails are Kuala Lumpur and Bangkok in Asia; Cape Town, Durban, and Pretoria in Africa; Mexico City in North America; Sao Paolo and Ro de Janeiro in South America; Moscow and St. Petersburg in Europe; and Tehran and Istanbul in the Middle East.

Table 2.4 Cities in Upper-middle-income Countries with Urban Rail

Location				Urban Indicator[1]			Urban Rail Indicator[2]			
Region	Subregion	Country	City	Area (km)	Pop. (000)	Pop. Density (no./ha)	No. of Routes	Route Length (km)	Mode[3]	Opening Year of 1st Line
Asia	East Asia	China	Beijing	3820	20,390	53.4	19	602	S, RT, M	1969
			Changchun	531	3,435	64.7	4	50.6	RT, LR	1941
			Changsha	622	3,775	60.7	3	69	RT, M	2014
			Chengdu	1541	10,680	69.3	4	109	RT	2010
			Chongqing	932	7,440	79.8	4	212	S, M	2005
			Dalian	777	4,300	55.3	6	141	RT, LR	1909
			Dongguan	1619	8,260	51.0	1	38	RT	2016
			Fuzhou	440	4,080	92.7	1	29	S	2016
			Guangzhou	3432	18,760	54.7	10	298	S, SR, MR	1997
			Hangzhou	1217	7,605	62.5	3	82	S	2012
			Harbin	570	4,915	86.2	2	55	S	2013
			Hey Ho	725	3,730	51.4	1	25	S	2016
			Hong Kong	275	7,280	264.7	13	268	S, LR	1910
			Kunming–Annin	712	3,730	52.4	3	64	RT	2012
			Nanchang	544	2,790	51.3	1	29	S	2015
			Nanjing	1269	6,380	50.3	7	219	S,SR	2005
			Nanning	306	2,690	87.9	1	32	RT	2016
			Ningbo	738	3,895	52.8	2	75	RT	2014
			Qingdao	1489	5,970	40.1	1	25	S	2015
			Shanghai	3280	22,685	69.2	17	617	S, ML, SR	1995
			Shenyang	1010	6,200	61.4	2	54.8	S	2010
			Shenzhen	1748	12,240	70.0	8	287	RT	2004
			Suzhou	1127	5,380	47.7	2	65	S	2012
			Tianjin	2007	11,260	56.1	6	175	S, LR	1980
			Wuhan	1166	7,620	65.4	5	181	S	2004
			Wuxi	738	3,670	49.7	2	56	S	2014
			Xian–Xianyang	932	6,150	66.0	3	91	S	2011
			Zhengzhou–Puyang	829	5,755	69.4	3	104	S, SR	2013
		Malaysia	Kuala Lumpur	1,943	7,365	37.9	5	208	S,M,SR,AE	1996
		Thailand	Bangkok	2,590	15,325	59.1	5	106	RT,S,AE	1999
	Central Asia	Azerbaijan	Baku	1,101	1,101	24.8	3	37	S	1967
Africa	North Africa	Algeria	Algiers	453	3,675	81.1	1	13.5	RT,T	2011
	South Africa	South Africa	Cape Town	816	3,865	47.4	4	460	SR	1882
			Durban	1,062	3,450	32.5	7	138	CR	1860
			Pretoria	1,230	3,030	24.6	4	145	SR	1910
America	North America	Mexico	Guadalajara	751	4,675	62.3	2	24	LR	1989

Location				Urban Indicator[1]			Urban Rail Indicator[2]			
Region	Subregion	Country	City	Area (km)	Pop. (000)	Pop. Density (no./ha)	No. of Routes	Route Length (km)	Mode[3]	Opening Year of 1st Line
			Mexico City	2,072	20,230	97.6	13	262	S,LR,CR	1969
			Monterrey	894	4,155	46.5	2	32	RT	1991
	Central America	Dominican Rep.	Santo Domingo	298	3,635	122.0	2	25	S	2009
		Panama	Panama City	220	1,530	69.5	1	16	RT	2014
	South America	Argentina	Buenos Aires	2,681	14,280	53.3	7	59.4	S.LR	1913
		Brazil	Belo-Horizonte	1,088	4,560	41.9	1	28	RT	1986
			Brasilia	673	2,585	38.4	2	40	RT	2001
			Fortaleza	518	3,460	66.8	2	43	CR	2012
			Porto Alegre	803	3,435	42.8	1	44	RT	1985
			Recife	414	3,375	81.5	3	40	RT,LR	1985
			Rio de Janeiro	2,020	12,240	60.6	11	274	S,LR,SR	1979
			Salvador	350	3,230	92.3	2	14	S	2014
			Santos	298	1,670	56.0	1	11	LR	2015
			Sao Paulo	2,707	20,605	76.1	12	352	S,SR,M	1974
		Peru	Lima	919	10,950	119.2	1	34	RT	2003
		Venezuela	Caracas	295	2,870	97.3	5	64	RT,SR	1983
			Maracaibo	407	2,065	50.7	1	7	RT	2006
Europe	Europe	Bulgaria	Sofia	207	1,320	63.8	2	21	S	1998
		Belarus	Minsk	324	1,980	61.1	2	37	RT	1984
		Romania	Bucharest	285	2,115	74.2	4	69.3	RT	1979
		Russia	Moscow	4,662	16,570	35.5	14	357	S,M	1935
			St. Petersburg	1,347	5,140	38.2	5	113	S	1955
Other	Middle East	Iran	Isfahan	350	2,435	69.6	1	12	RT	2015
			Shiraz	246	1,935	78.7	1	11	RT	2014
			Tabriz	168	1,715	102.1	1	7	RT	2015
			Tehran	1,489	13,670	91.8	5	144	S,RT,SR	1999
		Turkey	Adana	161	1,125	69.9	1	14	LR	2009
			Ankara	660	4,640	70.3	5	66	RT,LR	1996
			Bursa	207	1,890	91.3	3	41.1	LR	2002
			Istanbul	1,360	13,520	99.4	9	186.6	S, LR	1875
Total				72,465	436,481	-	285	7,609	-	-
Average				(1,098)	(6,613)	(60.2)	(4)	(115)	-	-

[1] Sources: Demographia World Urban Areas 12th Annual Edition: 2016.04, various sources.
[2] Source: Urban Rail.net
[3] S=subway, RT=rapid transit, M=monorail, SR=suburban rail, AE=airport express, LR=light rail, CR=commuter rail.

3) Large Cities in Developing Countries without Urban Rail

2.6 Table 2.5 shows the 21 cities in the world with populations of more than 5 million. Of the 21, seven are mega cities with populations of more than 10 million. Five are in Asia, i.e., Jakarta (30 million), HCM metropolitan area (12 million), Dhaka (16 million), Karachi (23 million), and Lahore (11 million); two are in Africa, i.e., Kinshasa (12 million), and Lagos (13 million).

2.7 All the 21 cities are either constructing urban rails or have them in the pipeline. They all suffer from serious traffic congestion, even Bogota which is well known for its BRT systems. Metro Manila with three urban rail lines also face the same situation. Common causes are as follows:

(i) Sharp increase in the number of private cars beyond road capacities;

(ii) Competition for road space among different modes, such as BRT, bus, paratransit, and

private cars. Increase in motorcycles is also a threat to public transport; and

(iii) Urban sprawl increases trip lengths, resulting in longer travel times for commuters and students.

Table 2.5 Most Populated Cities without Urban Rail

City (Country)	Urban Area (km^2)	Pop.[1] (000)	Pop. Density (no./ha)	Per-capita GDP (USD)	Car Ownership Rate (no./000 pax)	Poverty Rate[2] (%)	Existing Public Transport[3]	Project under Implementation	Projects being Considered
Hanoi (Vietnam)	466	7,445	160	2,111	23	11	BRT	Urban Railway	Urban Railway, BRT, monorail
Ho Chi Minh (Vietnam)	1,489	10,075	68	2,111	23	11	-	Urban Railway	Urban Railway, BRT, LRT, Monorail
Jakarta (Indonesia)	6,392	31,320	49	3,346	68	12	Conventional Railway BRT	BRT (Extended), Urban Railway	n/a
Bandung (Indonesia)	466	5,780	124	3,346	68	12	-	n/a	Monorail Cable Car/LRT
Dhaka (Bangladesh)	2,161	16,235	75	1,212	3	32	-	Urban Railway BRT	n/a
Yangon (Myanmar)	544	5,320	98	1,161	7	n/a	Conventional Railway	Urban Railway	Urban Railway BRT
Quanzhou (China)	1,529	7,020	46	8,028	205	6	Bullet Rain	n/a	n/a
Ahmedabad (India)	350	7,410	212	1,598	18	30	-	Urban Railway	n/a
Hyderabad (India)	1,603	10,740	460	1,598	18	30	Intercity Conventional Railway	n/a	Urban Railway
Pune (India)	479	5,785	121	1,598	18	30	-	n/a	Urban Railway
Slat (India)	233	5,685	244	1,598	18	30	BRT	BRT (extended)	Urban Railway
Karachi (Pakistan)	3,527	22,825	65	1,435	18	22	Conventiobal Railway	BRT	Urban Railway
Lahore (Pakistan)	790	10,355	131	1,435	18	22	-	Urban Railway	Urban Railway
Khartoum (Sudan)	932	5,205	56	2,418	27	47	-	n/a	n/a
Kinshasa (Congo)	583	11,380	195	455	n/a	47	-	n/a	n/a
Lagos (Nigeria)	907	12,830	141	2,641	31	70	-	Urban Railway	n/a
Onica (Nigeria)	148	7,425	502	2,641	31	70	-	n/a	n/a
Luanda (Angola)	894	6,955	78	4,104	38	41	-	n/a	n/a
Bogota (Colombia)	492	9,520	193	6,060	148	33	BRT, Ropeway	Urban Railway	n/a
Baghdad (Iraq)	673	6,790	101	4,948	496	25	-	Urban Railway	Urban Railway
Riyadh (Saudi Arabia)	1,502	5,845	39	27,000	336	25	-	n/a	Urban Railway
Total	26,160	211,945	-	-	-	-	-	-	-
Average	(1,246)	(10,093)	(150)	(3,850)	(81)	(29)	-	-	-

1 Source: Demographia World Urban Areas 12th Annual Edition: 2016.04.
2 Source: IndexMundi (https://www.indexmundi.com/g/r.aspx?v=69).
3 Excludes conventional rail, which does not function as urban rail, and bus.

4) Urban Rail Development in Developing Countries

2.8 Table 2.6 shows the indicative demand for urban rails in developing countries by mode such including MRT, light rail and monorail. There are a total of 1,075 projects with total length of 18,792km showing very large market. The demand in the cities in Asia such as India and China is considerably large, especially for MRT.

2.9 Average route length per city is still so short and as population and income increase, demand for urban rail increase the more.

Table 2.6 Distribution of Urban Rail Projects in Developing Countries by Mode

Region	Country Classification	Mode					
		Metro		Light Rail		Monorail	
		No.	Length (km)	No.	Length (km)	No.	Length (km)
Asia	Upper-middle-income	421	10,067	67	1,059	11	198
	Low-income and Lower-middle-income	115	1,760	15	329	7	104
	Total	536	11,827	82	1,388	18	302
Africa	Upper-middle-income	8	81	33	401	1	44
	Low-income and Lower-middle-income	11	241	31	597	1	13
	Total	19	322	64	998	2	57
America	Upper-middle-income	73	837	36	622	4	62
	Low-income and Lower-middle-income	1	11	4	51	0	0
	Total	74	848	40	673	4	62
Europe	Upper-middle-income	59	349	23	272	0	0
	Low-income and Lower-middle-income	7	17	2	4	0	0
	Total	66	366	25	276	0	0
Oceania	Upper-middle-income	0	0	0	0	0	0
	Low-income and Lower-middle-income	0	0	0	0	0	0
	Total	0	0	0	0	0	0
Middle East	Upper-middle-income	82	979	59	575	2	15
	Low-income and Lower-middle-income	1	15	0	0	0	0
	Total	83	994	59	575	2	15
Total	Upper-middle-income	643	12,312	218	2,929	18	319
	Low-income and Lower-middle-income	135	2,044	52	981	8	117
	Total	778	14,356	270	3,910	26	436

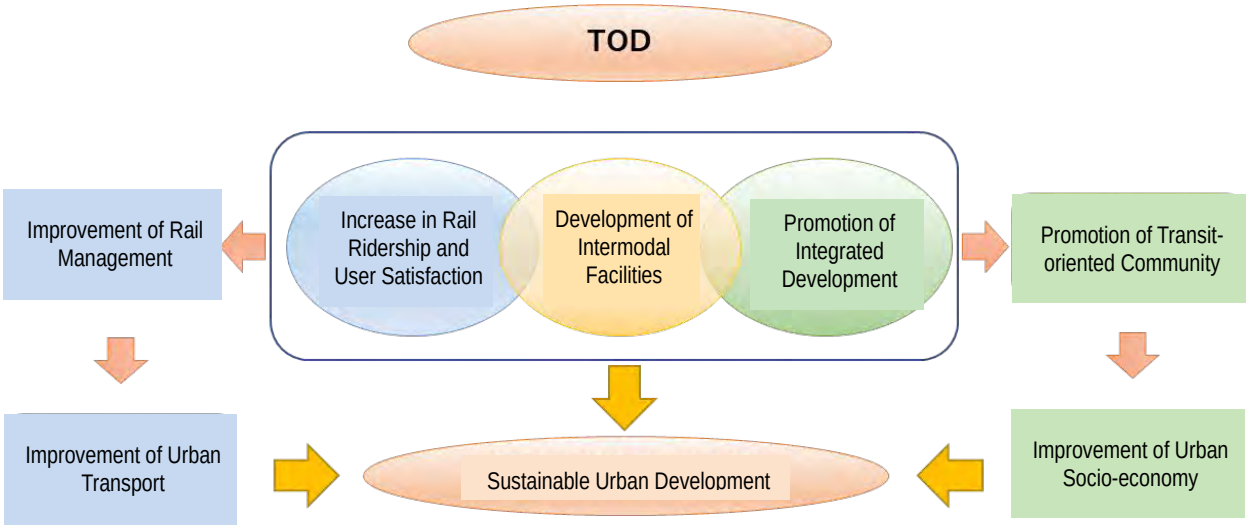
Source: Railway Dictionary

[1] Refer to Table 2.1 for classification of incomes.

3 DEFINITION AND ROLE OF TRANSIT-ORIENTED DEVELOPMENT

3.1 The concept of transit-oriented development (TOD) is defined, broadly, as urban/regional development to promote public transport and, narrowly, as the high-density, mixed-use, compact urban area development. It refers to high-density residential areas; accessibility to public, commercial, and business facilities; and high-quality pedestrian network around rail stations. TOD in Japanese and European cities has been practiced for a long time now. Although the understanding of TOD in developing countries vary, the commonly accepted notions include “access to public transport,” “mixed land uses,” “high density,” “multimodal,” “public space,” and “pedestrian environment.”

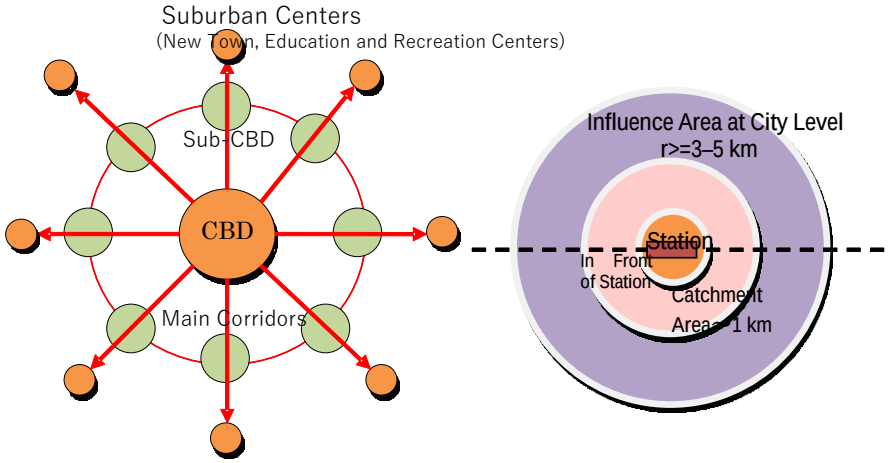
3.2 In Japan, TOD encompasses technology and institutions which support urban development that is integrated with urban rail and has long been known as *ekimae ensenkaihatsu* or development of station area or wayside development. Private railway companies have developed shops using extra spaces inside a station, department stores at terminals, or new towns along railway lines to increase rail ridership and services. TOD has recently included the act of transforming expanded urban areas and shifting from a reliance on private cars to high-density commercial and residential development around railway stations. Ekimae ensenkaihatsu in Japan promotes sustainable urban development by increasing fare revenue and promoting compact urban area development.



Source: Mission Team

Figure 3.1 Concept of Transit-oriented Development

3.3 The concept and role of TOD has changed spatially: From the district level, i.e., station and catchment areas, it has expanded to city scale by promoting the development of sub-CBDs.

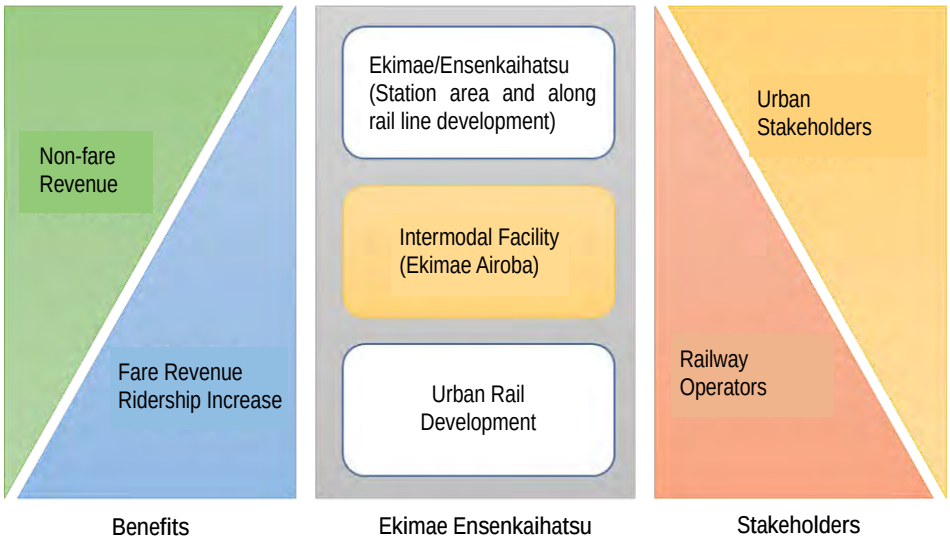


Source: Mission Team

Figure 3.2 Target Areas for TOD

3.4 Figure 3.3 shows the rail-based TOD whose effects derive from quality rail service and ekimae/ensenkaihatsu, which contribute fare and non-fare revenue. Intermodal facilities are called *ekimae hiroba* which connect rail and road-based transport in synergy.

3.5 *Ekinaka* or inside the station originally developed for commercial facilities by making use of extra space in the station. This type of development can be implemented together with rail projects. In contrast, development around and along the rail line requires additional land/space.



Source: Mission Team

Figure 3.3 Concept of Ekimae Ensenkaihatsu

4 URBAN RAILWAY DEVELOPMENT AND TOD IN CASE STUDY CITIES

4.1 Case Studies of Urban Railway Cities

4.1 The cities selected as case studies were selected from among Asian cities that have been recipients of technical assistance from JICA and must have available secondary information usually studied when planning for urban railway and station area development. These are the following cities and metropolises:

(a) **Metro Manila (Philippines), Bangkok (Thailand), and Delhi (India):** Megacities which already have urban railway, but traffic issues have worsened due to continuous growth of car numbers and population.

(b) **Hanoi and Ho Chi Minh City (Vietnam):** Cities with ongoing construction of urban railway projects.

(c) **Jakarta (Indonesia):** Traffic congestion is serious; MRT development project is ongoing, and it has the longest BRT network in the world.

(d) **Yangon (Myanmar):** Projects on upgrading and grade-separation of the existing railway system are planned to meet the growing traffic demand.

(e) **Ulaanbaatar (Mongolia):** Urban railway development is planned, and the urban spatial structure is suitable for urban railway development.

4.2 Hong Kong (China) and Singapore are also included case study cities, but their experiences are described in Chapter 6.

4.3 Most of the cities are megacities, because the development of urban railway is not only a transport matter but one that is highly related to the urban growth process. Through the process of urban railway development, various lessons can be learned. While Ulaanbaatar in Mongolia is not a large city, its linear urban structure lends well to urban railway development, which in turn is expected to contribute to solving the city's urban problems.

4.2 Viewpoints

4.4 The basic viewpoints for looking at the cities which were subjected to case study are as follows:

(i) How were the importance and role of urban railway understood and guaranteed as the government's policy? Can urban railway strengthen urban spatial structure, and can it function as the backbone of a hierarchical transit structure? What lessons could be learned?

(ii) How was the railway development project prepared and implemented? What problems were encountered in each project phase? What lessons could be learned?

(iii) How were the importance and role of station area development / railway catchment area development understood and were they implemented? What problems and outputs were seen? What lessons could be learned?

4.5 All cities missed the right timing to develop their own urban railway systems due to rapid urbanization and motorization. The characteristics of case study cities should be considered: for example, Delhi showed rapid urban railway development pace; Yangon has implemented restrictions on motorcycle use in urban areas; while Hanoi's and HCMC's rail transport suffer from stiff competition from motorcycles.

4.6 In this study, station area / railway catchment area refers to: (i) *ekinaka* (inside a station facility), (ii) intermodal facility, and (iii) station area /railway catchment area development. In developing countries, the function of intermodal facilities could be very important, but this has never been considered in urban railway projects. While developing ekinaka is the responsibility of railway operators and developing station areas is the task of the private sector, providing intermodal facilities is a very important mandate of the public sector.

Table 4.1 Profiles of Case Study Cities

Indicator			Metro Manila	Bangkok MA	Delhi NCR	Jakarta	Hanoi	HCMC	Greater Yangon	Ulaan- baatar
Urban Indicator[1]	Urban Area (㎢)		1,580	2,590	2,072	6,392	868	1,489	544	233
	Population (000, 2016)		22,930	15,315	24,998	31,320	7,445	10,075	5,320	1,280
	Population density (no./ha)		145	59	121	49.0	86	68	97.8	55
	Urban Spatial Structure		Radial/ circular, Multicores, Sprawling	Radial/ circular, Multicores, Sprawling	Radial/ circular, Multicores, Sprawling	Radial/ circular, Monocore, Sprawling	Radial/ circular, Monocore, Sprawling	Radial/ circular, Monocore, Sprawling	Radial/ circular, Monocore, Sprawling	Linear, Monocore, Sprawling
Socio – economic indicator	Per Capita GDP[2] (USD, National Level)		3,452	6,029	1,598	3,346	2,111	2,111	1,161	3,900
	Per Capita GRDP[3] (USD)		6,039	11,420	3,199	9,879	2,871	3,161	2,286	6,250
	Poverty Rate[4] (%, National Level)		26.5	13.2	29.8	11.7	11.3	11.3	32.7	29.8
	Air Pollution[5] (ug/㎥, National Level)		55	42	229	n.a.	n.a.	n.a.	n.a.	165
Urban Transport indicator	Road Area Ratio (Road Area /Urban Area %)		n.a	7.1	23.0	7.3	4.2	n.a	4.4	n.a
	Modal Share (Excluding Walking)[6]	M/C	12.0	53.5	21.5	41.0	83.6	85.8	29.8	0.1
		Car/Taxi	13.1		17.7	8.0	7.0	5.3	15.7	34.3
		Public (road)	64.4	43.0	60.8	18.0	8.2	6.3	49.5	62.6
		Public (rail)	6.1	3.5		-	-	-	1.0	-
		Others	4.5	-	-	2.0	1.2	2.6	4.0	2.9
	Trip Rate[6]	Including Walk	2.6	1.8	n/a	1.8	4.0	3.6	2.0	4.0
		Excluding Walk	2.0	1.5	1.6	2.4	3.0	2.8	1.2	2.7
	Car ownership [7] (unit /000 pop)		94	408	157	97	68	69	45	141
	MC ownership [7] (unit /000 pop)		58	272	288	383	722	794	34	n/a

1 Source: Demographia World Urban Areas 12th Annual Edition: 2016.04
2 Source: World Bank GDP per capita (http://data.worldbank.org/indicator/NY.GDP.PCAP.CD（2016))
3 Source: Takara Printing Co.,Ltd.
4 Source: IndexMundi (https://www.indexmundi.com/g/r.aspx?v=69)
5 Source: WHO Global Urban Ambient Air Pollution Database (PM10)
6 Sources and years
- Metro Manila: The Project for Capacity Development on Transportation Planning and Database Management in the Republic of the Philippines (MUCEP), 2014
- Bangkok: World Bank Strategic Urban Transport Policy Directions for Bangkok, 2017
- Delhi: Study on Traffic and Transportation Policies and Strategies in Urban Areas in India, 2008
- Hanoi / HCMC: Data Collection Survey on Railways in Major Cities in Vietnam, 2014
- Ulaanbaatar: The Study on City Master Plan and Urban Development of Ulaanbaatar City (UBMPS) ,2007
- Yangon: Project for Comprehensive Urban Transport Plan of the Greater Yangon (YUTRA), 2013
- Jakarta: JABODETABEK Urban Transportation Policy Integration (2010)

7 Sources and years
- Metro Manila: The Project for Capacity Development on Transportation Planning and Database Management in the Republic of the Philippines (MUCEP), 2014
- Bangkok: OTP Transport and Traffic Statistics and Information Thailand, 2013
- Delhi: Sustainable and Equitable Transport System In Delhi: Issues and Policy Direction, 2011 年
- Hanoi / HCMC: Data Collection Survey on Railways in Major Cities in Vietnam, 2014
- Ulaanbaatar: knoema (http://hi.knoema.com/atlas/Mongolia/Ulaanbaatar/Vehicles-per-1000-population), 2010 年
- Yangon: Project for Comprehensive Urban Transport Plan of the Greater Yangon (YUTRA), 2013
- Jakarta: JABODETABEK Urban Transportation Policy Integration, 2010

4.3 Metro Manila, Philippines

1) Profile of Metro Manila

4.7 Metro Manila is composed of 17 municipalities and governed by the Metropolitan Manila Development Authority (MMDA) in the coordination of metropolitan-wide projects. Metro Manila has an area of 620 km^2 and a population of around 12 million (2010). Its population continues to grow, and suburbanization in adjoining areas has progressed. The urbanized metropolitan area includes adjoining municipalities and has about a population of 22 million, which is forecast to reach 30 million in 2030 (see Figure 4.1 and Figure 4.2).

4.8 Continuous population growth and a widening income gap have created a large informal sector, inducing overcrowding in existing urban areas and sprawl. More than 1 million households in slums and squatters are scattered throught Metro Manila, occupying public land and hazardous areas. Meanwhile, middle-income groups who reside in suburban areas have to ensure long commuting times due to traffic congestion. The urban area has been expanding even into hilly areas and undevelopable areas. Because of BOP (bottom of the pyramid) business and OFW (overseas foreign workers) remittances, the country's economic growth has successfully continued, and urban development projects are also active. Without efficient urban planning, skyscrapers have been constructed, and the population density has become quite high (220 persons per ha). The impact of urbanization is significant, and the expansion of Metro Manila creates a lot of urban issues which have never been seen elsewhere in the world.

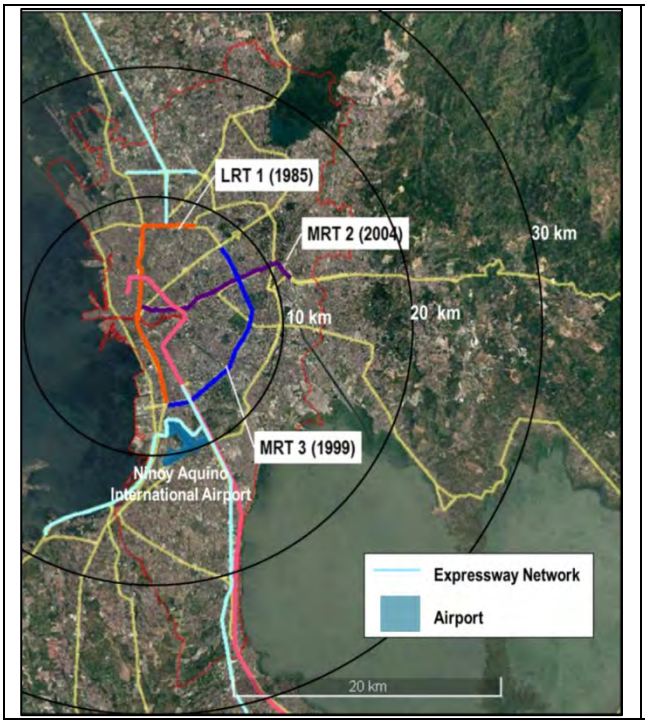
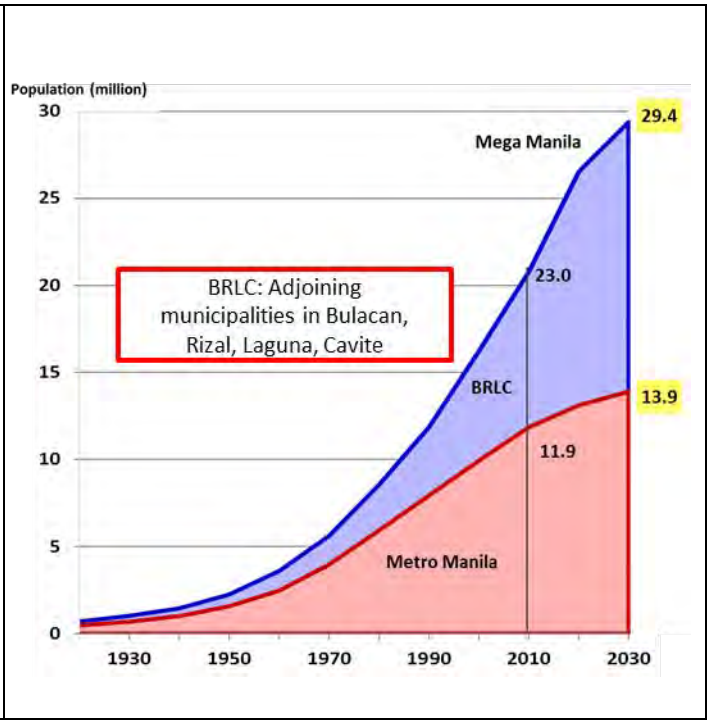


Figure 4.1 Map of Metro Manila



Source : Roadmap for Transport Infrastructure Development for Metro Manila and Its Surrounding Areas (Region III and Region IV-A)

Figure 4.2 Population Growth of Metro Manila / Mega Manila

2) Urban Transport and Urban Railway Development

4.9 The traffic condition in Metro Manila is getting even more serious, and congestion is evident not only during peak hours, but all throughout the day. The economic loss caused by traffic congestion is estimated at PHP2.4 billion per day.

4.10 The Manila LRT Line 1, which opened in 1985 (15 km of elevated light rail) is the first metro system in Southeast Asia. The MRT Line 3 (elevated light rail) and LRT Line 2 (elevated mass rapid transit) opened in 1999 and 2003, respectively.[1] The three routes/lines have their own fare systems and encountered a lot of problems during construction and operation. The daily ridership is 0.5 million for Line 1, 0.2 million for Line 2, and 0.5 million for Line 3. Overcrowding in the cars, on the platforms, and at ticket gates has become a serious matter.

4.11 The problems of urban railway in Metro Manila are the following: (i) closed network canno't meet urbanization; (ii) demand–supply gap; (iii) lacks connectivity to transit network; (iv) fare setting; (v) station plaza / feeder service; (vi) accidents and machine troubles due to low operating efficiency, overloading, and poor technical capability; and (vii) increasing subsidies. In addition, the difference in PPP schemes used in building the lines acts as a bottleneck in the development of urban railway as an urban transit network.

3) Plan

4.12 Traffic congestion in Metro Manila is considered as a national problem, to whose end a lot of projects have been planned and implemented. Among these projects, the most remarkable are the North-South Commuter Railway (elevated suburban railway utilizing PNR land) and the North-South Subway. These projects can reorient the current structure from radial and circular to grid and enhance the development of subcenters in suburban areas. Japanese loan is planned to be applied for both projects.

4) Station Area Development / Railway Catchment Area Development

4.13 Urban railway in Metro Manila was developed in a dense urban area and the provision of intermodal facilities was delayed and station area development was never considered. Some large shopping centers provide pedestrian decks connecting to the stations, but access from/to bus and jeepney is on the existing road for most of the stations.

5) Lessons from Metro Manila's Experience

4.14 The development of the urban railway in Metro Manila has been faster than in other Southeast Asian countries and has met a lot of problems along the way. Metro Manila's experience can provide lessons for other developing countries, as follows:

(a) **Transit Network Development vis-à-vis City Growth and Urban Area Expansion:** The urban railway network plan was prepared but the development was delayed while urbanization has rapidly progressed. As a result, the network plan didn't meet the urban size. Long-term planning of urban development project is required to solve demand–supply gaps and connectivity / extensibility of the transit network.

(b) **Demand Analysis and Mode Selection:** Megacities in developing countries have shown long-term urbanization (population concentration / suburbanization) exceeding

[1] MRT Line 3 introduced a light rail system. On the other hand, LRT line 2 introduced a mass transit rail system

the target years of master plans. In urban railway planning, demand analysis, mode selection, design of platform / station facilities, and further expansion projects should be considered.

(c) **Provision of Intermodal Facilities:** A lack of intermodal facilities impacts not only the railway users, but also road users. The minimum scale of necessary intermodal facilities should be implemented as part of railway projects.

(d) **Fare Setting on Urban Railway:** The fare on urban railway in Metro Manila is the same as that on other road-based public modes. As traffic congestion is serious, urban railway service is packed more than its capacity, causing machine troubles and accidents. Fares that match the high level of service is important also for the financial viability of an urban railway project.

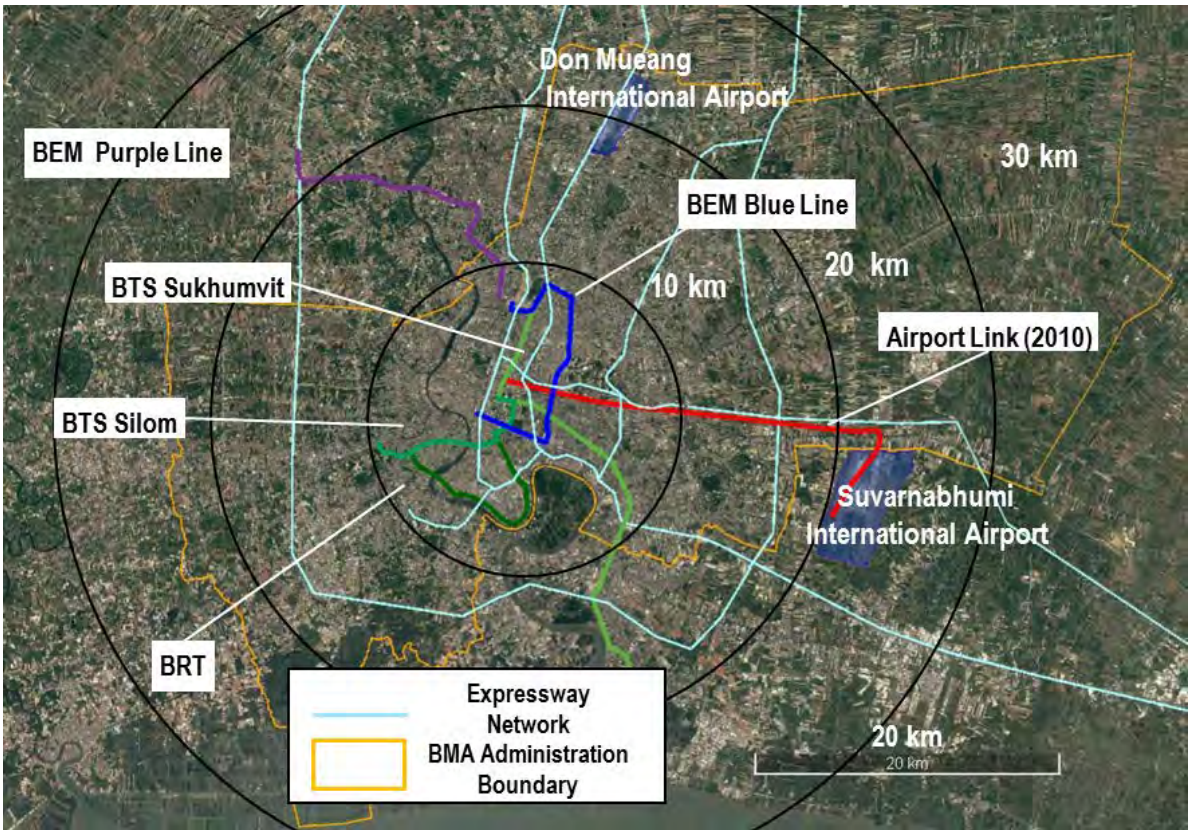
(e) **Capacity Development of Stakeholders:** The capacity of government is very poor, railway projects are not appropriately planned, and implementation is frequently delayed.

4.4 Bangkok Metropolitan Area, Thailand

1) Profile of Bangkok

4.15 Bangkok has an area of 1,569 km^2 and a population of 8.3 million. But the population in the metropolitan area is about 15 million, which is much more than the second-largest city. The primacy of Bangkok is quite high. Active foreign direct investment and globalization enhance the importance of Bangkok and such concentration in the city is assumed to continue. One of the problems of the spatial structure of Bangkok is its unique road network. The road-to-area ratio is 8.5% in the urban area and 2.5% in the suburban area. In other cities, road provision is lower. Large urban blocks surrounded by major roads are not provided with adequate secondary and distributor roads. Traffic flow is not appropriately distributed and is concentrated in a few arterial roads, causing severe traffic congestion.

4.16 Land-use control is extremely troubling, and mixed-use development is ongoing. High-rise development in the urban area and sprawl in the suburban are progressing. Such inefficient and rapid urban development makes infrastructure development even more difficult and induces various urban problems including traffic congestion.



Source:Worked out by the Study Team based on Google Earth.

Figure 4.3 Map of Bangkok Metropolitan Area

2) Urban Transport and Urban Railway Development

4.17 Like Metro Manila, urban planning is given less consideration by Bangkok authorities and therefore is not effective. On the other hand, aggressive real estate development has made Bangkok into one of the most congested cities in the world. Motorization has progressed rapidly, causing traffic problems to become more serious.

However, the urban expressway was developed actively as a countermeasure to traffic problems. Eight sections of the urban expressway network with a total route length of 208 km have greatly improved the traffic condition. The urban expressway network is planned to be expanded further to reach 330 km.

4.18 The existing railway in Bangkok was once utilized for urban transport, but the impact was very limited and the share of the existing railway is less than 1% of the total urban traffic demand. In 1999, the first urban railway route was opened by BTS, a private company. In 1992, the Mass Rapid Transit Authority (MRTA) was established and worked on the development of the Blue Line. This line was planned to be an elevated railway but was later modified to be a subway with the phase 1 section opening in 2004. The Airport Link and Purple Line were opened in 2010 and 2016, respectively. In the meantime, BRT was opened in 2010. Additionally, the Red Line between Bang Sue Junction (SRT) and the northern suburbs is being planned.

3) Plan

4.19 The development of urban railway in Bangkok has been rapid. The various urban railway routes have been planned and constructed, and the development of the planned 10 routes with 464 km of urban railway network is assumed to be progressing rapidly. It is remarkable that the network intends to expand into the suburbs.

4) Station Area Development / Railway Catchment Area Development

4.20 Based on related documents, the characteristics of station area development are as follows:

(i) In the city center, pedestrian decks have been widely developed, easing the overconcentration of passengers in stations. Some stations are connected to hotels and commercial facilities.

(ii) The development of medium-/high-rise residential buildings around urban railway routes has progressed. The main target is the middle-income group who hails from suburban areas and in other urban areas. As a result, it has contributed in the mitigation of urban sprawl and has impacted people's lifestyles, i.e., the commuting distance is shorter and car ownership is reduced.

4.21 In December 2015, the development of the Orange Line (39.6-km route with 30 stations between Taling Chan in the west and Minburi in the east) was approved. Real estate development around the route has increased, suggesting that urban railway development stimulates real estate development.

5) Lessons from Bangkok's Experience

4.22 Bangkok's experience in urban railway development give the following lessons:

(a) **Development as Urban Railway Network:** Like Manila, the first urban railway route in the city was implemented by the private sector. Due to budget constraints, the capacity of the railway was quite lower than the demand. The urban railway network has extended into the hinterland in the adjoining provinces, but connectivity along the routes is poor.

(b) **Role sharing between Urban Expressway, Urban Railway and Road Transport:** Unlike Metro Manila, the fares on Bangok's urban railway is twice those of the bus. The service level is also higher, and it attracts the middle-income group. As a result, the role

sharing between urban expressways (mainly for logistics and business trips), urban railway (mainly for commuting and school trips), and road transport (feeder) is established.

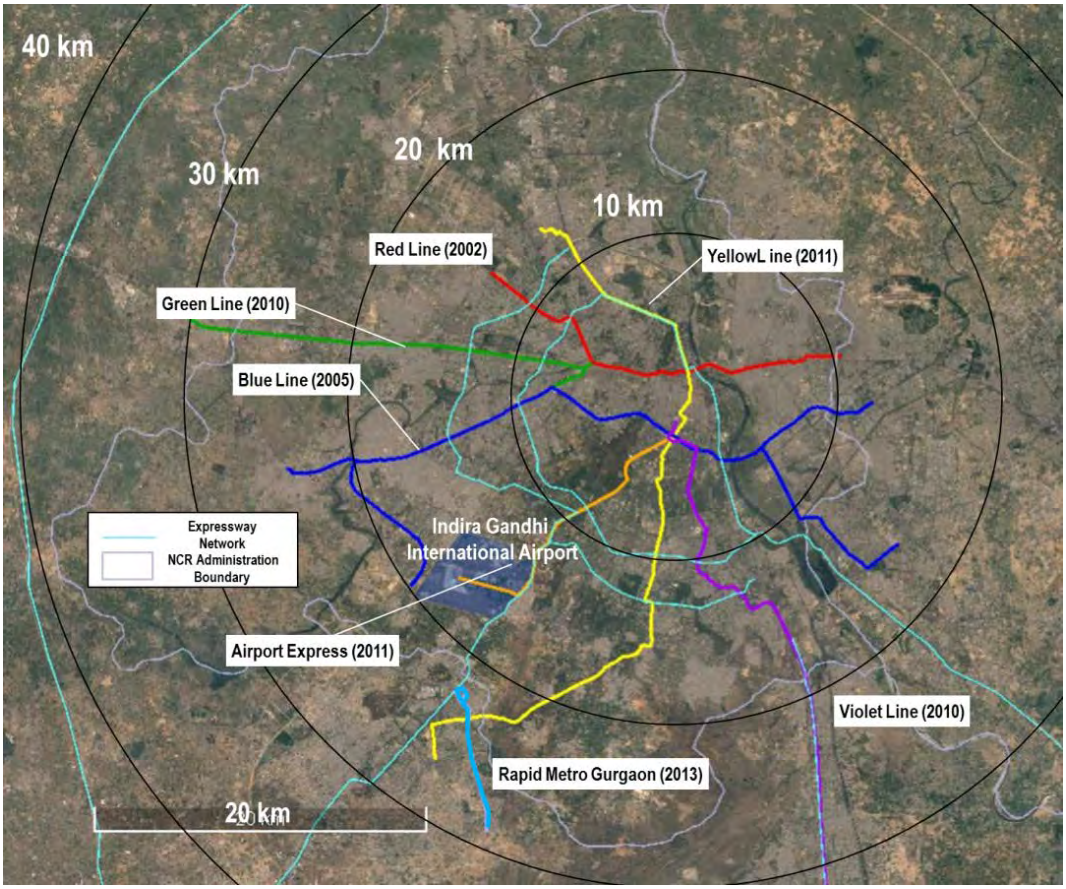
(c) **Merger between BECL (Bangkok Expressway Company Limited) and BMCL (Bangkok Metro Company Limited):** In December 2015, the two transport infrastructure companies were consolidated as BEM (Bangkok Expressway and Metro). BMCL experienced losses every year, but BECL showed good performance. The merger is expected to enhance the competitiveness of urban railway development.

(d) **Strategy of BTS:** BTS has shown a healthy increase in ridership and is planning to extend and expand its routes. At the same time, BTS has a presence in real estate together with large private developers. A joint company with a 50:50 investment ratio was established and the development of condominium buildings within 500 m from subway stations has progressed. Its advertisement business has also developed through an unconsolidated subsidiary. In the service sector, its hotel business and e-money business are also financially viable.

4.5 Delhi NCR, India

1) Profiles of Delhi

4.23 Delhi is a union territory of India. Its area is 1,483 km^2 with a population of around 16.75 million (2011). There are four satellite cities in the suburbs and they are aggregated with the National Capital Region. The population in the greater region is 21.75 million. The urban population in India is still 30% of the total population. If economic growth with industrialization will continue, the population in this megacity will continue to grow in the future. Since the 1990s, industrialization has progressed and Delhi has become the national economic center. Industrialization and population growth have caused various negative impacts, such as the deterioration of the living environment, traffic congestion, and air pollutions.



Note : Worked out by Study Team based on Google Earth.

Figure 4.4 Map of Delhi NCR

2) Urban Development Issues and Urban Development Master Plan

4.24 Based on the Delhi development act (1957), the urban development master plan of Delhi was prepared in 1962 to prevent overcrowding and to promote the city's sustainable growth together with its adjoining areas. However, the population growth in Delhi has been higher than expected. Delhi has grown from an administrative city to a multifunctional city without enough residential, transport, and social infrastructure. At the same time, the strict land-use control and development permission caused an overdevelopment in adjoining regions. The urban development master plan was updated in 2001 to meet the rapidly increasing population and employment in subcenters, restructure the urban transport

network, and promote the development of mass transit. The characteristics of urban development in Delhi are as follows: (i) spatial distribution of urban function, (ii) self-standing suburban development, (iii) obligation to allocate low-income housing for every residential development project (20% of total residential units), (iv) public housing development projects, and (v) improvement of living environment in suburban villages (to prevent population outflowing).

4.25 Such policies were not effective. The creation of employment in local regions did not occur, and suburban residents commute to their workplaces located in the city center. The provision of residences for industrial workers has been insufficient. Public development projects, including residences, was stuck due to budget constraints and lack of cooperation among related agencies.

3) Urban Transport and Urban Railway Development

4.26 The urban transport situation in Delhi is severe and air pollution related to transport is considered as the worst in the world. The development of urban transport (mass rapid transit system) has progressed rapidly. Currently, 350 km and 241 stations of urban railway network are operated. The daily ridership is about 2.8 million (2015) but bus and other paratransits are dominant. Rapid motorization of private modes is accelerating traffic congestion.

4.27 The urban railway network in Delhi has developed rapidly: 65 km in Phase 1 (1998 - 2005), 125 km (2006-2011), 160 km (2012-2017). In the fourth phase, a 110-km network length is planned to be developed until 2020, bringing the entire network to 460 km covering the city center and connecting a number of suburban areas. The rapid development is due to the thorough hands-on approach with top–down structure. On the other hand, various negative impacts are pointed out, as follows: (i) excessive bidding competition, (ii) deterioration in quality, and (iii) deterioration in safety.

4.28 The three fundamental acts promoting urban railway development at the national level are the following:

(a) **The Metro Railways (Construction of Works) Act, 1978** regulates urban railway construction work in large cities (such as Mumbai, Kolkata, Delhi, Chennai).

(b) **The Metro Railways (Operation and Maintenance) Act, 2002** regulates the operation, maintenance, and management of urban railways in large cities and other cities.

(c) **The Delhi Metro Railway General Rules, 2002** specifies the regulation by union government which is guaranteed by Delhi Metro Railway (Operation and Maintenance) Ordinance, 2002 (Ord. 7 of 2002).

4) Station Area Development / Railway Catchment Area Development

4.29 Private ownership of land (and buildings) is officially permitted in India, but it has a lot of difficulties. There are strict controls on land use and real estate right. Sometimes the land can’t be utilized due to regulation.

4.30 Among such constraints, there are successes and failures in intermodal facility development in station areas. The importance of intermodal facilities is widely understood. Moreover, Delhi Metro Rail Corporation is already capable to implement station area development projects with the consortium. With the strong leadership of related

departments, the rapid development of a vast urban rail network has progressed, triggering the development of new towns and stations.

5) Lessons from Delhi's Experience

4.31 The lessons from Delhi's experience in urban railway development are as follows:

(a) **Legislation and Strong Leadership:** Strong leadership is not effective without legislation. Issues regarding quality and safety require flexible, hands-on approaches.

(b) **Understanding of Importance of Urban Railway:** Urban railway development can change the image of urban public transport and can change public lifestyles. It can also fill social gaps, indicating that urban railway does not merely provide urban transportation but also various assistances.

(c) **Coordination with Urban Planning:** Urban spatial restructuring can be planned by developing an urban railway network. In India, the consciousness about urban planning is high, and urban railway network planning shows the intention to rearrange the spatial structure of Delhi.

4.6 Jakarta, Indonesia

1) Profile of Jakarta

4.32 Jabodetabek or Greater Jakarta (comprises Jakarta, parts of 5 cities and 3 provinces) is capital region of Indonesia and has 31 million of population (2015) in 6,392 ㎢ of land area. The characteristics of urban transport are as follows: (i) the street network is absolutely insufficient in the urban area, (ii) road is not developed hierarchically, and (iii) the unique urban structure, which villages called “Kampong” are included in the urban area, and the density of urban area is relatively low and the traffic flow is concentrated into the limited arterial roads. And development of sub-centre in the City has been delayed and it contributes to the traffic congestion.

4.33 Development of transport infrastructure didn’t catch up the increasing of population and urban transport demand. And traffic congestion has been chronically occurred. Especially, development of arterial transport network such as major roads and urban railway has been delayed. And the motorization of motorcycle and private car are significant. During the period from 2000 to 2010, the number of registered motorcycles and cars had been 4.6 times and 2 times, respectively. On the other hand, the share of bus among commuters has been sharply decreased since 50 % to 16 %.

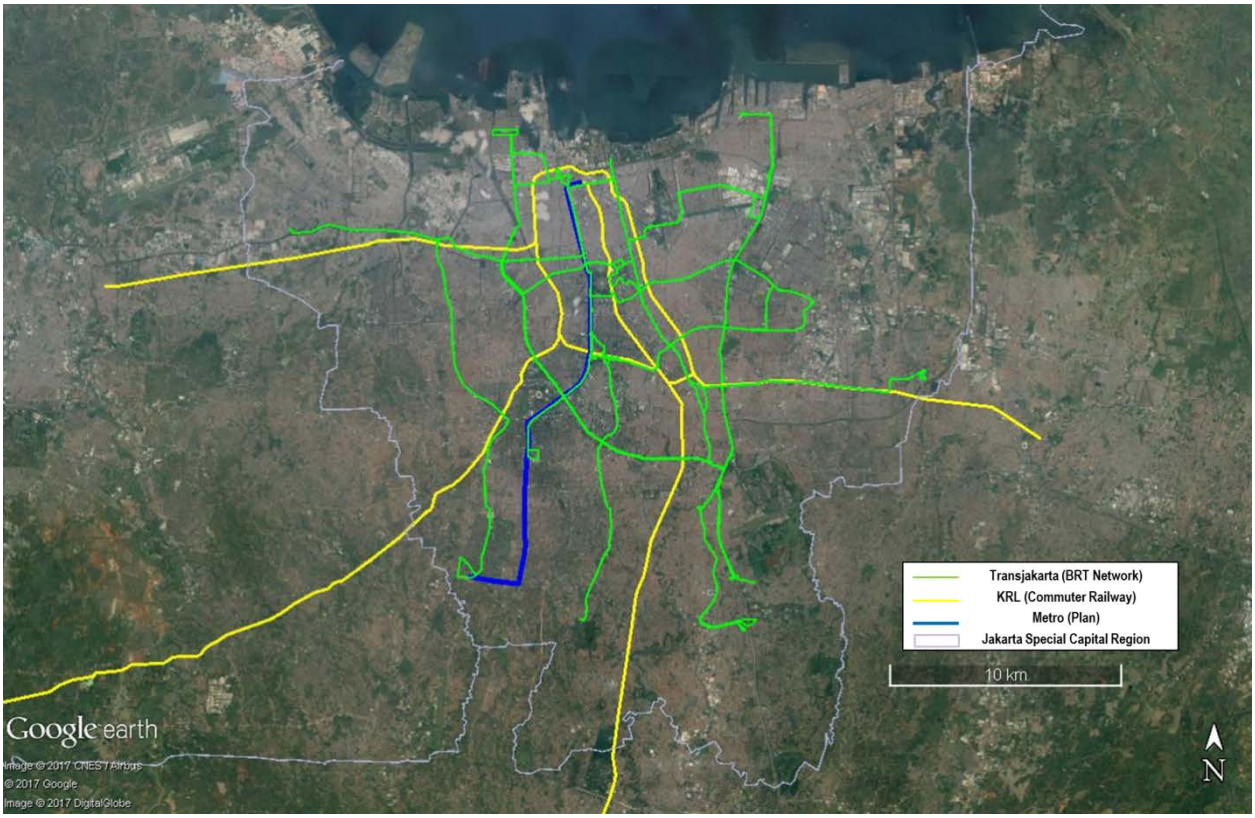
2) Urban Transport and Urban Railway Development

4.34 As the public transportation, BRT systems called “Trans Jakarta” is operated. The BRT network has 207 km of the longest route length in the world and the most of sections have exclusive lane. The first BRT route was opened in 2004 and the development of the routes had been continuously implemented. However, the BRT network has some problems as follows: (i) illegal use of exclusive lane by private car, (ii) Traffic congestion around CNG stations by bus fleets to refuel, and (iii) Provision of feeder service is also delayed, (iv) Accessibility to the BRT station, and (v) Traffic safety at intersection with other vehicles.

4.35 On the other hand, JICA has studied on urban railway development since 1980s and the new urban railway route is planned to be opened in 2019. The existing railway can’t fully function as the urban railway.

3) Station Area Development / Railway Catchment Area Development

4.36 The most of urban development in Jakarta are of complex facilities such as shopping center, apartment and office buildings. Such development projects are mainly located in central area and along arterial roads and toll roads. However, the accessibility by public mode is limited. And connectivity between Transjakarta and KRL Jabodetabek is not ensured in the city centers and only 10 suburban stations. On the other hand, JABODETABEK Transport Authority (JTA) clearly stated the enhancement of TOD.



Source: : Worked out by Study Team based on Google Earth

Figure 4.5 Map of Greater Jakarta

4) Lessons Learned

4.37 Lessons learned from urban railway development in Jakarta are as follows:

(a) **Limit of Urban Transport Network by BRT:** Jakarta has Trans Jakarta, the world longest BRT network. However, the system can't meet with population growth and mitigate traffic congestion. The PPHPD of BRT is limited to 3,600 pax and there are illegal intrusions by private cars and accidents at the intersections.

(b) **Importance of Information Provision to Decision Makers of Transport Policy:** The BRT system was proposed in *Urban Arterial Road System Development Study in Jakarta Metropolitan Area* (ARSDS) since 1985 to 1987, but the proposal had never attracted attentions. In 2004, the State Governor decided to introduce BRT, because he was inspired by the presentation of BRT from former Mayor of Bogota city, Colombia. Based on the strong wellness, the development of BRT was achieved.

(c) **Difficulties of Urban Railway Development due to the Preceding Urban Expressway:** In Jakarta, the expressway network, existing railway and BRT networks have been developed in advance. As the result, the space for urban railway is constrained.

4.7 HCMC / Hanoi, Vietnam

1) Profiles of HCMC and Hanoi

4.38 HCMC has 7.4 million of population. Development of high-rise buildings (commercial/ residential) have been emerged and the population density in the city centre is quite high (280 per ha). In the adjoining provinces of HCMC, the middle size cities have been emerged and the multipolar distributed urban structure is planned to be formed.

4.39 Hanoi has 7.1 million of population. There are historic conservation areas such as Ancient Quarter and French Quarter and the building restriction with height-limit is imposed but the population density in the city centre is quite high (276 per ha). Urbanization around the urban fridge area and sprawling around radial arterial road and Ring Road no. 3 have been progressed. To 5 satellite cities are proposed to be developed in the 25 – 30 km from city centre to achieve balanced development of the city. Among them, Hoa Lac Satellite city is projected to be 0.6 million of population in 2030 but not progressed.

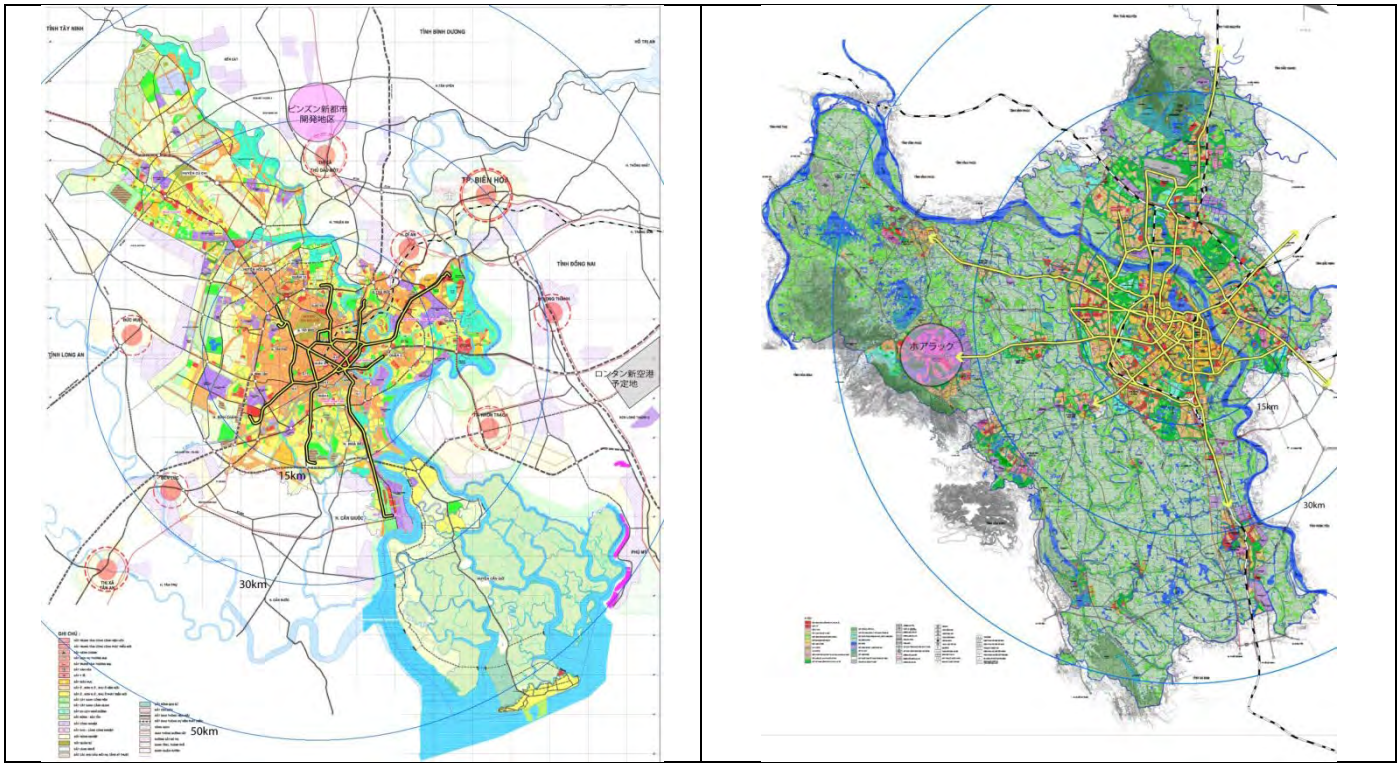
2) Urban Transport and Urban Railway Development

4.40 The remarkable point of cities in Vietnam is the dominance of motorcycles. This issue is related to the urban structures. The traditional residential blocks in Vietnam compose the middle-rise (3-5 stories) with narrow alleys (2-3 m of width) and it is accessible only by motorcycle. This tendency has been getting sufficient. On the other hand, suburbanization and the income growth induce the shift from motorcycle to private car.

4.41 Urban railway Line 1 in HCMC and Line 1, 2 and Line 3 in Hanoi are ongoing. All of them are proposed as the priority routes in other JICA studies. The urban railway development projects in Hanoi and HCMC were started in advance of a serious urbanization but the progress of the development in both cities (especially Hanoi) is very slow. The factors are (i) land acquisition, (ii) Decision for the location of the station, (iii) Cutting down the trees, (iv) landscape, (v) complication of administrative procedure, etc. Meantime, the speeds of population growth and motorization have been faster than expected.

3) Future Plan

4.42 According to the urban railway development plan in both cities, 320 km of 8 routes and 160 km of 6 routes are proposed in Hanoi and HCMC, respectively. The most critical problem of urban railway plan in HCMC is that the railway network is exclusive in the administrative boundary and the connectivity with middle size cities is not considered and the development of multipolar distributed urban structure triggered by urban railway can't be achieved. Although the discussion of the necessity was started, the implementation will requires the long time. On the other hand, Hanoi expanded the administrative boundary from 921 km^2 to 3,345 km^2 through the annexation of the parts of adjoining provinces and conventional urban area has been rapidly expanded and urban transport network is too extensive.



HCMC Hanoi

Source: Data Collection Survey on Railways in Major Cities in Vietnam

Figure 4.6 Land-use Plan and Urban Railway Plan in HCMC and Hanoi

4) Station Area Development / Railway Catchment Area Development

4.43 JICA studies to support the planning the intermodal facility and station area development had been conducted and understanding among stake holders had been enhanced and the road map of the project is also indicated. However, it does not lead to the implementation. The urban planning framework in Vietnam is bilayer with General Plan and Detail Plan. For all development projects, the detail plan should permitted as be coordinated with General Plan. Although the effectiveness of the framework is inadequate, zoning to enhance intermodal facility development and station area development.

5) Lessons Learned

4.44 Lessons learned from experiences in Hanoi/HCMC are as follows:

(a) **Application of Railway Land Development and Intermodal Facility Development on the Urban Development Masterplan and Urban Transport Masterplan:** The urban railway development plan is not adequately integrated with urban transport masterplan. There are conflicts for development space between urban railway and road facility. At the stage of Masterplan (General Plan), the basic direction should be indicated. Because there is the plan as the framework (i.e. Detail Plan), the proposal on urban railway development can has legal basis and coordination with related authorities is also possible.

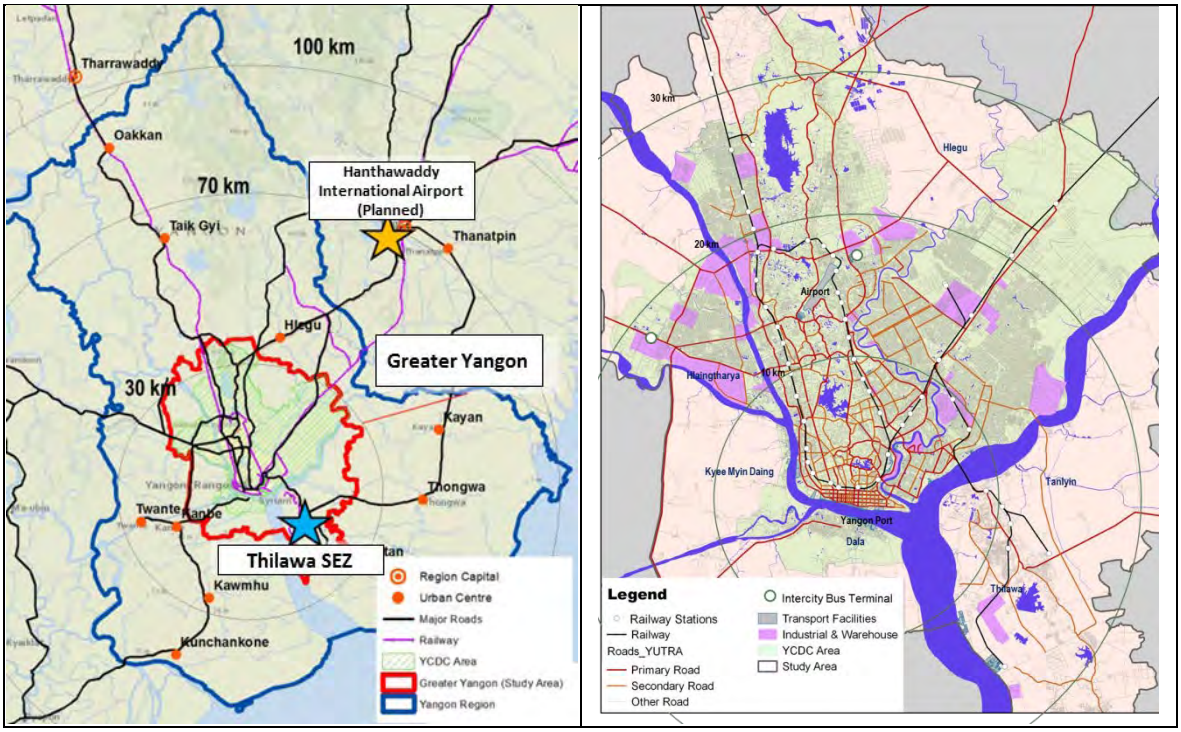
(b) **Importance of Intermodal Facility:** Especially in Vietnam Cities, the motorcycle is dominant as the transport mode and the development of intermodal facilities such as P&R and Kiss & Ride is necessary to maximize the ridership of urban railway. And the intermodal facilities should be integrated with entire railway development projects.

(c) **Redevelopment of Unutilized Land:** There are a lot of unutilized lands around the railway and they have the chances of development projects even under the existing framework. In HCMC, the private developments are planned to be implemented with the construction of urban railway. Especially in the area around Ben Thanh Market, three urban railway routes will be connected and the development of underground shopping arcade is also planned. Even in Hanoi, there are a lot of opportunities for integrated development.

4.8 Greater Yangon, Myanmar

1) Profile of Yangon

4.45 Yangon is former capital city of Myanmar. The Greater Yangon is 1,592 km^2 of the metropolitan area in Yangon Region (9,804 km^2), including YCDC administrative area (971 km^2). The population is 6.2 million (2016) and estimated to be 9.5 million in 2035 and will achieved 10 million in 2038. The urban area is surrounded by rivers and covered by abandoned green areas. And a lot of pagodas are distributed. The urban area is medium density and includes the high density of existing CBD which was built in the colonial period and adjoining low density buildings.



Yangon Region, Greater Yangon and YCDC Administrative Area

Transport Network in Greater Yangon

Source: Project for Comprehensive Urban Transport Plan of the Greater Yangon (YUTRA)

Figure 4.7 Map of Greater Yangon

2) Urban Transport and Urban Railway Development

4.46 The share of bus transport is quite high (49.4 % of total traffic demand excluding walk), partly due to the restriction of motorcycle use. The restructure of bus transport modernization was started as the priority policy but the service level (capacity, punctuality, safety and accessibility to bus stops) is still low. Meantime, the numbers of private cars and taxis have been rapidly increased and traffic congestion is getting severe.

4.47 Urban railway development projects were just started. Among them, the utilization of existing railway is focused as priority project. 46 km length of Current Yangon Circular Railway is operated along the fringe area in double track (section in city centre has half – underground structure) and has high potential in urban transport and urban development aspects. Currently, the Yen Loan Projects for improvement of the capacity has been started.

In the future, the grade separation project to function as high-grade urban railway is also planned.

3) Future Plan

4.48 In addition of grade separation project of Circular Railway, the development projects of new urban railway and suburban railway utilizing existing lines are planned. New urban railway lines are 2 lines of north-south line and east – west lines to mitigate traffic congestion of the corridors and enhance urban development of sub centres.

4) Station Area Development / Railway Catchment Area Development

4.49 Government has great expectations on station area development as the financial scheme for urban railway development. However, there are the difficulties to achieve with lack of experiences and legal framework. On the other hand, there are a lot of large railway lands and public lands along the Circular Railway Line and it can be utilized for new development projects. Currently, A private redevelopment project is on-going around Yangon Central Station but how the development benefits will be returned to the urban railway development project is not clarified.

5) Lessons Learned

4.50 Yangon has advantages of abundant railway lands and public lands along the Circular Railway Line and the utilization of the Circular Line is important not only as urban transport but also as urban development aspects. There are a lot of points to be solved, such as institutional framework, coordination between related bodies, role sharing of private and public, and specification of roles for railway operators, but immediate actions are necessary.

4.9 Ulaanbaatar, Mongolia

1) Profile of Ulaanbaatar

4.51 Ulaanbaatar was selected as city of case studies, because the on-going urban problems (such as sprawling of ger Area, air pollution, health issue of residents in ger area and traffic congestion in urban area) can be solved by urban railway development.

4.52 Ulaanbaatar is capital city and the largest city of Mongolia. The population is 1.28 million, which is about 40 % of total population in the nation. The population in Darkhan City, the second largest city and Erdenet City, the third largest city is 120 thousands and 83 thousands, respectively and the primacy of Ulaanbaatar is extremely high. The residential areas can be divided into “Apart Area” in city centre and “Ger Area” distributed around fringe area. Ger is traditional portable dwelling tent. The residents of Ger area mainly use coal stove and it is one of the reasons of air pollution. On the other hand, the urban spatial structure extends east and west and the northern and southern parts are surrounded by hills. The urban facilities and traffic demand are concentrated along the east west arterial road.

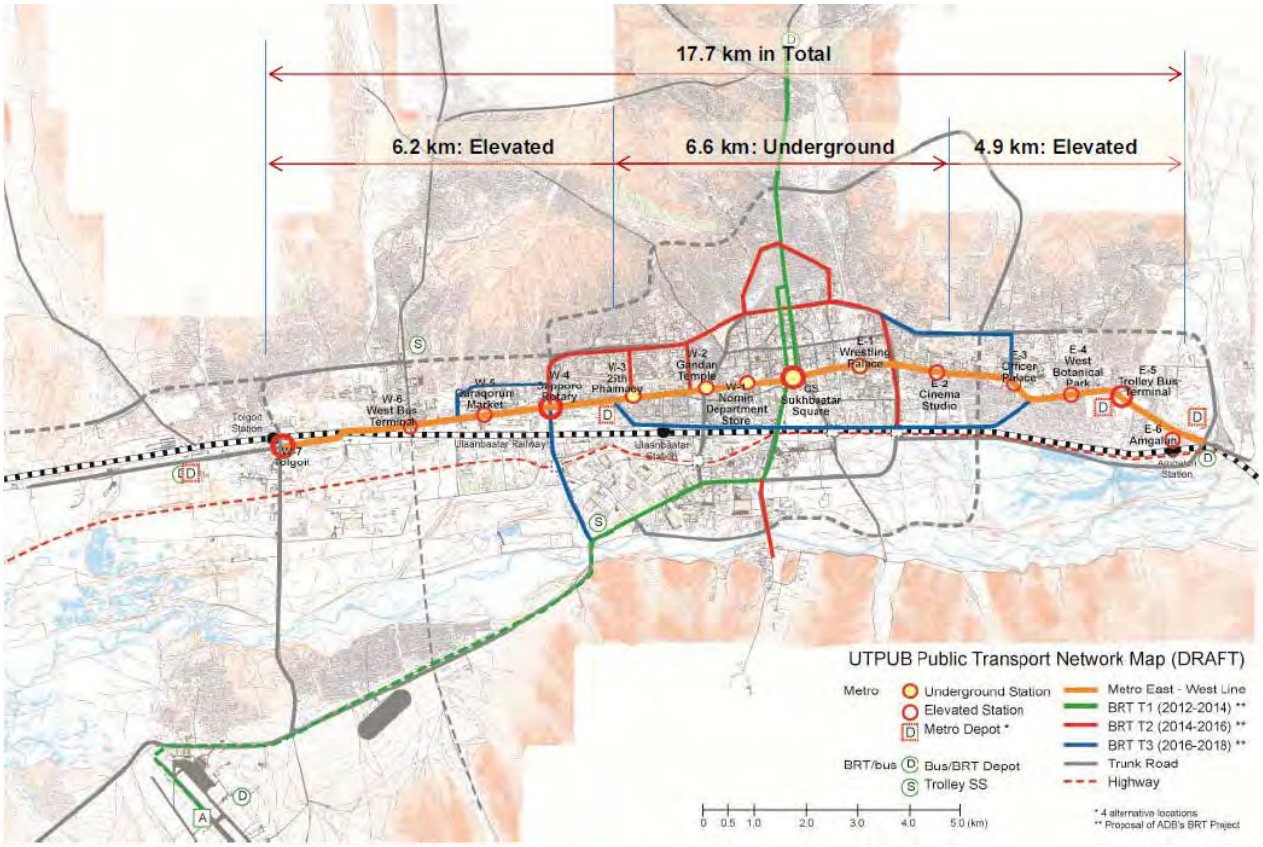
2) Urban Transport and Urban Railway Development

4.53 With the growth of population and economy, the ownership of private car has been progressed as 141 units per 1,000 of the population. The road development has not been progressed compared to the motorization, and the traffic congestion has been severe due to the lack of traffic management, bad driving manner and increasing on-street parking vehicles.

4.54 As shown in Figure 4.8, the development of mass transit is planned to mitigate traffic congestion along the east-west corridor with high development potential and enhance the developments of sub-centres along the corridor. JICA studies proposed to introduce urban railway (elevated structure and partly underground). This proposal haven’t been permitted due to the high project cost. And ADB has proposed to introduce as BRT routes but it is in flux.

3) Lessons Learned

4.55 The most important lesson from Case of Ulaanbaatar is that inappropriate land policy and urban policy are losing opportunities to readjustment of urban area triggered by urban railway. The opportunities of utilization of abundant national resources and unutilized public lands, and opportunity of value captures on railway development projects also have been lost. Development of only one east-west urban railway route will includes a 50-60 % of population into the catchment area. With the development of urban railway development, idle land around the corridor can be developed and compact urban structure can be formed to enhance the resettlement from Ger Area.



Source: The Study on City Master Plan and Urban Development of Ulaanbaatar City (UBMPS) ,2007

Figure 4.8 Map of Ulaanbaatar and Urban Public Transport Network Map

5 ISSUES ON RAIL DEVELOPMENT AND TOD IN DEVELOPING COUNTRIES

1) Importance of Railway

5.1 The introduction of urban rail in developing countries was debated much in the past. In the United States since 1965 and after many long debates, it has been judged that bus services are a preferable mode. These debates have strongly influenced urban rail development in developing countries such that the World Bank tends to follow the same direction when assisting developing countries in transport planning. Meanwhile, the Asian Development Bank has started providing assistance to rail planning and development since the 1990s.

5.2 Up to now, there has been no meeting of the minds between groups supporting and opposing the introduction of rail. The main points of conflict between the two are shown in Table 5.1.

Table 5.1 Contrasting Viewpoints about Urban Railway Development

Aspect	Positive Viewpoint	Negative Viewpoint
Traffic Congestion	Reduces traffic congestion and increases transport capacity of a corridor.	Creates additional traffic and will not ease road congestion.
Economic and Financial Viability	Tends to balance cost and benefit in the long term.	Favors financial healthiness from the beginning.
Preferred Public Transport Mode	Public transport as a whole, particularly guided transport, is appreciated.	Flexibility of road-based public transport is appreciated.
Urban Development Effects due to Rail	Expects impact on urban structure.	Has unsuccessful experience in transport and urban development.
Choice of Public Transport System	A centralized, integrated transport system can provide the most efficient service.	Public transport should satisfy diverse needs by different modes.
Rail Development Organization	Public organization should provide guidance to transport and urban growth.	Management capacities of public organizations are so weak that intervention in private sector initiatives must be put at the minimum.
Expected Urban Development Density	High-density development will lead to high-efficiency, high-quality living environment.	No response on density (opinions are divided in the same group).

Source: Various sources.

5.3 As shown in the table above, those who support rail development look at the long-term effects of rail development on urban development, while the naysayers give more weight on the short-term financial constraints. And the arguments continue.

2) Role and Effectiveness of a Master Plan

5.4 Planning for rail projects require a master plan; too often, however, rail projects are implemented without planning. A master plan should show: (i) how a railway network will affect the envisioned urban spatial structure, (ii) how to build the network within funding capacities, and (iii) how to gain consensus among stakeholders with varying and conflicting interests about railway not only as a transport project but as a strategic urban development tool. The role of a master plan is to provide a comprehensive view on urban rail development to determine the location of the first line, avoid the introduction of inadequate systems, guide interline integration, and inform on the expected role of railway investors.

5.5 In addition to the aforementioned role of a master plan, its existence helps prevent excessive political interference in many projects. It is thus important to establish a workable

and agreed master plan based on which rail transport development plan can be worked out.

5.6 In developing countries, many cities have master plans which have been prepared with the assistance of donors. And while cities have their own planning institutions, and the number of academics, researchers, and experts in the field is also growing, these same organizations, institutions, human resources, knowledge, and experiences are unfortunately not enough for cities to deal with urban problems that have become increasingly more complicated and worsen faster than they could be solved by them.

5.7 At the same time, few cities have their own railway master plans. The advantage of having one is that it gives decision makers a comprehensive understanding of the network and land uses, interline connectivity, location of conflicts with roads, and so on. An urban rail master plan also indicates where the transport backbone of the city and subsequent urban development will take place.

3) Significance of Building a Hierarchical Public Transport Network

5.8 While the necessity to develop urban areas based on public transport is commonly recognized as urban transport problems have become even more serious, the concept and the method to realize it are still uncertain. Actual urbanization takes place so fast that effective measures tend to fall behind. Traffic demand in big, urban areas is not only large but also diverse, requiring different services which must be provided in a seamless manner. Providing a hierarchical public transport network is necessary but constrained by the following issues:

(i) Rail organizations are not administered centrally. Urban rails are often constructed by different implementing bodies who do not coordinate well with each other;

(ii) Rail development relies on external sources, such as ODA and the private sector, both for funds and technology; and

(iii) The lack of coordination in planning and project implementation among railway operators and with urban development organizations fail to realize the expected development synergy.

4) Need for Building Consensus

5.9 The preparation of a master plan varies by city and country. Some plans are prepared by following a country's guidelines in order for the plans to become official documents, while others are made by authorities without sufficient study. In the latter case, the opportunity for the people to participate in planning, especially when it comes to their living conditions, is usually constrained, and even more so when development comes at the cost of resettlement.

5.10 Information on railway development is not sufficiently disseminated to communities along the affected areas and in the whole city, resulting in unreasonable demands for compensation.

5.11 Stakeholders of a rail project are extensive. From the central and local government, their departments and agencies, the private sector, and the public. The process alone of getting permits and signatures is so complex and time-consuming, it affects project execution. When donors are involved, the process requires even more time.

5) Issues at Project Preparation and FS Stage

(1) Identification of Priority Projects

5.12 The identification of priority projects in case study cities involved the following considerations:

(i) Priority projects are identified based on a master plan, if there is one. There are instances when projects are chosen even in the absence of feasibility studies. When rail projects have different project owners, interline connectivity is not guaranteed;

(ii) Possible line expansion and extension are not considered;

(iii) While the first line is implemented in the most heavily trafficked corridor, the system tends to have a smaller carrying capacity because of constraints in acquiring initial capital. And once it is constructed, capacity expansion is difficult to undertake; and

(iv) There are cities who have expanded their urban areas and decongested their city centers.

(2) Project Implementation Methods

5.13 While implementation methods for railway projects vary, the common characteristic is the introduction of private sector funding and technology.

5.14 There are many risks in project implementation, to wit:

(i) **Political Risk:** Changes in policy due to changes in government leaders which will affect the private sector more. Inadequate rules and regulation are causes of this risk.

(ii) **Tender Risk:** This occurs when a private contractor obtains permission. A number of documents, including an FS report, are needed. There are instance when residents along the project line have brought court cases against contractors, and this can add to the voluminous documents that the latter has to produce, reproduce, and distribute.

(iii) **Construction Risk:** Engineering issues (such as redesign), cost escalation, and delays in project due to resettlement and environmental issues during construction, will affect both the public and private sectors.

(iv) **Operating Risk:** Operating and maintenance risks due to accidents, as well as natural disasters and power supply will affect both the public and private sectors.

(v) **Commercial Risk:** This refers to risks related to costs and revenue of private contractors during operation and management. The most significant factor is ridership which is affected by fare levels.

(vi) **Cost Change Risk:** Whether or not cost increases due to inflation, energy cost, and interest rate, these costs can be passed on to riders in the form of fares. Still, this will affect the private sector.

(vii) **Foreign Exchange Risk:** Risks involved in the exchange rate of local currencies will affect the private sector who mostly relies on revenue in local currency.

5.15 When a rail project is implemented via a PPP scheme, the following ill effects may arise:

(i) Rail system tends to become small because the prospective demand forecast is often too optimistic. There is a tendency for the private sector to reduce its initial investment;

(ii) There is little interest in interline connectivity and future line expansion and extension; and

(iii) Often, there are lawsuits due to delays in the original schedule and the private contractor withdraws from the project due to various reasons such as the rail operator is unable to provide the needed services, and the government is unable to increase the fare as planned.

5.16 The participation of the private sector in urban rail projects need sufficient advanced study from the viewpoint of providing safe and stable public transport services which is the primary objective of urban rail.

(3) Selection of Optimal Mode

5.17 Selecting an optimal mode is important in determining the priority projects.

(i) The choice of the appropriate mode is undertaken during the feasibility study and is based on demand forecasts, available road space, construction cost, and socio-environmental considerations, wherein demand forecast is the variable that is given the most concern. While demand forecasting is normally conducted for a 20-year horizon, cities in developing countries need a planning horizon because they continue to grow for a much longer time and expand in ever-widening areas, which cause congestion, accidents, passenger discomfort, and operational overload.

(ii) This is particularly important in the first rail line and mode to be selected because they will affect subsequent lines, as well as systems and networks of other modes, which all too often result in a demand and supply mismatch.

(4) Location of Alignment and Stations

5.18 Selecting rail routes and stations must take into consideration the following concerns:

(i) Major roads with high traffic demand and requiring low level of resettlement are to be considered when selecting rail alignment and stations. However, station areas will become new bottlenecks and reduce overall transport capacity, negatively affecting both railway passengers and road users;

(ii) Securing adequate space for stations is always difficult. It is also the case that the role and effects of railway and stations are not properly explained to stakeholders;

(iii) In the case of building viaducts, tree cutting is often unavoidable. The problem becomes complex when the affected trees are old and there is a drastic change in the urban landscape.

5.19 In the scenarios mentioned above, it would be wise to look at station development not from the transport perspective alone, but as a component of urban planning. With this in mind, it can be safely said that there are always other ways to select a rail alignment, such as on public land like in Hong Kong. Alternatives must be considered carefully especially in suburban areas.

(5) Demand Forecasting

5.20 While in many feasibility studies the demand forecast is the determining factor in planning and designing rail facilities and in selecting the modes, other factors influence the forecast demand/ridership, such as the following:

(i) Fare levels, competing public transport modes (such as bus along a target corridor), restraint on private car use, stakeholder of rail project often neglect or pay little attention to; and

(ii) Government's policy target, e.g., one government declared that public transport share should be 30% of the total transport demand by a certain year. Demand analysis follows that overall target.

5.21 However, once rail is constructed and is used for over 50 years, demand may pick up because cities continue to grow. The system will eventually reach its full capacity and likely require expansion.

5.22 Uncertainty is demand forecasts serves as a significant deterrent in private sector participation. When a government introduces a rail project, ridership is often large to attract investments in public transport. However, once the private sector implements it, ridership becomes conservative. Because fares affect demand, increasing fares once the project becomes operational is difficult.

(6) Capacity of Target City

5.23 The limited capacities of railway organizations in cities are a common observation.

(i) Domestic organizations, institutions, human resources, and funding sources are constrained, hence the reliance on external sources in implementing new projects line by line. Under this circumstance, a different system is introduced, ruining interline and service connectivity;

(ii) Lack of capacities in railway operation and management is an issue in many cities and prevent the delivery of safe and efficient services; and

(iii) When a rail project is newly introduced in a city, it may take some time to establish a management body and its associate institutions.

5.24 There is no shortcut to overcoming the situation. Human resource development must commence as early as possible. An academy for rail engineers should be established once a certain length of route network is constructed to internalize necessary technologies, build local expertise, and store knowledge.

6) Issues at Implementation Stage

(1) Project Execution

5.25 Rail projects are implemented using methods which can be different even if done in the same city. These depend on how the public and private sector are involved. Under a circumstance wherein the political and socio-economic situations vary, it is difficult for a private company to take various risks and implement the project in developing countries. As there are insufficient capacity in rail development in developing countries it is important for the government to efficiently and effectively implement the project using ODA funds.

(2) Facility Construction and Cost Management

5.26 Rail projects often suffer from cost overruns which cause socio-political problems and project delays. In the process from FS to detailed design to procurement, project cost tends to increase. In cities that do not have experience in rail projects, cost escalation can become a daunting issue. The time lag from cost estimations, approval, and construction, not to mention foreign exchange fluctuations, is a critical factor in price increases.

(3) Land Acquisition and Resettlement

5.27 Because urban rail is constructed in existing urban areas, land acquisition and resettlement are two of the most critical issues to address, in particular, delays in the payment of compensation and in resettlement, both of which government's responsibilities. Like in cities in Vietnam where lands are owned by government, land acquisition for infrastructure turn into a socio-political issue, resulting in cost overruns and implementation extensions. Methods such as land readjustment and land pooling, which were carried out in Bangkok and in Indian cities, respectively, can serve as alternative implementation methods.

(4) Procurement of E&M

5.28 Cities in developing countries often procure equipment and machinery from overseas suppliers. Technical specifications, however, tend to be lower due to fund shortage. Cities allow suppliers to compete mainly on prices. And to bring down their prices, suppliers tend to propose lower-quality equipment and parts. Due to lack of technical know-how, cities sign contracts with suppliers even if the latter has no support system, resulting in product defects, frequent breakdowns, or parts not meeting technical specifications. The O&M stage is thus fraught with serious problems especially after the warranty period expires and the supply of parts cease.

5.29 Governments in developing countries tend to select top-notch equipment which later on becomes maintenance headaches because they require not only technical know-how, which is often absent among the users, but also spare parts which are not only expensive but not available in the local market. Normally railway operators' intentions are not known, unnecessary specifications to adapt to local conditions are introduced in preparing technical specifications. Similar situations take place both in private consignment and public O&M organization due to lack of knowledge to judge the recommendations of consultants.

(5) Operation and Maintenance

5.30 Even if quality equipment is used this does not assure that a reliable railway operation can be provided continuously. This is because of shortcomings in O&M, too. Since inspection and maintenance are usually outsourced, O&M organizations fail to accumulate maintenance know-how which would allow them to evaluate the capacity of maintenance contractors. Often, O&M troubles occur due to a lack, rather than an excess, of maintenance work.

5.31 The concept of preventive maintenance and inventory control is absent. Budget is only requested once troubles have surfaced. Only then can procurement follow. During this period, other troubles may happen. The equipment cannot be used even if the parts which first broke down have been replaced.

5.32 Some countries do not have a license system for rail drivers. This is left to the initiative of each rail operator. While normal operation is not hindered by technological development of automatic operation, there are concerns if there is sufficient knowledge about preventing accidents and measures to mitigate emergency cases. When railway starts test operation, there must be capable O&M staff. And because preparing such staff for their tasks can take three years, preparing for the O&M stage should start as early as the construction stage.

5.33 When the owners of infrastructures and O&M organizations are different, there are often troubles due to unclear demarcation of responsibilities.

(6) Rail Business Management

5.34 Self-financing railways except some Japanese railway companies are rare and becomes a burden to the government due to following reasons:

(i) Fares are set mostly by the government based on political interests not on financial need; therefore, fare levels become low. The importance of rail related businesses such as real estate, commercial development in station buildings, advertising, and feeder services are neither understood nor covered by ODA, while local governments do not permit such business.

(ii) As a result, rail operations face difficulties during project implementation. When they suffer from low ridership, governments provide them with large subsidies.

(7) Ekimae-Ensenkaihatsu: Development of Station Area and Area along the Line

5.35 The role and necessity of developing the areas at and around railway stations is hardly understood and appreciated not only by railway organizations including governments but also by public transport users. Although there are cases wherein park and ride facilities are constructed in suburban stations, the provision of intermodal facilities in urban centers is insufficient and limited to walkways between elevated stations and sidewalks, and entrance and exit in the case of underground station. These facilities are also constructed by governments only when problems occur. Lately, however, various developments are taking place along railway lines and these are initiated by other companies. These show the lack of appreciation about the benefits to urban development from the beginning of rail development planning. These attempts are constrained with the following factors:

(a) **Absence of Economic Control and Promotion:** Urban rail network is basically implemented according to the approved plan of the government. In developing urban rail, there is hardly a case wherein the urban development side takes the initiative nor provide necessary individual facilities nor land use control and incentive for land use around the stations.

(b) **Absence of Development Methods of Ekimae Ensenkaihatsu:** Land acquisition is a serious constraint to urban rail development in built-up urban areas. Acquiring land by purchasing them is a serious problem for any city. The understanding of, and experience in, land consolidation through conversion of rights are poor.

(c) **Limited Role of Rail Operators:** Ekimae ensenkaihatsu project is not included in the responsibilities of rail organizations. The development of ekimae hiroba is not considered as an integrated component of rail projects. Necessary urban facilities are only developed after the rail has been developed and such facilities are often limited to the improvement of access such as pedestrian bridges.

(8) Reality of Ekimae Ensenkaihatsu

5.36 The aforementioned issues are not only due to policy and institutional constraints; opportunities are also constrained in actual ODA projects, as briefly described below.

(i) The coverage of ODA is normally limited to the minimum requirements of rail infrastructure. Therefore, coordination regarding ekimae ensenkaihatsu is difficult;

(ii) The budget for planning, such as market research, is not considered. There is a need

to incorporate ekimae ensenkaihatsu as a component of rail project not only to provide transport facilities but also commercial facilities to support sustainable rail development; and

(iii) The space under the viaducts is limited. As urban rail in developing countries are normally in the middle of roads, the space under the viaducts cannot be used for commercial purposes and at-grade space of stations.

(9) Opportunity for Private Sector including Foreign Companies

5.37 Ekimae ensenkaihatsu in developing countries are little understood by the governments; therefore, the provision of adequate institution lags behind. Although there are trial and error cases, they are far from internalizing how station area development benefits rail projects. Toward this end, governments must first prepare comprehensive plans that will maximize the benefits of rail, then clarify the roles of the private and public (control and incentive) sector, thereby identifying the relationship of both parties. At this point, the important component is ekimae hiroba which must be provided by the governments. However, ekimae ensenkaihatsu of various types might be better implemented by the private sector with relevant knowledge, while the public sector gives permission from the viewpoint of maximizing benefits while protecting public interest. Ownership of land and properties is a major concern of foreign investors, though many cities permit the same to a certain level.

(10)Development Risks Observed in Japan

5.38 The development of rail and ekimae ensenkaihatsu involve various risks, the main one of which are as follows:

(a) **Land Acquisition Risk:** Large-scale land acquisition will be a serious problem in the development of railway and and ensenkaihatsu. Therefore, existing publicly owned lands must be utilized as much as possible.

(b) **Project Timing Risk:** Railway development requires large amounts of funds not only for the railway itself but also for acquiring lands along the planned line. Therefore, it is unrealistic to pursue both. A proper mechanism must be worked out to handle railway operation and ensenkaihatsu.

(c) **Ridership Risk:** Fare level, especially for the first line, tend to be set low as a government policy and to prevent low ridership. However, fare revenue affects financial viability of investors; it is here that government subsidy becomes necessary.

6 EXPERIENCE OF CITIES IN JAPAN AND OTHER DEVELOPED COUNTRIES: LESSONS FOR DEVELOPING COUNTRIES

6.1 Japanese Experiences of Development Around Stations and Along Railway Lines

1) History of integrating urban railways and development projects in Japan

6.1 Among major cities of the world, railways have great influence on urban formation and movements inside the city depend on mainly public transportation. Tokyo metropolitan area is maintaining g giant, high density and convenient city with various public transportations like movement of people is railway and that of cargo is automobile. There are many types of development cases in Tokyo that formed a metropolitan area with public transportations and the experiences in Japan is effective for developing countries to understand TOD which is integrating urban railways and development projects. The characteristics of history of that in Japan are as follows.

(a) **Railway was the only public transportation in the era without cars:** Tokyo was thought to exceed 1 million people in the early 18th century, and in 1872, which was already the largest population size in Asia (Meiji 5 Year), the railway history began with the opening of the railroad to Shimbashi – Yokohama. It was regarded as the only transportation in times when there was no car, and as a profitable business. Therefore, many railway companies were established throughout the country and most of main railway network was completed by the end of the Meiji era.

(b) **Although the railway in Japan developed as a private business and majority of the business was acquired and nationalized, a lot of private railway was left in big cities:** In 1904 the Kobu railway was electrified and the convenience was improved, urbanization had progressed due to population increase along railway areas. In the Hanshin Express Railway led by Ichizo Kobayashi, president of Hansin Express Railway at that time, it had created a model of railway management in Japan, such as carrying out development along railway, construction railway and department store as side jobs simultaneously. In order to attract passengers, there were many cases of development of residential areas and building attraction facilities such as amusement parks. Hankyu Umeda station in 1920 was the first to have a department store at the terminal station, after that department stores were set up one after another at each private railway terminal.

(c) **Formulation of a long-term plan at the Imperial reconstruction plan of the Kanto Great Earthquake:** Although Tokyo, which was devastated by the Great Kanto Earthquake, could not carry out land readjustment projects for the burning area of 3,630 ha due to the earthquake, there was a plan to construct a main road network and subway under the road in Ikebukuro, Shinjuku, Shibuya, Shibuya, Meguro which were becoming emerging terminals to the city centre.

(d) **Rapid population growth of large cities and integrated** development **of urban development and urban railways in the period of high economic growth:** In the period of high economic growth from 1955 to 1973 that shows annual growth of more than 10%, population concentration had progressed and it caused urban problems such

as urban sprawl, deterioration of living environment due to insufficient urban infrastructure which developing countries have currently. (Tama rural urban development began in this era.) To cope with these problems especially urban sprawl, in 1968 the New City Planning Act established the area (urbanization promotion areas) where urbanization should be preferentially and systematically planned within 10 years. Together with this act to control urban sprawl, the New Housing and Urban Development Act (1963) came into effect as a large-scale urban development law for planned guidance of residential areas, and the government started a large-scale new town development (Tama New Town).

6.2 In parallel with the development of large-scale new towns, middle-size housing development have also increased due to opening of new stations at intermediate stations of existing stations. In this case, the installation cost of the intermediate station is set as a burden on the developer in principle, and it is covered by the developers around the new station and the municipalities in the area expected to improve the transportation convenience. This method is called "New station installation by a burden of developers (Requested Station)." (Koshigaya Lake Town)

6.3 The above-mentioned large-scale new town development has a population size of 200,000 to 300,000, including the development of areas exceeding the walking area of the railway station. For this reason, feeder bus routes are maintained by railway companies and regional bus companies as transport facilities from residential areas in development areas to stations.

2) Features of integral development with urban railway

(e) **Base Development as an Urban Function Enhancement:** Entering into a stable growth period which continued slumping economy after a period of high economic growth, strengthening urban power became a major issue, and new large-scale development such as coastal development was promoted. In addition, construction of railways as access traffic was integrally carried out. (Rinkai subcenter development, MM 21 development). Utilizing stations with high transportation convenience and large sites, development of bases of idle areas (railway depo etc.) of many stations were carried out as a new urban base development project (cases of developing idle land, such as railway depo, Shiodome district, Sky tree, Shinagawa Station etc.). As for redevelopment projects and establishment of a new station, there are many examples of redevelopment project (Toranomon Hills) at the same time of a new line of a subway.

(f) **Redevelopment of base transportation terminal:** Main terminals in the centre of cities has increased quality about base and hub by increasing the number of station users. However, through 70 to 80 years after construction of facility around stations, redevelopment projects have been proceeding for an intensive use of land due to increase the number of long-distance bus lines, aging of the bus terminal. (Redevelopment projects around Shibuya Station, redevelopment project of Abe no Harukusu, development project at Shinjyuku Bus Terminal).

(g) **In the declining trend of railway users, business development to get profits from new business:** As a characteristic of the Japanese railway, many railway companies are engaged in a wide range of businesses. Many companies get profits from non-railway business and it account for the majority of railway company sales. These efforts

have also been a railroad company's efforts to provide railway users with diverse living services by making full use of the role of the station's local transport centre.

3) Type of Eki-naka (shops inside station buildings), development around station and along railway

6.4 In Japan, stations are developed for users of railway stations with large scale development which includes stations, area around stations and station square plaza. Examples of development integrated station and large-scale development can be categorized as Eki-naka, station square plaza and development along railway (existing urban area, railway idle area, new developed area, middle station development of suburban existing railway). There are many cases in Japan, but representative examples considered to be useful for developing countries to develop along the railway. Representative cases are shown in Table 6.1.

Table 6.1 Type of Development Around Station and Along Railway Lines

Type		Case Station	Contents
Eki-naka and development around station	Eki-naka	Shakujii Park	Inside station buildings/Under viaduct
		Preservation/Restoration of Red Brick Station Building at Tokyo Station	Use FAR transfer
	Intensive land use of railway	Abeno Harukasu	Aging station/Intensive use of station sites
		National Highway No. 20 and Shinjuku Station South Exit Bus Terminal	Project combined with road improvement project
	Station square plaza	Station Square Plaza of Shinjyuku /Ikebukuro Station	Excessive expropriation/Private funds
	Redevelopment project around station	Redevelopment Project in Shibuya and around Shibuya Station	Remodeling of the station due to direct service of subway
	Redevelopment project of existing urban area	Toranomon Hills	Large-scale redevelopment project and construction of new station
Development along railway	Utilizing factory site	Ebisu Garden Place	Land use conversion and redevelopment project
	Utilizing railway idle site	Sky Tree / Shiodome / Saitama Shintoshin / Shinagawa	Redevelopment project at railway idle site
	Requested station	Koshigaya Lake Town	New station and development of residential area
		Honjyo Waseda Station	New station and opening a university
	Large-scale urban development project	Denen-Toshi Line/Tama Newtown/ Kitachiba Newtown	New town development and access railway
		Yukarigaoka/ Hankyu Railway Line	Pioneering business by the private sector
		Tukuba Express	Improving congestion and access to research academic city
	Development of new business	Minato-Mirai 21／Rinkai Subceter Line	Large-scale development and access railway

Source: JICA Study Team

4) Station Square Plaza

6.5 The most important thing about development around station and along railway is a traffic hub. Unless this function is secured, the original functions of the railway are greatly impaired. Construction of the railway has been proceeded with ambiguity as to who will be responsible for this function in railway development in developing countries. In the case of Japan, regarding the station square plaza, there has been an agreement about the division between railway side and city side since the war damaged reconstruction project, and it is

necessary to understand Japanese TOD case based on these circumstances. The main points are as follows.

(i) With regard to developing a station square plaza, it was decided that a policy to improve streets and railways site as a unitary facility was issued in 1946 at the war damaged reconstruction project, the site and expenses would be split between city side and railway side. Since then, although the burden ratio has been changed until now, this policy has not changed. In other words, it was considered as a principle that urban development departments or road manage departments would develop them.

(ii) With regard to size of station square plaza, in 1953, the station square plaza research committee decided a formula for calculating size of the station square plaza as a function of passengers. In 1972, a new agreement about a development policy of station square plaza between the Ministry of Construction and the Japan National Railways (national treaty) was formulated and the burden rate on the urban side was changed from 1/2 to 3/4. Regarding the calculation of a station square plaza, a more rational method was presented to build up the area for each plan element.

(iii) Station square plazas were relatively developed at old stations as there was a system concerning the burden of railway side and urban side. However, after the privatization of the Japan National Railways, it has become a burden on the urban side and is being developed as a city facility.

(iv) In front of a station with a potential of development as a local base station, there are many cases of integrated station square plaza and redevelopment projects at facing the station square plaza. At suburban stations, there are many examples of developing only station square plaza includes bus stops and taxi pools. However, in the project to develop both railway and large-scale development, it is planned to develop the station front area from the beginning, and proceed as integrated development plan to meet population in the future.

6.6 In this way, in the cities of Japan the development of the station square plaza was taken for granted under the sharing ratio by the railway side and the city side. Among them, cases which the station square plaza was developed as a city plan are examples of Shinjuku Nishiguchi Square before the war, development of the station square plaza of Ikebukuro station at the war damaged reconstruction project, and so on.

5) Eki-naka and Development Around Station

6.7 Eki-naka and development around station have been used for a long time at private railway terminal stations for the purpose of securing non-railway income as well as promoting the use of railway users such as campus stores, department stores, movie theaters. Features of Japanese railway business model are as follows.

(i) Commercial development at Eki-naka and around station (including offices and residences), and non-railway business such as urban development in the station area are the main pillars of management. The time of the former Japan National Railways, it was implemented as a user service such as kiosks and soba shops, but recently the Eki-naka development got a lot of attention, as a countermeasure to the decline of users due to aging. It was aimed at seeking a source of income and the beginning of the

renovation of the Ueno station shopping zone as "Station Renaissance" of JR East in 2002 is the first step of the renovation.

(ii) From the viewpoint of user service of Eki- naka, many railway companies try to invite attractive shops to compete with commercial facilities outside station, and the business is expanded as attractive shopping zone at many terminal stations. This trend is particularly noticeable in private railway companies, but sales of non-railroad business are also about 20% to 30% of total sales of JR east, west and central as well as around 10% in Tokyo Metro which is a pure urban railway company. It turns out that non-rail business is an important source of profits. These are not carried out completely independently from the management, but they are strategically implemented aiming at a synergistic effect.

(iii) Generally, in each non-railway business, it can be said that the existence of railway gathers passengers at the station and is generating demand for these non-railway businesses, and the synergistic effect make company's management possible.

Table 6.2 Case examples of development around station and along railway in Japan

	Development project around Shakujii park Station	Preservation/Restoration of Red Brick Station Building at Tokyo Station	Abeno Harukasu
Objective	• Town planning around station and train viaduct project	• Preservation/Restoration of Red Brick Station Building at Tokyo Station	• Rebuilding due to depreciation of department store
Business Entity	• Seibu Properties • Administration, town planning council	• JR East	• Kintetsu railway Co., Ltd.
Business scale (Area, number of units, business etc.)	• 5,100 m² Transportation Square and residential living service facilities under the viaduct	• Application of exceptional FAR (Floor Area Ration) of site area (116.7 ha)	• Site area 28,700 m² • Total project cost JPY130 billion •
Special Revenue Source	• n.a.	• Selling surplus FAR	• Financial support through designation of urban regeneration special district
Project Period	• First phase in 2012 • Currently under implementation	• Concept Plan in 1998 • Partial Opening in 2012	• Started construction in January 2010 • Opening in March 2014
Site	• Using site under viaduct	• No need	• Rebuilding department store
Development Profits	• Revenue from real estate related business	• Selling surplus FAR to developer and secured project cost	• Revenue from real estate related business
Lesson	• It is possible to avoid the land risk by using under viaduct.	• Securing the project cost by selling FAR at the upper part of the station	• Land risk can be avoided due to rebuilding of department stores. • Implementation of area management and plan formulation due to participation of local community.
	National Highway No. 20 and Shinjuku Station South Exit Bus Terminal	Redevelopment Project in Shibuya and around Shibuya Station	Toranomon Hills
Objective	• Extension of national highway and development of bus terminal	• Urban regeneration model in urgent urban renewal area	• Ring road No.2 and redevelopment project
Business Entity	• Tokyo National Highway Office and JR East	• Tokyu Corporation, JR East, Tokyo Metro, Urban Renaissance Agency	• Ring road No.2: Tokyo Metropolitan Government Bureau of Urban Development • Land acquisition: Urban Renaissance Agency • Building: Specific builder

Business scale (Area, number of units, business etc.)	• Artificial ground (1.47 ha) for bus terminal	• Urgent urban renewal area (139 ha) • Land re-adjustment project at Shibuya station area (5.5 ha) • Shibuya station south area:7100 m^2 • Dougenzaka1-chome area:3,330 m^2 • Sakuragaoka-kuchi area：17,000 m^2 • Shibuya Miyashita-cho Plan:5,020 m^2 • Nanpeodai-cho:4,128 m^2	• Shimbashi -Toranomon district urban redevelopment project: 8.0 ha • Land acquisition: 5.0 ha
Special Revenue Source	• n.a.	• Subsidy for urgent urban renewal project	• Promotion of private funds by specific builder system
Project Period	• Starting construction of overriding bridge in February 2000 • Basuta Shinjuku opened in April 2016	• Starting land readjustment project in 2010	• Road undergroundization decided in 1998 • Opening of Toranomon Hills Mori Tower New Line in June 2014
Site	• Increasing land by construction of artificial ground on the upper part of railway land	• Aggregate dispersed land by land readjustment project	• Urban Renaissance Agency implement land acquisition
Development Profits	• revenue from real estate related business on artificial ground.	• Revenue from real estate related business	• Revenue from real estate related business
Lesson	• It is possible to avoid the land risk by using the railway upper part. • The committee composed of academic experts and others conducted coordination of various stake holders.	• Aggregation of dispersed land by land readjustment project. • Increase FAR and induction of private investment by designating urgent urban renewal area.	• Urban Renaissance Agency will formulate consensus of rights holders, designate Mori Building with extensive knowledge in real estate management as a specific builder and implement redevelopment project that makes good use of special fields

Source: JICA Study Team

6) Case Study of Development along Railway

6.8 In Japan where urbanization has been advanced around the railroad, urban development has a closely relationship with the railway station. About 30 million Tokyo metropolitan areas were formed, it can be said that the railway which has function of mass transport enabled it. Along with the progress of urbanization, Japan's experience of urban planning and railway network based on master plan for a long time is a valuable experience for large Asian cities.

6.9 Urban Railway stations tend to develop as a transport base and a commercial center when users reach from 20,000 to hundreds of thousands. In developing countries, real estate companies understand the potentials around the station, and there are many cases which they buy up lands around stations. Railway planning in developing countries is primarily aimed at resolving traffic congestion, and it tends to think about the operation of railways only by the number of users, and the viewpoint of railway management is lacking. In many cases it is often set without considering railway development, and the railroad planning route and planned site of the station are often released beforehand. Therefore, there are many cases that lands around station are bought up by private sector.

6.10 The potential of the railway station is understood by the Japanese railway company as development of commercial facilities at the station and real estate development of the railway land, and many projects are being carried out. Looking at cases of development along railway which has close collaboration with railway, there are the following types, industrial site along railway, railway idle land, development of new stations due to developer burden, large-scale development projects. Table 6.3 shows examples in Japan.

Table 6.3 Examples of development along railway in Japan

	Ebisu Garden Place	Tokyo Sky Tree	Shiodome area
Objective	• Land use conversion and effective utilization of factory site	• Effective utilization of railway site (cargo handling station)	• Effective utilization of cargo terminal land
Business Entity	• Sapporo Beer, Residential Cities Reserve Corporation	• Tobu Tower Sky Tree (Tobu Railway is the largest shareholder)	• Combined project by Tokyo Metropolitan Urban Development Bureau and private company
Business scale (Area, number of units, business etc.)	• Site area: 83,000 ㎡ • Total Project Cost: 295 billion JPY	• Site area: 36,844 m² • Total Project Cost: 65 billion JPY	• Construction area: Approximately 30.7 ha • Started with a project cost of 149.3 billion yen
Special Revenue Source	• Subsidy of housing development city promotion project	• Procurement of funds through issuance of euro bonds	• n.a.
Project Period	• August 1991 - September 1994	• July 2008 - February 2012	• 1985 Establishment of planning committee on Shiodome district
Site	• Use of factory site	• Use of railway site	• Land Readjustment Project
Development Profits	• Revenue from real estate related business	• Revenue from real estate related business	• Revenue from real estate related business
Lesson	• Effective urban development by Land use conversion and changing FAR • Increase the number of passengers by access between station and redevelopment district • Effective utilization of factory land	• Reduction of development risk by using railway site	• Reduce land risk by using the cargo terminal site
	Saitama Shintoshin	Shinagawa	Koshigaya Lake Town
Objective	• Relocation of the operation stations as business nuclear cities based on the capital development plan	• Construction of core facilities to be the core of international exchange base	• Establish a new station in the middle of existing stations and develop new towns, industrial parks etc.
Business Entity	• Country, Saitama Prefecture, Housing · Urban Development Corporation (now Urban Regeneration Organization) MND Saitama (Mitsubishi Estate, Nippon Steel Urban Development, Daiei Real Estate)	• JR East	• Developers and municipality
Business scale (Area, number of units, business etc.)	• Project cost: about 94.3 billion JPY • Development area: about 47.4 ha	• Development area: about 16 ha	• Development area: about 225.6 ha • Station cost :3.6 billion JPY
Special Revenue Source	• n.a.	• Private fund	• Local burden as property tax
Project Period	• Ongoing	• Ongoing (provisional opening in 2020, scheduled to start in 2024)	• 1996 Decision of land readjustment project • 2008 Opening of a town event
Site	• Land Readjustment Project	• Securing development site by moving train station	• Land Readjustment Project
Development Profits	• Revenue from real estate related business	• Revenue from real estate related business	• Reduction of cost of new stations due to price increase of land price
Lesson	• Development of commercial facilities such as business facilities has greatly influenced the increase in railway users • · Reduce land risk by relocation of the operation stations.	• Long-term efforts have created land for development from relocation of depo.	• Increase property tax due to rise in land price
	Honjo Waseda Station	Minato Mirai 21	Yurikamome Rinkai Subcenter Development
Objective	• Honjo regional base as the core of urban area	• Development of commuting line	• Improve access to reclaimed land where traffic is inconvenient
Business Entity	• Honjo City, Urban Renaissance Agency	• Yokohama city	• Tokyo
Business scale	• Site area: about 64.6 ha	• Area :186 ha	• Development area: Approximately 442 ha

(Area, number of units, business etc.)	• Estimated project cost :14.55 billion JPY	• Plan for employment population of 190,000 and resident population 10,000 • (Landfill of about 79.3 ha) •	
Special Revenue Source	• Saitama, Honjo-shi	• Yokohama City and large land owner construction cover partial funds. • Land users around the new station cover approximately 50 billion JPY.	• Tokyo
Project Period	• Scheduled for 2018 from 2006	• Ongoing	• 1987 Rinkai sub-city development basic plan • Yurikamome opened in 1995
Site	• Land Readjustment Project	• To expand site by landfill	• Tokyo sub-central development by landfill
Development Profits	• Revenue from real estate related business	• Revenue from real estate related business	• Supplementing the project cost by raising the asset value of the land
Lesson	• To plan suburban area based on Shinkansen new station	• To expect the increase of land price by borrowing railway funds	• Improvement of access to central area leads to improvement of property value of land

Source: JICA Study Team

6.11 Many cases are seen as large-scale development cases combined with the establishment of railway stations and routes. In particular, it is a large-scale residential area development to resolve rapid population growth and many system reforms and new rules were proposed to resolve many problems based on urban development. The New Residential Urban Development Project formulated in 1963 is a residential land development project based on the full land acquisition system under the New Housing Urban Development Law. Tama New Town project under the New Housing Urban Development Law was a trigger for subsidiary system of access railway to new town project, because railway companies must cover many funds of this project. After that, the residential land development corporation that enabled integral development (internal assistance) was established. "Chiba New Town" was started based on the residential land development corporation. Later, “Act on Special Measures concerning Comprehensive Advancement of Housing Development and Railway Construction in Metropolitan Areas” was enacted and "Tsukuba Express" was started to develop under this act. Because of the revision of such a system, large-scale new towns have been developed and each project has its own characteristics.

6.12 For large-scale new town development in the suburbs, commuting means are indispensable, and there are many cases of residential land development and integrated development of railway new lines. In the old days, Tama rural urban development which started 48 years ago, Yukarigaoka residential area which introduced a new transportation system, case of introducing railway to the public corporation's new town development, case of that same entity carry out both housing development and railway construction, examples of attempts to create lands along railway by land readjustment project, there are changes in the development method like these cases by the change of the times.

Table 6.4 Examples of development along railway

Railway Development Plan	Features of project	Lesson
Tokyu Denentoshi Line Tokyu Tama Denentoshi development	• Denentoshi development is a representative case of Japan 's development along railway that formed cities with a population of 600,000 along the railway in about 45 years. The project was realized by a scheme of land readjustment project and the private sector got reserved area instead of implementation of land readjustment project. It was planned with railway plan to integrate the urban development project and the railway. Tokyu Cooperation Efforts to raise the asset value along Tokyu Denentoshi Line through redevelopment of stations such as Futako Tamagawa, Tama Plaza, etc. In addition, Tokyu Cooporation try to implement town management, Next-generation suburban town planning and improvement of civic pride to raise the value of area and meet super-aging.	• A long-term effort system is necessary. • A other scheme to proceed land readjustment project except for advance land acquisition (such as a joint project with landowners) • Non-railway income exceeds 80% of whole profit due to diversified business development such as living service business and management super markets and so on.
Odakyu Line, Keio Line Tama new town	• Tama new town is the largest new town in Japan, with a planned population of 340,000, conducted by Tokyo metropolitan government, Japan housing cooporation and so on. A representative example of a suburban NT that introduced the Odakyu Line, Keio Line, etc for commuter transportation system. New town development (the New Housing Urban Development Law) by the pre-acquisition of the land was carried out, the other lands are developed by land readjustment project. • Aging is a problem, because residents started to live at same time. It has universities, research institutes, companies, hospitals and other regional complexes.	• Residential development is limited to the public corporation, railway operators cannot develop along railway • In order to maintain asset value, it is indispensable to form communities by various hierarchies.
Hokuso Line Chiba new town	• Case study on integrated development project of railway and NT by the housing development corporation. • As a result of a prolonged advance land acquisition method and a declining demand for housing against the planned population of 300,000, the plan was completed with population of 180,000. Therefore, the Hokuso Line is a high fare railway.	• Efficiently operate the business, avoid prolonged • Avoid excessive investment as profitable business.
Tsukuba Express Line Development along tsukubai express line	• Tsukuba Express is a large-scale development along railway that municipalities and the Urban Renaissance Agency conducted. When UR implemented land readjustment project, rate of land decrease was explained as 40% and municipalities covered the excess. Therefore, the burden of municipalities was a big. • Although it was a project to secure land with replotting in area of land readjustment project, some area delayed these projects. As the result of the delay, land acquisition was needed to ensure lands. • The construction cost of the underground structure in the central part required a huge construction cost (808.1 billion yen), and as a result, it was decided to cover cost with the investment of the municipality.	• The development along railway is project under government, so the burden of municipalities tend to be a big. • There was a time of oversupply of residential due to supply and carry out projects at the same time • Currently the railway operating balance is turning into a surplus as the population along the railway increases.
Hankyu Corporation	• It was a company that made the beginning of integrated development of suburban housing, not only for suburban housing development, but also for commuters in the city center direction. • In addition, it developed leisure facilities such as Takarazuka Opera in suburban area, and tried to make a trend of user from center city to suburban.	• It was a pioneer of development along railway in Japanese and carried out to make a trend of both direction.
Yukarigaoka Line	• Yamaman, a real estate company, started to develop railway and newtown includes in not only infrastructure but also survice and others. • Considering sustainability for of the community, Yamaman sells a certain number of houses each year and try not to bias the age group. Also, it is working on the improvement of various living service facilities and living support facilities.	• This is first case which private led urban transportation system and residential land development. • The infrastructure cost burden is large and the railway management is squeezed.

Source: JICA Study Team

6.2 Case Study of Hong Kong and Singapore

6.13 Hong Kong and Singapore have grown from a developing country stage to a developed country and have been promoting urban development while responding to population increase and traffic problems like other developing country cities. In this process, Urban Railway play a major role and support the mobility of citizens as a backbone of public transportation. Urban Railway in Hong Kong succeeded in returning development profits to urban railway through integrated railway and urban development, Singapore also developed urban railway and is ranked higher in the most attractive cities in the world.

1) Hong Kong Experience

(1) Overview of Hong Kong

6.14 Hong Kong is located on the coast of the southern region of China and consists of Hong Kong Island, the Kowloon Peninsula and the surrounding islands, the area is 275 ㎢, the city has a population of 7.3 million people. The area is surrounded by mountainous areas, and an extremely high-density urban area was formed in order to effectively utilize the limited flat land. Although it was an international relay trade port for a long time, now it is an important financial market and an important position along with New York, London, Tokyo. Various public transportation such as trams, trams, buses, water transportation, are being developed as well as railway, and the share of public transportation is extremely high. On the other hand, the level of car ownership is generally low. Currently it already has a city rail network of 10 routes 246 km, but plans to extend more than 100 km for the future. In addition to urban railway, it has a highway network of approximately 250 km.

6.15 In Hong Kong, the administrative area is narrow, there are many hilly areas and the suitable development areas are limited, so it has suffered from serious housing problems. It was said that it is not unusual for three generation families to live in the flat of about 2DK. In addition, road construction was also inadequate and traffic problems were serious. In order to solve such a situation, development of new town (bed town) including Hong Kong subway construction and super high rise residential housing was positively implemented. It is believed that access to the city center and housing problems were improved, foreign investment became active, and contributed to new economic development. Hong Kong's New Town began in the 1950's, but it was in earnest in the 1970's that the nine new towns have been developed and it is said that about half of the population of Hong Kong is accommodated. These new towns, urban centers and activity bases are connected by urban railway and highway network.

(2) Urban Railway System

6.16 Since the early 1970s, economic growth, housing development demand, population growth in Shinkai (out of Hong Kong, areas other than Hong Kong Island and Kowloon Peninsula) greatly exceeded the outlook, while road improvement has failed to catch up, it was said that necessity of comprehensive traffic plan was recognized. It was published as “Transport policy white paper " in 1979. In the 1970s, the outline of the urban use plan was formulated first, and the traffic plan was decided after it. As a result, the development of transportation infrastructure will be followed by city and housing development. However, in the early 1980s, it was recognized that due to resource constraints, the capacity of the transportation system cannot be expanded indefinitely. And the demand for transportation

was the result of mutual use of land use and traffic improvement, it was thought that adjustment of both was necessary and it was possible to realize Value for Money financially and economically. It announced, “All ports (Hong Kong) development strategy" which integrated land use plan and transportation plan in 1984. In 1986, the government decided to change to a plan that takes into consideration resource allocation from the after-demand plan, in the "Secondary body (total) transport research" targeting 2001. In other words, in order to realize efficient transport infrastructure development with conscious of the budget constraint, priorities should be set in cost benefit calculation. Also, it was suggested that consideration should be given to reducing traffic demand within the range of the proposed traffic network capacity, and it was published in 1990 as "Second Transport Policy White Paper". Integral development in Hong Kong is thought to have progressed under political background.

(3) Integrated Development by Urban Railway and Returning Development Profits

6.17 Hong Kong, along with a high standard of urban railway networks, is also known for internalizing the benefits of station and railway development into railway operations by its maintenance method. At the beginning of the construction, the public sold the land cheaply, and the resulting development benefit was used as a part of the railway project expenses, which led to self-reliant management after that. With this kind of internal aid, the railway administration was supported. This system has been actively used even on subsequent lines, and real estate development profits from integrated development are regularly recorded. Characteristics of returning development profits by Hong Kong MTR are as follows.

(i) Management of real estate in the upper part of the station and garage, and surrounding real estate development is the returning development profit method in the case of MTR. In fact, it led the joint venture with private real estate companies and developed residential and commercial facilities. In addition, it sells many of them, while continuing ownership to continue leasing management.

(ii) The sale business is an essential element for bringing profit early and efficiently reducing interest burden on construction costs.

6.18 From the viewpoint of safe operation of railway, MRTC keeps ownership of the upper part of the garage in the developed real estate and manages real estate by leasing. It includes shopping centres, housing facilities, office buildings, and MTRC is one of the biggest real estate managers in Hong Kong.

(4) Lessons from Hong Kong’s Experience

6.19 The lessons learned from Hong Kong's development along railways are as follows.

(i) Although it was established as a business that produces stable profit by developing integrated urban railway, this has been made possible by the preferential acquisition of public land. However, in urban areas where high-density traffic access is likely to be restricted, it seems to be largely based on the development of planning power and business model to maximize the potential of high-quality railway service.

(ii) Creating a railway business model that makes active use of foreign human resource, technology and capital and enables overseas expansion.

(iii) By separately using sale and renting, MRTC secured the safety of railways and at the same time made a mechanism to ensure continuous profits while reducing the burden of initial investment.

2) Singapore's Experience

(1) Outline of Singapore

6.20 Singapore is the highest income-level city state in Asia with a population of 5.7 million in area 518 km 2. From the beginning of Singapore, Singapore has practiced urban development systematically from the viewpoint of effective use of limited land. The first conceptual plan showing the urban development strategy was created in 1971 and then revised in 1991 and 2001, but the basic idea of the spatial structure is consistent. The first route of Singapore's urban railway opened in 1987, but it already has shown a plan which has locations in the future of Mass transportation to connect CBD to the center in conceptual plan in1971.

6.21 Currently, Singapore manages urban traffic by combining high-quality urban railway, urban highway, car restraint (holding control, road pricing) ,new transportation system, LRT, bus and so on to provide citizens with high-quality mobility. In addition, in Singapore, many of the current expressways (150 routes in 8 routes) had been in operation by 1998, including the Pan-Island Expressway in 1962. Looking at the timing of opening up with urban railway, the development of highway network has almost completed.

(2) Urban Railway System

6.22 Singapore's urban railroad was decided to be implemented in 1982 at the end of the 10 years of research and controversy involving the United Nations and the World Bank, as well as the well-established roads and highly efficient bus systems at the time. Construction started in 1983, partial opening in 1987, 67 km of the first phase in 1993 opened. The route length of MRT is 170 km, and further extension and new line of about 150 km are planned in the future.

(3) Urban Development in Singapore

6.23 Urban development in Singapore had many urban problems such as serious housing shortage, poor living environment, lack of infrastructure, which had been faced at the time of independence in 1965. However, it has developed as a city with competitiveness and attractiveness that is always ranked high. The backgrounds are as follows.

(a) **Excellent urban planning and this practice under the Ministry of National Development established in 1959**

(b) **Land system and expansion of state-owned land:** Under the idea that "land belongs to the state ultimately" in Britain, Singapore has aggressively promoted land use after the acquisition of the autonomy right in 1959. It has gotten 30% of the land and played a major role in the improvement of public facilities, urban redevelopment projects and new town development. In addition, nearly 20% of the country's land was increased by landfill, and development of Changi International Airport, Jurong Industrial Park, Pongolu Residential Area, Marina Square and Marina South adjacent to Downtown area was carried out.

(c) **Land Acquisition System and Urban Development:** Land acquisition is based on the Land Acquisition Act, and government has mandatory land acquisition right, arbitrary acquisition is not implemented. In other words, public works requiring land acquisition will be decided at the National Assembly after negotiations by related ministries and agencies, and acquisitions will be made through procedures such as public notice. In addition, although the government will develop infrastructure after land acquisition, the construction and management of the building is mainly left to the private developer.

(d) **Housing policy:** Housing construction as the foundation of people's livelihood has been promoted under the goal of cheap housing supply by the government and has made great results. High-rise, high-density residential housing complexes have been constructed, and narrow national land is effectively used. Housing construction has been performed in combination with new town development connected with trunk transportation network (expressway, urban railroad), not development of old urban area. Under the idea that citizens have their own houses will lead to the stability of society both politically and economically, new town development is promoted as well as the ownership system.

(4) Lessons from Singapore’s Experience

6.24 Singapore is one of the few cities, including developed cities, which has implemented development with the conceptual plan. The main lessons learned from that experience are the following.

(a) **Excellent Urban Planning and its operation:** By developing concept plan containing long term and master plan to regulate and induce concrete development, it regularly formed consensus and developed organization system. The fact that there was the foundation of urban planning in British colonial era also made this possible. Among them, urban planning consistently included land use, housing, transportation and the environment.

(b) **Government's strong leadership:** There was a strong leadership towards the development of a leader supported by an independent sense of crisis as a small island country with no resources and a government organization supporting this. As a result, coordination between organizations was smoothly carried out.

(c) **Utilization of foreign human resources, technology and capital:** Singapore has actively accepted overseas investment and foreign resources, as well as ODA, from the beginning of independence and actively utilized infrastructure development.

7 WAY FORWARD

1) Building an Urban Rail Network

7.1 Urban rail development in developing countries has just began. It is uncertain if a desirable network can be put in place nor if the necessary fund be mobilized. JICA studies conducted in the past indicates that a megacity with a population of 10 million requires more or less 300 m of rail network. Without this level of network, urban rail may not function as the core system of public transportation which includes BRT, bus, and paratransit. The system will also likely encounter various problems such as a mismatch in demand and supply and inadequate interline connectivity. But all this can be avoided with a railway master plan.

2) Importance of Intermodal Station Facilities

7.2 Inadequate or lack of space and facilities at the station is a hindrance not only to the use of urban rail but also cause traffic congestion around the station. It will negatively affect both rail passengers and road users. Traffic congestion caused by rail station create new bottlenecks and lower the traffic carry capacity of rail corridor as a whole. Lack of intermodal facilities at the station also narrow the catchment area of rail. Walking environment of the catchment area (500m to 1000 m radius from the station) must be improved to promote ridership and benefit non-rail users in the area.

7.3 Intermodal facilities at rail station is a catalyst to connect rail use and urban development around the station. For the possible area where integrated urban development plans will be prepared and included in the existing city plan, those development normally require land acquisition and longer time than railway construction. The project must be separated from rail project. However, minimum size at space for feeder service must be included in the rail project.

3) Integrated Urban Development around and Along Rail Lines

7.4 Although limited opportunities of integrated urban development at and along rail lines because necessary institutional development methods are absent, interests of both public and private sector will increase as rail develops. Successful railway development is achieved only when integrated urban development at and along the line are implemented to realize “public transport based urban development”.

7.5 At present private sector moves fast and they ride free on rail development. Many cities practice zoning system in urban planning, though their enforcement power is almost nil. Accordingly, zoning must be reviewed in the influence area of a rail to define development conditions and provide legal basis for development permission. In developed urban area there are many land owners and their rights are complex corresponding institutions building is needed.

4) Implementation

7.6 In developing countries railway projects are mainly promoted by rail related organization who pay little attention to urban development at and along the station, even intermodal facilities and ekimae hiroba. Rail project normally generate sufficient economic benefits on precondition that railway access is endured, rail passengers’ convenience assured and road users enjoy decongestion cost. Others include the benefits from ensenkaihatsu, of which the benefits are difficult to be quantified but normally captured as

increase in land prices as a rule of thumb. Anyway, to maximize the benefits of urban rail development, both projects must be implemented in as integral manner, If not integrated, they must be coordinated.

Table 7.1 Project Implementing Organizations for Ekimae Ensenkaihatsu

Development Type		Municipal Government	Railway Operator	Other Transport Operator	Developer
Ekimae Hiroba (Intermodal Facilities)		O Land, bus loading/ unloading facilities, pedestrian facilities, traffic management facilities	△ Cost share with government municipalities, signboard	△ Cost share with government municipalities	——
Ekinaka (Inside Station)	Inside Station	——	O Kiosk	——	——
	Station Building	——	O Commercial facilities	——	△Commercial facilities
Ekimae (At/Around Rail Station)		△ Community service facilities	——	——	O Commercial business, residential facilities
Ensenkaihatsu (Along Rail Line)	Rail Property	△ Related environment improvement	O Integrated development	——	△Participation
	New Town	△ Part of infrastructures	△Adjustment of alignment stations	——	O Integrated development
	Publicly Owned Land	——	△Adjustment of alignment station	——	O Integrated development
Access	Infrastructure	Access roads	△Cost sharing	——	——
	Feeder Service	Rerouting of bus	△Access service	O Access service	——

Noted: △ Main role O Secondary role

5) Role of ODA

7.7 In developing countries, rail projects are often implemented with an insufficient understanding of the strategic importance of rail being developed as a network. The first line is of particular importance as it might become an expensive risk of the government in terms of administrative procedure, funding, and ridership, among others. As the role of the government in railway network development for the long term is huge, long-term organizational, institutional, human resource, and technological support has to be provided.

7.8 Rail organizations vary. The following table gives a summary of the different types of development from the viewport of internalizing the development benefits. For all types of organization, proper institutional arrangement is required which must be worked out even if difficult.

Table 7.2 Type of Railway Organization and Characteristics

Type		Characteristic	Internalization of Development Benefits	Support of ODA
Government, Municipalities		• Not financially independent • Public subsidy • Possible network development while concerns on projects with low priority	▪ Possible to internalize development benefits partially through tax on land acquisition	▪ Possible
Public Corporation	Limited business coverage	• Basically financially independent • Public fund including investment in kind • Subsidy	▪ Impossible to become urban development project organization ▪ Possible to absorb commercial revenue within station ▪ Internalizing development benefits is possible indirectly but not directly ▪ Possible cross-subsidy among the lines	▪ Possible
	Unlimited	• The same as above • Revenue from non-rail business	• Possibility to urban real estate development business using railway properties	• Possible
Concession	Infrastructure and operation	• Likely to become interline connectivity and cross subsidy between lines difficult • Stability of project (there is no successful case in developing countries)	• Possible when concession organization implement real estate business	• Difficult in general
	Operation only	• Above problems are reduced	• The same as above	• Possible for fiscal investment and load programs
Private		• Self-financing • Freedom in non-rail business • Possible government subsidy	• High possibility for rail operator to internalize real estate business	• Difficult in general

6) Development Fund

7.9 As urban rail are of high level of publicness, it is difficult to run as private business. As urban rails must provide guarantee stable operation for long-term, their safety, operation, fare, among others are under the supervision of Government. The challenges are not only for the operation but also sustainable funding. Regardless a project is public or PPP, the Government has to shoulder heavy load such as subsidy for long-term.

Table 7.3 Funding Source for Urban and Infrastructure Development

Classification and Type		Effects and Issues in Developing Countries
Government Burden	General fund	Transfer from tax
	Issuing Bond	Equitability among generations, under developed financial market, necessity of Government guarantee
	Earmarked Tax	Creation of earmarked tax
	Property Tax	Increase in real estate value but efficacy is limited due to deficient land registration and valuation systems
	Land Transaction Tax	Significant effects in transaction of real estate after the increase in value
Value Capture of Development Benefits	Special tax	Imperfect institution on special tax targeted for users
	Value capture from general development	Imperfect institution to collect increase in land value
	Beneficiary Pay	Change to land owners
	Land Adjustment	Land acquisition
Usage Fare	Fare collection	Uses pay but fare of urban rail is set low
	Cross-subsidy	Integrated operation of high profitable and low profitable lines
Private Fund	Borrowing	High interest rate. Long-term borrowing is difficult.
Equity	Many cities lack internal capital	

7) Facing Risks

7.10 In ekimae ensenkaihatsu and in railway development, there are various risks such as land, market, administrative procedure, funding, ridership, among others. In order to reduce the risks, a taxation system which integrates the urban development of railway, various internal subsidies, appropriation of increase in real estate value to revenue among others, is needed.

Appendix

Transit Oriented Development

Tokyo, a Global City Created by Railways

This is English translation version of [Transit Oriented Development
Tokyo, a Global City Created by Railways] (Edited and written by Takashi Yajima and Hitoshi Ieda. Published by The Institute of Behavioral Sciences)

Edited and written by Takashi Yajima and Hitoshi Ieda

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Table of contents

Chapter 1 Unique Transit Metropolis Tokyo

1 Railways serve to support Tokyo

(1) Movement of people is dependent on railways

(2) Movement of goods dependent on automobiles

(3) Transit Metropolis Tokyo

2 Transit Metropolis Tokyo outpacing Paris

3 The creation of Tokyo through railways

(1) Steam railways that were disliked in the cities

(2) Construction of private railways in major cities

(3) Earthquake reconstruction and looping of the Yamanote line

(4) Disaster reconstruction providing opportunities for suburban habitation

(5) Integrated development of suburban development and suburban railways

4 Development of Japanese-style TOD

(1) Japanese-style TOD and its features

(2) Business model for private railways in major cities

(3) Development of JR (national railway) terminals

(4) Support for TOD from the public sector and development of "new towns"

5 Fall from the bright and promising suburbs to the suburbs at twilight

(1) Age of urbanization and bright suburbs

(2) New mega trends and the tarnished suburbs

Chapter 1　Unique Transit Metropolis Tokyo

1. Railways serve to support Tokyo

(1) Daily trip of people is 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)Freight transport is dependent on trucks

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%.

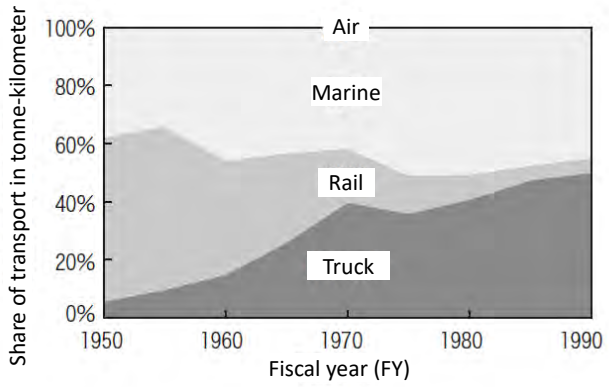


Figure 1: Share of domestic freight transport by means

(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.

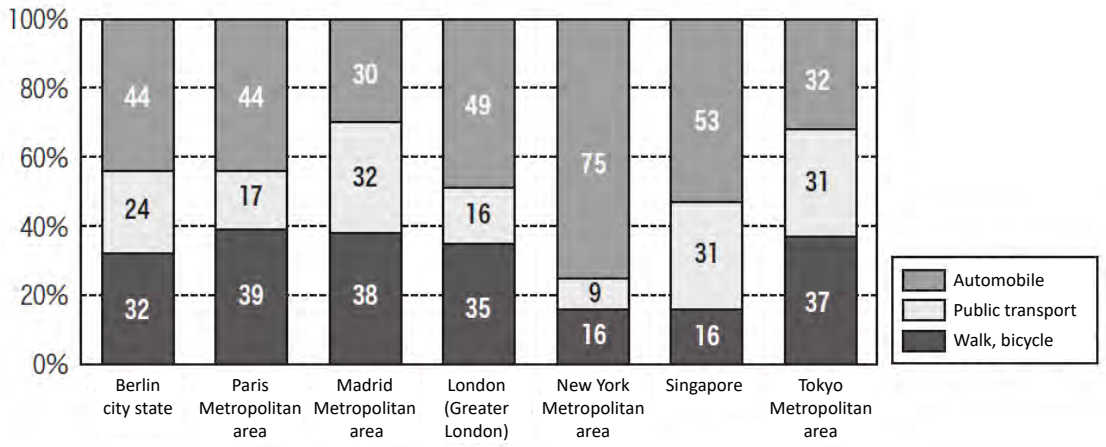


Figure 2: State of use of different transport means in large cities worldwide

(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).

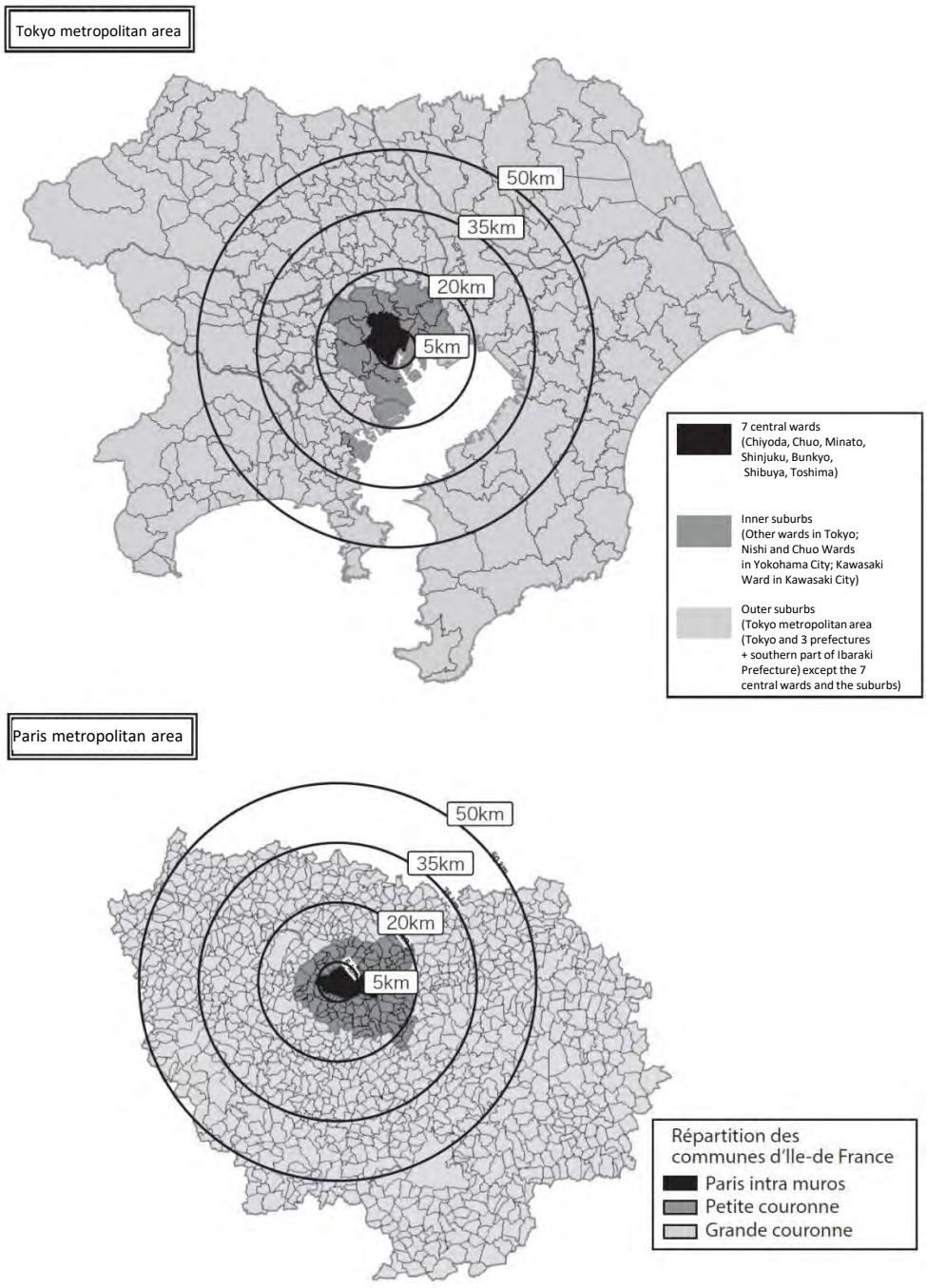


Figure 3: Sizes of Tokyo and Paris metropolitan areas

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)

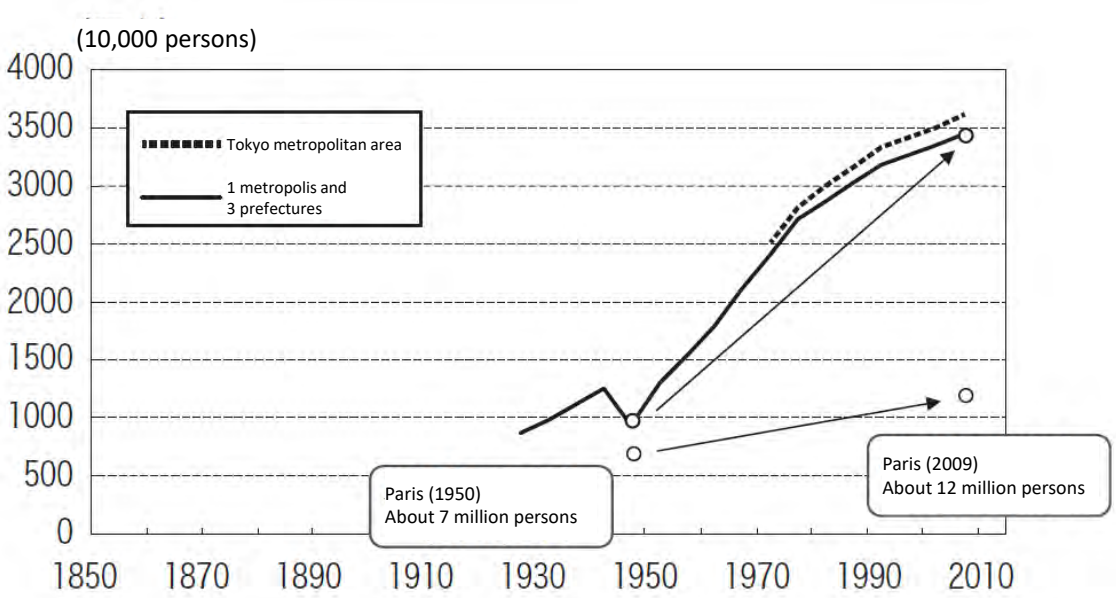
* Population of Tokyo as of 2005

* 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)

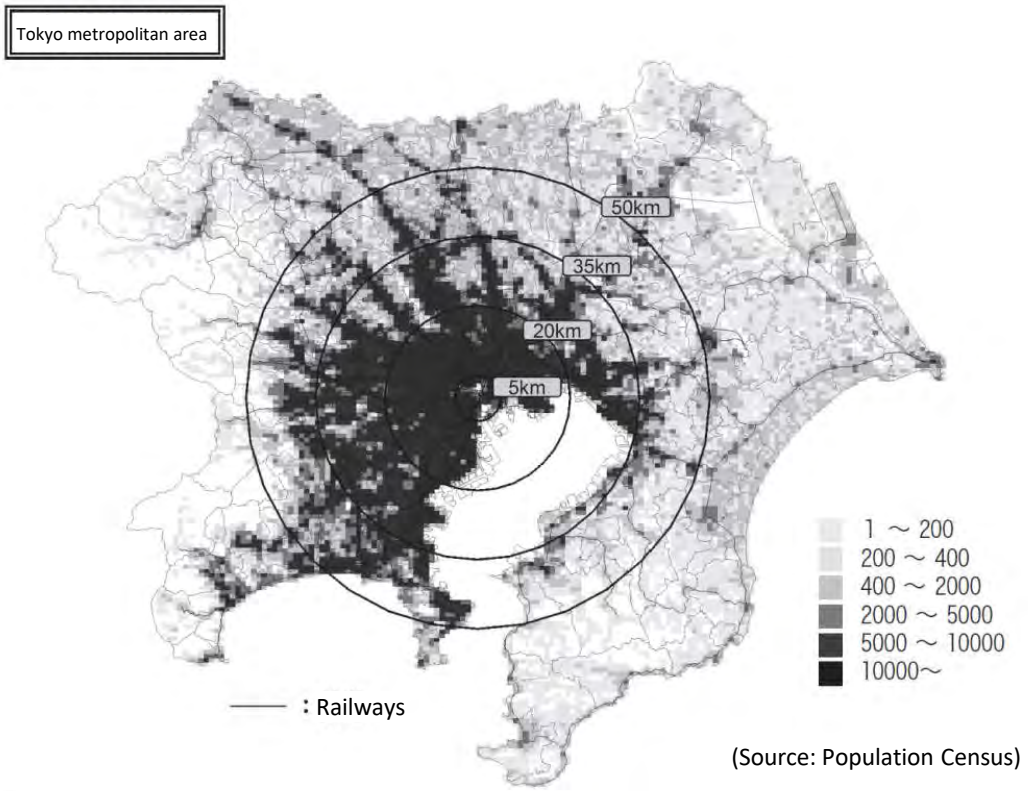
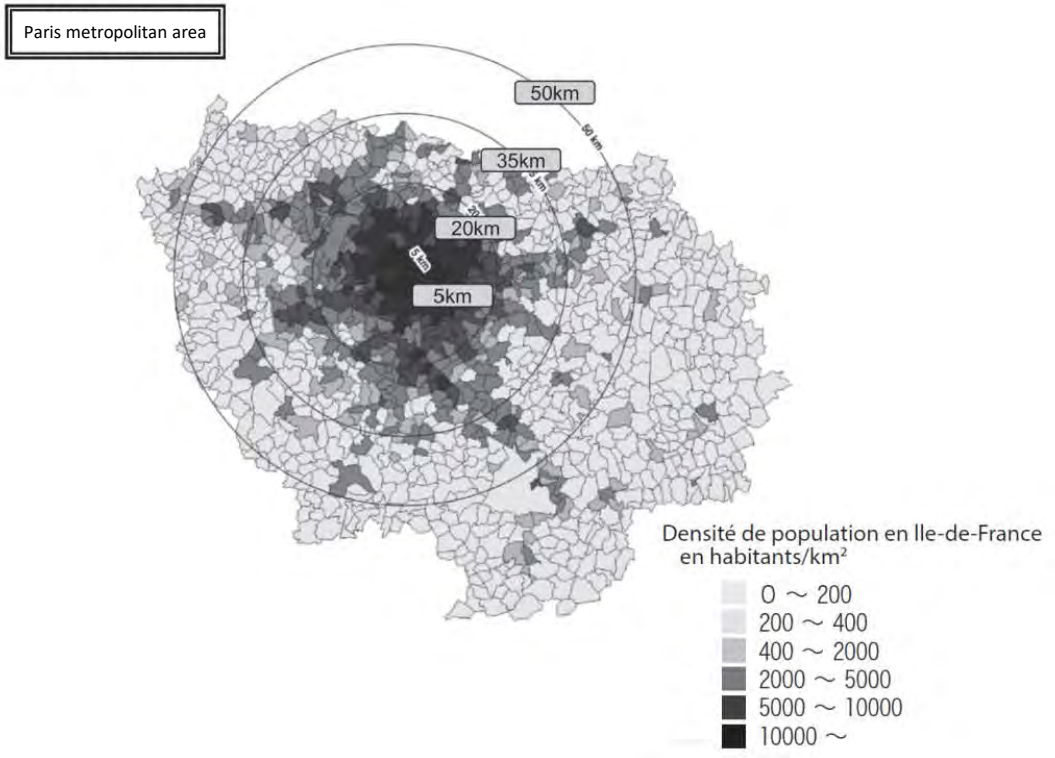


Figure 5: Distribution of nighttime population (Tokyo metropolitan area in 2006; 1-km^2 grids)



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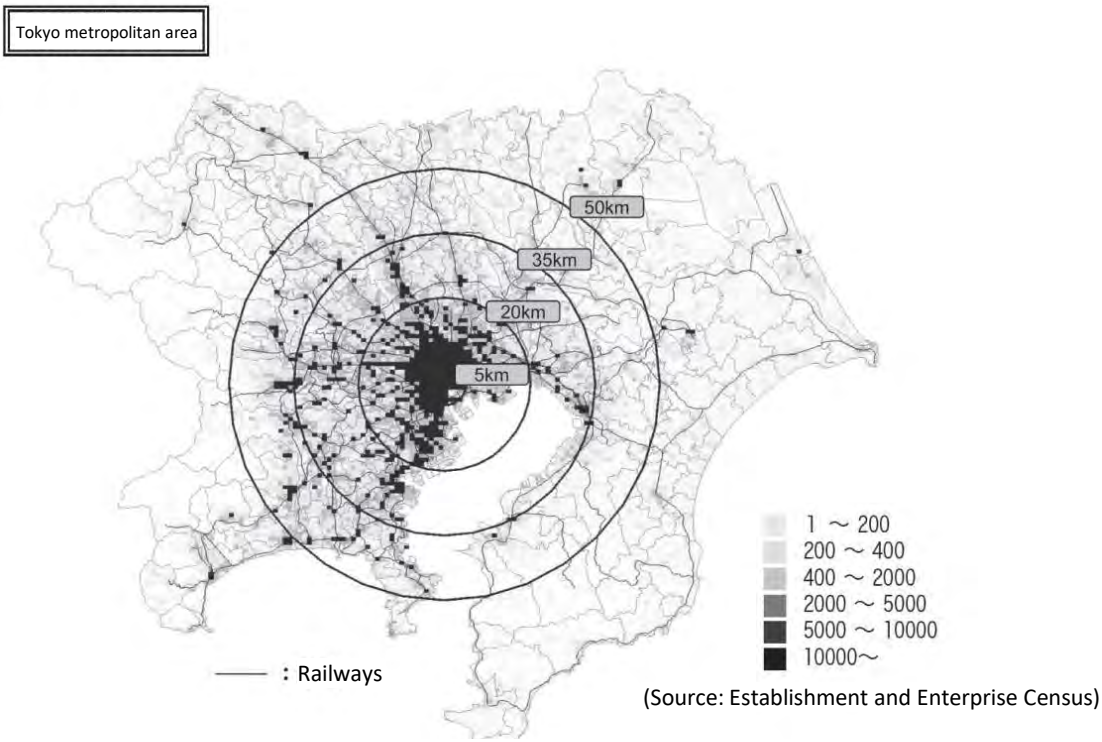

(Source: Establishment and Enterprise Census)

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

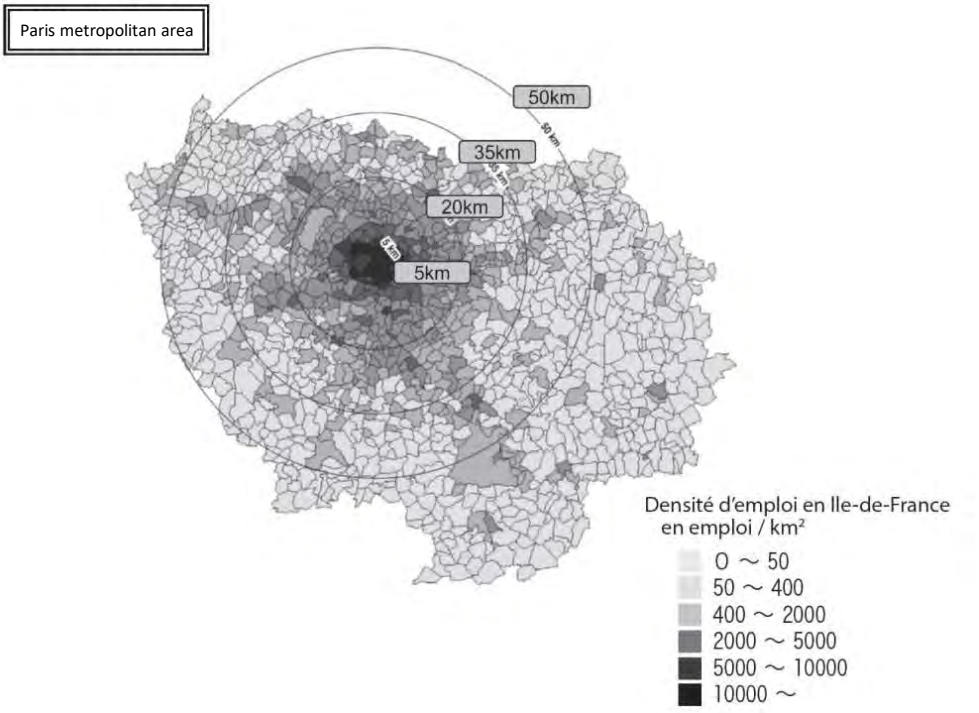

Figure 8: Distribution of working population (Paris metropolitan area)

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.

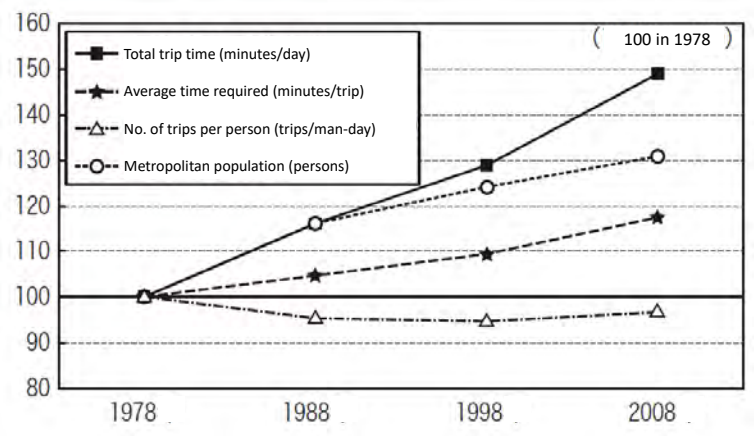

Figure 9: Travel behavior characteristics of the whole metropolitan area (Tokyo metropolitan area)

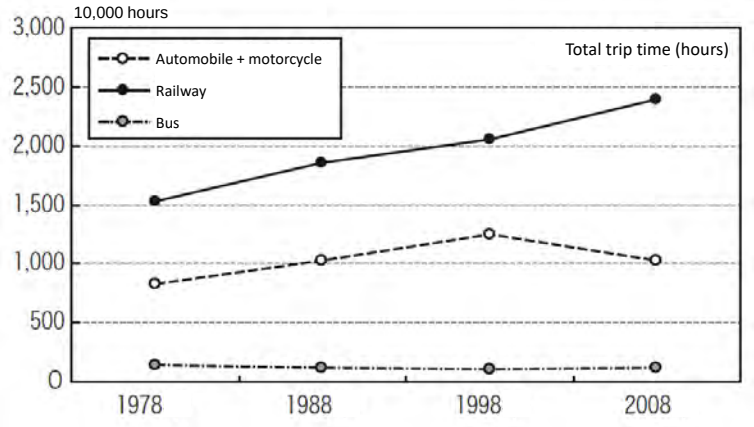

Figure 10: Trip characteristics by typical transport means (Tokyo metropolitan area)

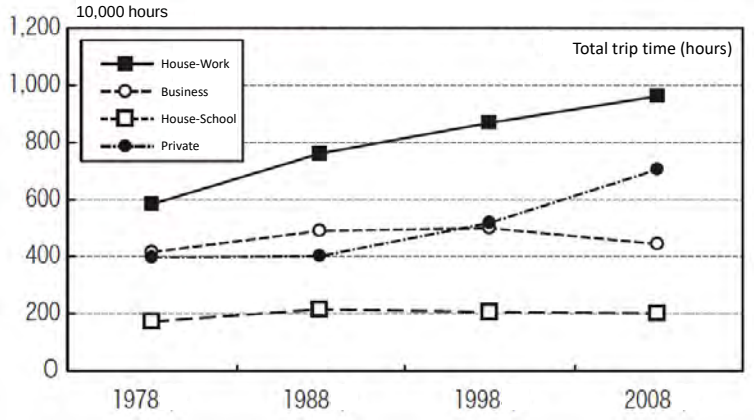

Figure 11: Trip characteristics by purpose represented by the sum of travel time by means of railways, buses and motorcycles (Tokyo metropolitan area)

(Source: Tokyo Person Trip Survey)

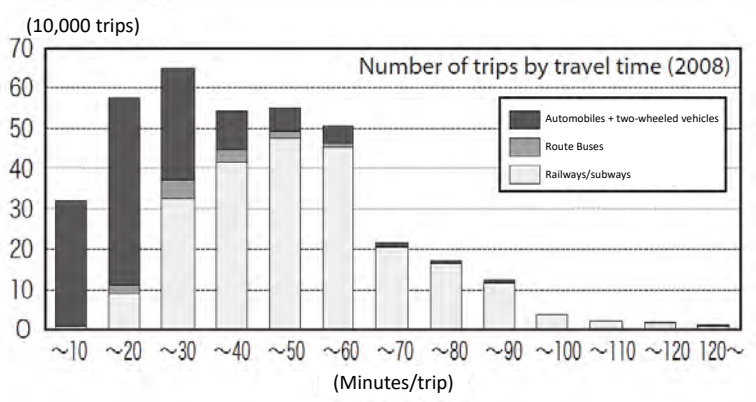

Figure 12: Number of trips during peak hours (7:00 to 10:00 a.m.) classified by travel time and modes

(Source: Tokyo Person Trip Survey)

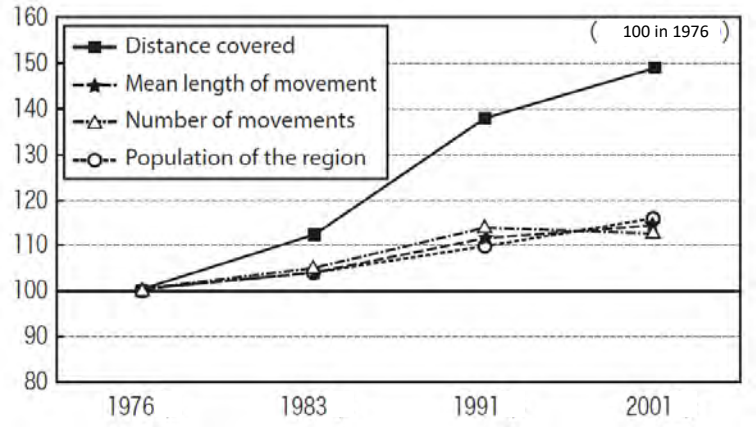

Figure 13: Travel behavior characteristics in the whole metropolitan area (Paris metropolitan area)

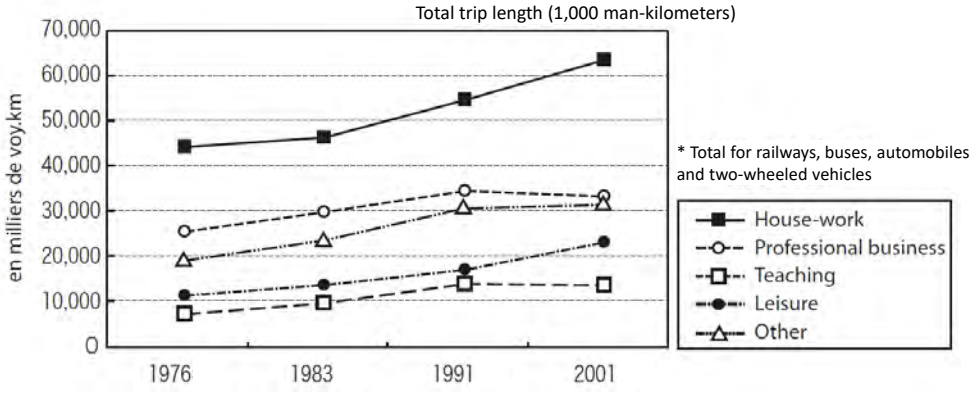

Figure 14: Travel behavior by purpose represented by the sum of travel time by means of railways, buses and motorcycles (Paris metropolitan area)

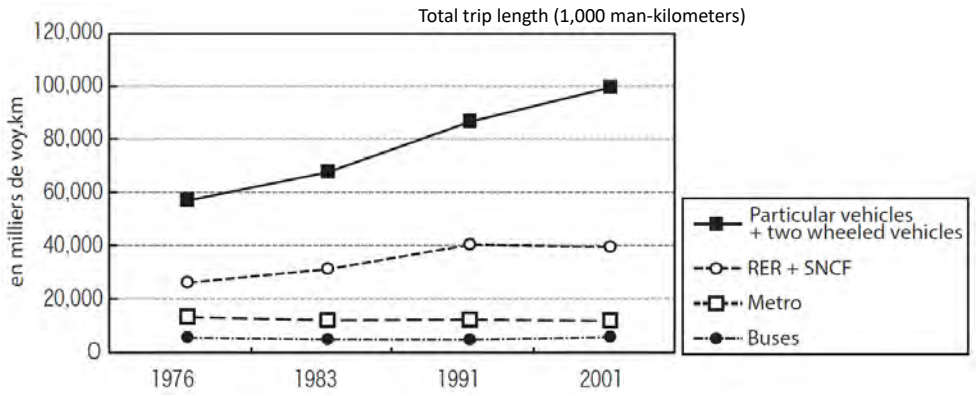

Figure 15: Movement behavior by typical modes (Paris metropolitan area)

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.

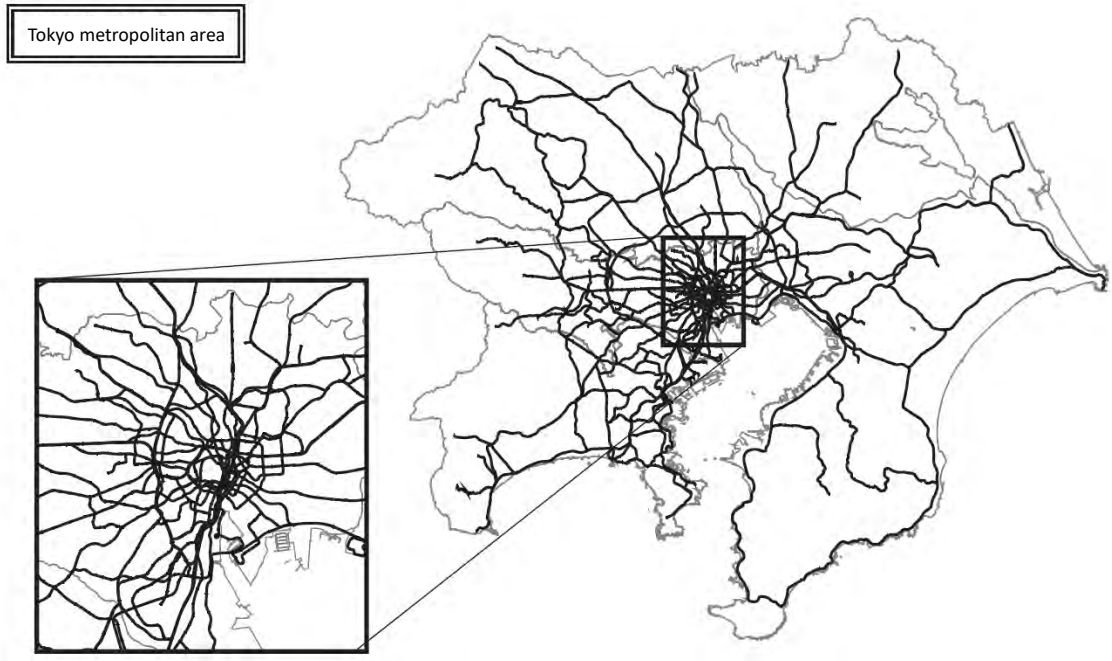

Figure 16: Railway network (Tokyo metropolitan area) (2008)

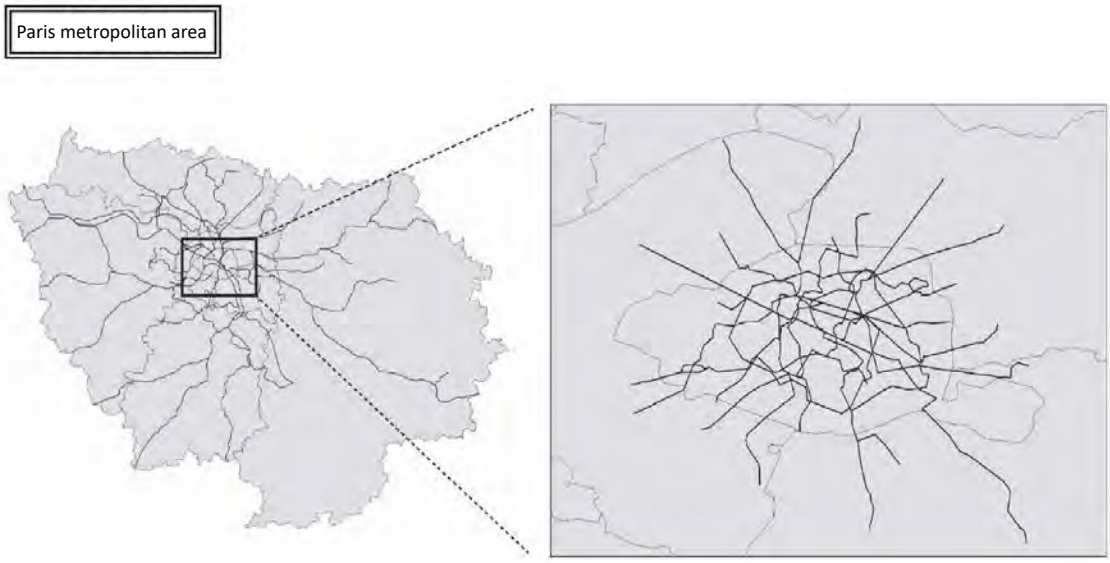

Figure 17: Railway network (Paris metropolitan area)

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.

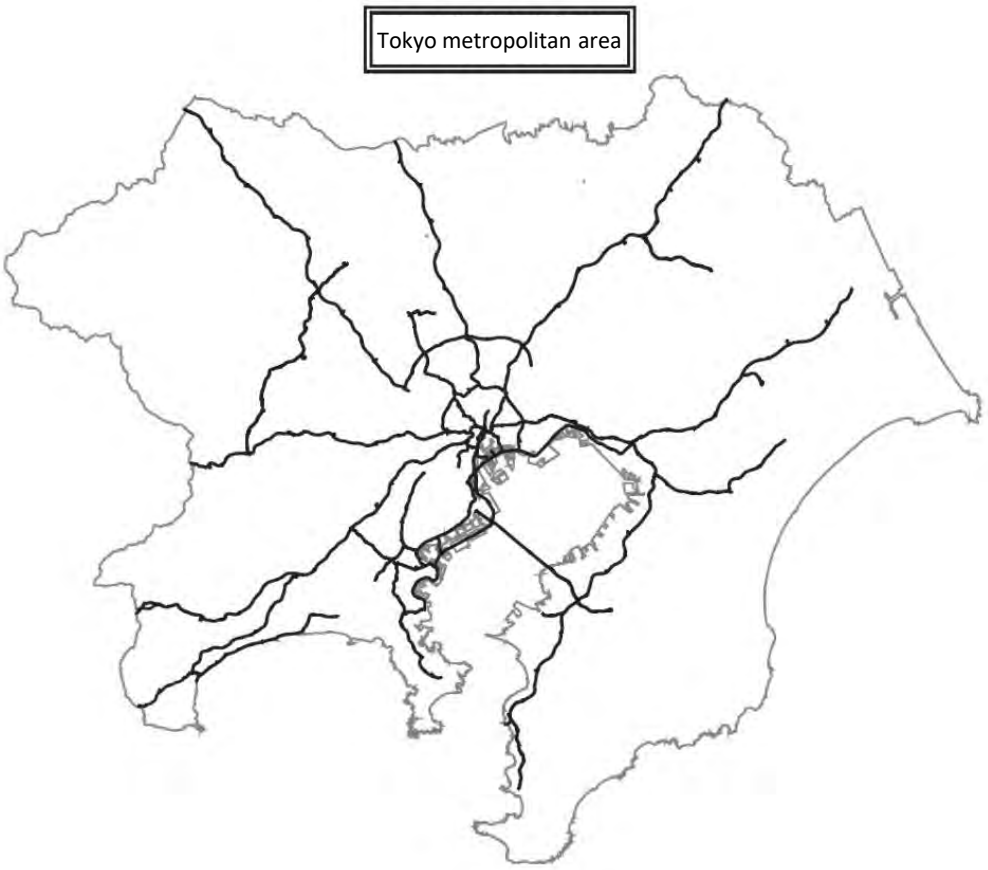

Figure 18: Expressway network (Tokyo metropolitan area)

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 through 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 that were disliked in the 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) Earthquake reconstruction 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).

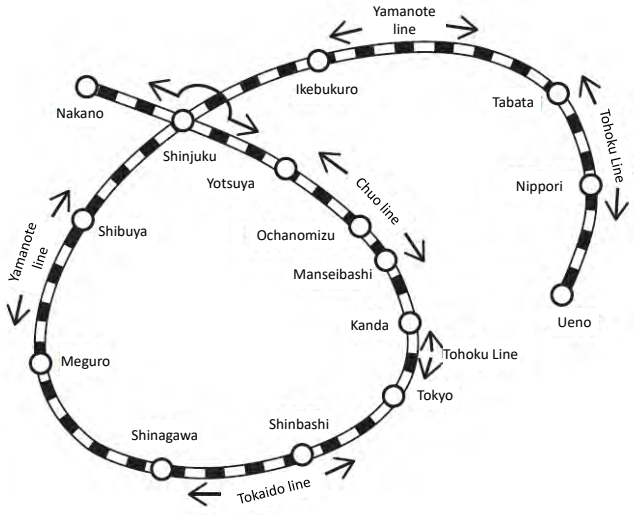

Figure 20: Yamanote Line in Tokyo, running in the shape of the Japanese character "の" (1919)
(Source: Kenji Nakamura, "Birth of the Yamanote Line," Ikaros Publications)

Around 1940 Around 1908

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

(4) Disaster reconstruction providing opportunities for suburban habitation

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.

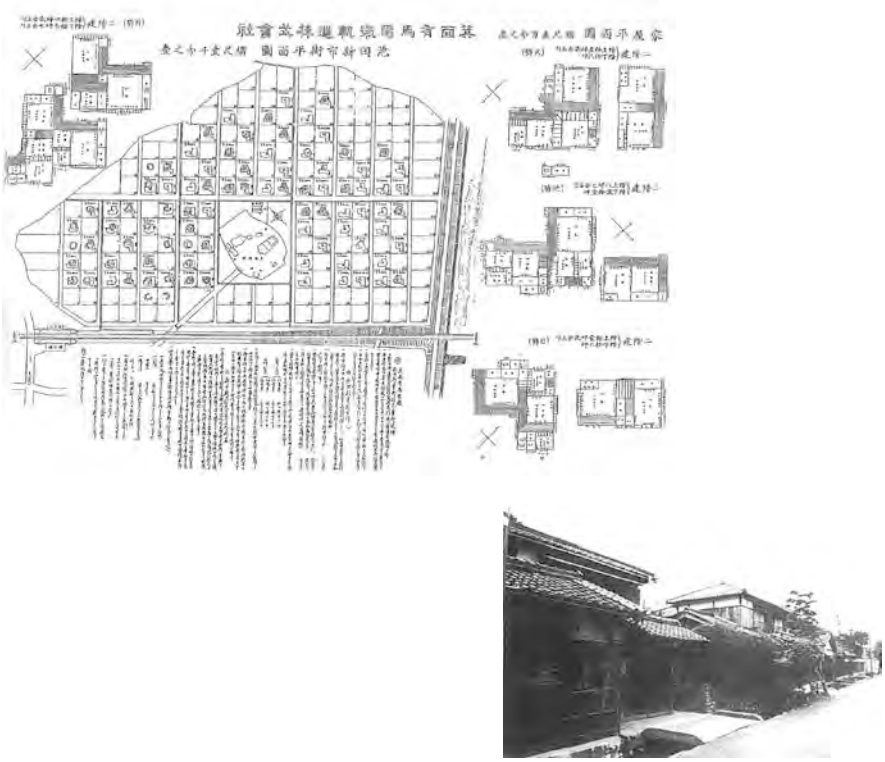

Figure 22: Earliest plan of suburban housing development
(Source: Urban Developers' Association of Japan,
“List of Private Railway Groups’ Urban Development Projects,” 2003)

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. Development 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.

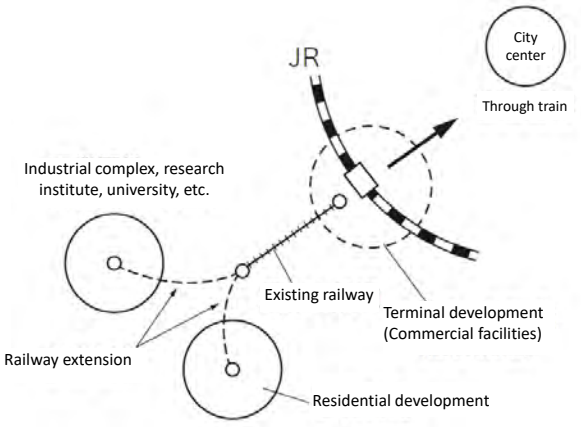

Figure 23: Land use scheme for developments alongside a railway line

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)

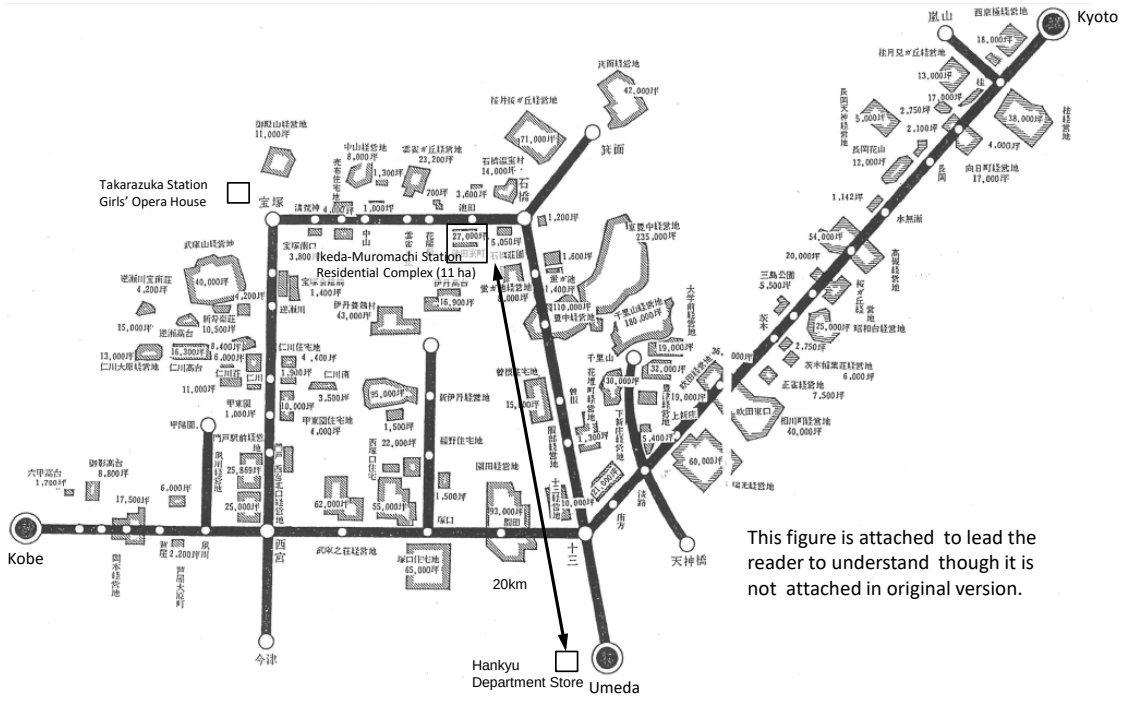

Figure: Development alongside the railways of Minoo Arima Electric Railway Co.

(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) Support for TOD from the public sector 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. From the bright and promising suburbs to the suburbs in twilight

(1) Age of 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 the tarnished suburbs

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?