



Modes of operation of railway systems involving multiple operators in selected places

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1. Introduction

1.1 Over the past two decades or so, the Government expanded Hong Kong's railway network and used it as the backbone of the public transport system to meet the increasing commuting needs of the general public. The MTR Corporation Limited ("MTRCL"),¹ established in 1975, has been the sole operator responsible for developing, operating and maintaining the railway network in Hong Kong since 2007 when its operations were merged with that of the Kowloon-Canton Railway Corporation ("KCRC").² In recent years, delays in completion of new railway projects and a spate of serious railway safety and service disruption incidents have aroused public concerns about and dissatisfaction with the operation of MTRCL. As such, there have been calls for the Government to consider introducing other operators to participate in constructing and operating the proposed new railway lines, in a move to expedite railway construction projects and prompt MTRCL to strive for service improvement.

1.2 Meanwhile, some other places like **Shenzhen** and **Tokyo** have engaged more than one operator in developing and operating different lines/networks in their railway systems so as to tap into a wider pool of experience, capabilities and resources for expanding their local railway systems. While Shenzhen's subway system features an integrated network albeit being run by two operators, Tokyo's railway system comprises multiple independent surface and underground lines/networks operated by separate public or private operators.

1.3 At the request of Hon Edward LEUNG Hei, the Research Office has prepared this **Information Note** which studies the development and operation modes of the railway systems in Hong Kong, Shenzhen and Tokyo. This Note will first review **Hong Kong's** policies on railway development, the mode of operation of the Mass Transit Railway ("MTR") system, and issues and concerns about the service performance of MTRCL. It will be followed by the study of **Shenzhen** and **Tokyo**

¹ MTRCL was known as the Mass Transit Railway Corporation prior to the Government's stake sale in 2000.

² Before the merger, Hong Kong's railway network was managed by two separate operators – the Mass Transit Railway Corporation that ran the predominately underground network, and KCRC that ran the above ground lines including the East Rail, West Rail and Light Rail.

where more than one company has been engaged to develop and operate different railway lines/networks of the local railway system. Special reference will be made to the system design and measures implemented to help promote commuting convenience and enhance commuter experience when travelling on railway lines/networks operated by different operators.

2. Hong Kong

2.1 In Hong Kong, the railway network is the backbone of public transport system which accounts for about 40% of all trips made on public transport each day. At present, the network comprises nine local lines, the Airport Express, the Guangzhou-Shenzhen-Hong Kong Express Rail Link (Hong Kong Section) and the Light Rail (see [Appendix 1](#)). The total length of the network amounted to about 271 km in May 2022, increasing by some 83.1% from 148 km in 2000. The average daily patronage of the railway services reached a high of 5.46 million passenger journeys in 2018, up from 3.24 million in 2000, before retreating to 4.03 million passenger journeys in 2022 amid the disruption to daily activities arising from COVID-19.³

2.2 Indeed, as early as in the late 1990s, the Government already highlighted in a transport strategy⁴ the strategic direction to develop railways as the backbone of the public transport system and accelerate expansion of the railway network. It was envisaged that railways, being an efficient, fast, reliable and environmentally friendly transport mode, would play an important role in the transport system for meeting growing transport demand as a result of socio-economic development. The **Railway Development Strategy 2000** (“RDS-2000”) subsequently released in May 2000 sets out the railway development blueprint and maps out the plan to expand the railway network to more than 200 km by 2016.⁵

2.3 In September 2014, the Government updated RDS-2000 and published **RDS-2014** to provide the framework for planning the further expansion of

³ See Transport Department (2022a, 2023).

⁴ The transport strategy, entitled “Hong Kong Moving Ahead – A Transport Strategy for the Future”, was promulgated in October 1999. It was formulated based on the findings of the Third Comprehensive Transport Study (“CTS-3”) completed in September 1999, which came after two earlier rounds of CTS in 1976 and 1989 respectively. CTS-3 aims to provide a transport development framework for supporting the sustainable development of Hong Kong. See Transport Bureau (1999).

⁵ In 2000, the total length of railways was about 148 km, covering six railway lines and the Light Rail. Major railway projects put forward in RSD-2000 included the Shatin to Central Link, the West Island Line and Guangzhou-Shenzhen-Hong Kong Express Rail Link (Hong Kong Section).

Hong Kong's railway network up to 2031. RDS-2014 recommends the implementation of seven railway projects taking into consideration transport demand, cost-effectiveness and development needs of New Development Areas and other new developments.⁶ Most recently, the Government has put forward a number of new railway projects in its Northern Metropolis Development Strategy released in 2021 and the Chief Executive's 2022 Policy Address. These projects cater for developments in the Northern Metropolis and promote connectivity and integrated development between Hong Kong and Mainland cities in the Greater Bay Area.⁷

Development and operation mode of the railway network

2.4 At present, MTRCL is the **sole operator** tasked with developing, operating and maintaining the railway network in Hong Kong. It was established in 1975 as a statutory company to build the MTR network and became a public listed company in October 2000 with the Government selling 23% of its issued share capital to private investors in an initial public offering. In 2007, the railway operations of KCRC were merged into those of MTRCL to form an integrated MTR system.⁸ According to the Government, the merger aimed to bring benefits such as (a) improving overall coordination of the development and operation of the railway system and thereby enhancing efficiency of the system and reducing duplication; and (b) ensuring seamless interchange arrangements for existing and planned railway lines to offer passengers convenience and reduce journey time^{9, 10}

⁶ These projects are: (a) Tung Chung West Extension; (b) Tuen Mun South Extension; (c) Northern Link and Kwu Tung Station; (d) Hung Shui Kiu Station; (e) South Island Line (West); (f) East Kowloon Line; and (g) North Island Line. While the construction works of three of the proposed projects will commence in 2023 for completion from 2027 to 2030, the other railway projects are still at different planning stages.

⁷ Examples of proposed railway projects include (a) the Northern Link Spur Line connecting San Tin/Lok Ma Chau with Huanggang; (b) the Hong Kong-Shenzhen Western Rail Link connecting Hung Shui Kiu and Qianhai; and (c) the Central Rail Link connecting Kam Tin with the Kowloon Tong Station.

⁸ Under the merger agreement, MTRCL has been granted the service concession to operate the railway network of KCRC for 50 years from the merger date. MTRCL has also acquired from KCRC certain investment properties, property management business and property development rights.

⁹ Prior to the merger in 2007, passengers interchanging between the MTRCL and KCRC lines at the three interchange stations had to pass the ticket gates of both networks and was imposed a second boarding charge of HK\$1 to HK\$7. The arrangements were abolished after the merger.

¹⁰ Other benefits from the merger included paving way for (a) a comprehensive review of the railway fare structure with a view to reducing fare; and (b) the introduction of an objective and transparent fare adjustment mechanism to replace fare autonomy of the operators before the merger. See Environment, Transport and Works Bureau and Financial Services and the Treasury Bureau (2006) and GovHK (2007).

2.5 Over the years, railway development projects managed by MTRCL have been financed by direct grant of the Government and/or funds raised by adopting the **“rail-plus-property” development model** (“R+P model”).¹¹ For the development of some new railway lines, the Government will grant the land development rights at stations or depots along the route to MTRCL under the “R+P model”. The profit generated from the sales or lease of developed properties will then be deployed by MTRCL to finance railway development projects without involving direct Government financing. The Government will benefit from the land premium received from the land grant and the enhanced equity value through its majority shareholding in MTRCL. The successful experience of MTRCL in applying the R+P model to finance the development of the MTR network and promote transit-oriented development (“TOD”)¹² has been a reference case for some Mainland and overseas cities.

2.6 As for performance of the railway services, MTRCL indicated that it had achieved 99.9% for the indicators on trains running on schedule (train service delivery) and passenger journeys on-time¹³ for “heavy rail” services in 2022. Such service performance level has been maintained since the rail merger in 2007 amidst expansion of the railway system over the years. The train service delivery in light rail was also maintained at 99.9% in 2022. Furthermore, MTRCL recorded 154 delays of eight minutes or more in 2022, down from 194 in 2021. Of the delays, incidents causing delays of 31 minutes or more¹⁴ reduced to eight from 16 over the period.¹⁵

¹¹ For example, the Kwun Tong Line, the Island Line, the Tseung Kwan O line and the South Island Line were developed by MTRCL under the R+P model. On the other hand, the Guangzhou-Shenzhen-Hong Kong Express Rail Link (Hong Kong Section) and the Shatin to Central Link development projects were financed by Government funding. See GovHK (2012).

¹² TOD refers to a planning and design strategy that aims to promote urban development that is compact, mixed-use and closely integrated with mass transit by clustering housing, services, jobs and amenities around public transport stations. See World Bank Group (2017).

¹³ Train service delivery measures actual train trips against those scheduled to be run while passenger journeys on-time refers to journeys that are completed within five minutes of the scheduled journey times. MTRCL’s service performance pledge is 99.5% for both indicators.

¹⁴ Under the existing service disruption notification mechanism, MTRCL is required to notify the Transport Department within eight minutes whenever any service disruption that has lasted for eight minutes or is expected to last for eight minutes or more occurs. A fine will be imposed on MTRCL for any service disruption that lasts for 31 minutes or more and is caused by equipment failure or human factor within MTRCL’s control. The fines will be set aside for providing fare concessions to passengers.

¹⁵ See MTR Corporation Limited (2023c).

Issues of concern

2.7 Nonetheless, a spate of serious railway safety and service disruption incidents in recent years such as signal system failures and door detachment incidents¹⁶ has aroused concerns over the quality of repair and maintenance of the MTR system.¹⁷ Meanwhile, delays and cost overruns in major railway construction projects such as the Guangzhou-Shenzhen-Hong Kong Express Rail Link (Hong Kong Section) and the Shatin to Central Link have precipitated another concern over the capability of MTRCL to concurrently handle multiple new railway projects.¹⁸ As such, there have been views that the Government may consider introducing competition by inviting other contractors or railway operators to bid for the construction and operation of new railway lines through open tenders, thereby improving the cost- and time-efficiency in implementing the projects and prompting MTRCL to strive for project management and service improvement.¹⁹

2.8 In response to the above, the Government has indicated that if a new railway project involves extension of the existing railway network, it would first invite MTRCL to submit a proposal for implementing the project pursuant to the operating agreement signed between the Government and MTRCL in 2007. As for new independent railway lines such as the Hong Kong-Shenzhen Western Rail Link connecting Hung Shui Kiu to Qianhai proposed in the Northern Metropolis Development Strategy, the Government would have room to consider the feasibility of inviting other operators or contractors to participate in the construction and operation of the railway lines.²⁰ The Government will also keep in view various issues such as fare setting, interchange concession and connectivity with other railway lines in case other operators are involved in the construction and operation of a specific new railway line.

¹⁶ Latest major incidents include (a) dislodgement of two pairs of train doors of a train when entering the platform at the Yau Ma Tei Station on the Tsuen Wan Line on 13 November 2022; and (b) emergency stopping of a train approaching the Tseung Kwan O Station on the Tseung Kwan O Line as an abnormal extension of the gangway between two train cars was detected on 5 December 2022.

¹⁷ See GovHK (2022b) and Legislative Council Secretariat (2023).

¹⁸ See GovHK (2017) and 香港01(2021).

¹⁹ See 香港01(2021, 2022) and Panel on Transport (2021).

²⁰ See GovHK (2022a) and Panel on Transport (2021).

3. Shenzhen

3.1 The Shenzhen Municipal People's Government ("Shenzhen government") commenced development of its subway system, the Shenzhen Metro ("SZ Metro"), in 1998 to support the development of the municipality as envisaged in the "Shenzhen Comprehensive Plan 1996-2010" (深圳市城市總體規劃 1996-2010).²¹ The strategic objectives of the Plan are to develop Shenzhen into a regional economic centre and a modern and international city with development focus on three urban clusters in the east, central and western parts of the municipality. Over the years, the subway system has progressively been expanded to meet the growing transport demand amidst continuous socio-economic development of the municipality.²² Currently, SZ Metro comprises 16 lines²³ with a total length of about 548 km (see [Appendix 2](#)). Its share of public transport passenger journeys increased significantly from 31.0% in 2015 to 60.6% in 2021.²⁴

Development of the subway system

3.2 Shenzhen Metro Group Co., Ltd. ("SZMC"), a state-owned enterprise established in July 1998,²⁵ is entrusted with constructing and operating most of the SZ Metro lines. In the first phase of development between 1998 and 2004, SZMC was the sole contractor responsible for constructing SZ Metro Line 1 ("SZL1") and SZL4. The construction projects were financed by capital investment of the Shenzhen government and bank loans.

3.3 Nonetheless, the Shenzhen government has explored other financing models to support the further development of its subway system and related TOD projects since commencement of the second phase development of SZ Metro

²¹ The development of Shenzhen has been guided by a series of development plans since its establishment as a special economic zone in 1980. The Shenzhen Comprehensive Plan 1996-2010 was approved by the Shenzhen Municipal People's Congress in 1997 and the State Council in 2000.

²² After some 40 years of development, Shenzhen has transformed from a small town to become an important economic centre, and technology and innovation hub in the Mainland. The permanent population of Shenzhen increased from about 320 000 in 1980 to 17.7 million as at end-2021. Shenzhen's per capita gross domestic product reached RMB173,663 (HK\$209,333) in 2021, one of the highest among major cities in the Mainland.

²³ These comprise Lines 1, 2, 3, 4, 5, 6, 6B, 7, 8, 9, 10, 11, 12, 14, 16 and 20.

²⁴ See 深圳市地鐵集團有限公司 (2023a).

²⁵ SZMC is a large-scale wholly state-owned enterprise under the direct control of the State-owned Assets Supervision and Management Commission of Shenzhen Municipal People's Government (深圳市人民政府國有資產監督管理委員會). Its businesses cover, among others, subway construction and operation, and property development and management.

in 2007.²⁶ It has engaged the MTR Corporation (Shenzhen) Limited (“MTRSZ”), a wholly-owned subsidiary of MTRCL,²⁷ in the construction of SZL4 phase two so as to draw on MTRCL’s rich experience in R+P development.²⁸

3.4 The SZL4 phase two project was the first “R+P” development where MRTSZ was awarded the land development rights of SZL4²⁹ in addition to the exclusive rights for constructing and operating the new railway line. As to the latter, the Shenzhen government signed a concession agreement with MTRCL in March 2009, under which MTRSZ is responsible for the investment and construction of SZL4 phase two as well as the operation of the combined SZL4 phase one and phase two³⁰ for a period of 30 years from June 2011 under a build-operate-transfer (“BOT”) arrangement. In addition, MTRSZ has been involved in the construction of the SZL4 north extension with eight stations and is responsible for its operation from commissioning in October 2020 to the end of the 30-year SZL4 concession agreement.

3.5 In the subsequent third and fourth phases of development from 2011, new SZ Metro lines were mainly developed by SZMC under the R+P model.³¹ It was not until recent years that the Shenzhen government introduced the private-public partnership (“PPP”) model for financing the construction and operation of two new SZ Metro lines (SZL12 and SZL13) with the contractors selected through a competitive tendering process. In 2020, the Shenzhen government awarded the SZL12 PPP project to a joint venture company of SZMC and Power Construction Corporation of China (中國電力建設集團有限公司),³²

²⁶ The second phase of development spanned between 2007 and 2011, involving the extension of SZL1 and SZL4, and the development of three new lines i.e. SZL2, SZL3 and SZL5.

²⁷ MTRSZ was formed in March 2004 after MTRCL entered into an agreement in principal with the Shenzhen government in January 2004 for the construction of SZL4 phase two and the operation of the entire line. The total project investment was estimated to be RMB6.0 billion (HK\$5.7 billion).

²⁸ MTRCL also provides valuable experience in areas such as market analysis and site plan and design. Furthermore, it serves as a sound benchmark for the local subway company, and thereby encourages competition. See World Resources Institute (2017).

²⁹ MTRCL won the bid for the development rights on the SZL4 depot site through MTRSZ and another subsidiary in August 2011, and completed the TOD project in 2017. The total operating profit of the project before depreciation, amortization and variable annual payment was about HK\$2.7 billion over 2014 to 2022.

³⁰ SZL4 phase one, which has 5 stations and is 4.5 km in length, was taken over from SZMC on 1 July 2010, and phase two, with 10 stations and 16 km in length, commenced operation on 16 June 2011.

³¹ As at March 2021, SZMC was engaged in eight ongoing R+P projects and planned to invest in seven new projects. These projects involve heavy investment, but the income generated from property sales might be affected by the market cooling measures adopted by the Shenzhen government in recent years. See 中誠信國際信用評級有限責任公司(2021).

³² SZMC has 51% stake in the joint venture company.

and the SZL13 PPP project to a joint venture company led by MTR Consulting (Shenzhen) Co. Ltd. (“MTR Consulting”), a wholly owned subsidiary of MTRCL.³³ The contractors of the two projects have been granted the concession to operate and maintain the respective lines for a term of 30 years starting from the time of commissioning, and they will transfer the ownership and operation of the lines to the Shenzhen government after the end of the concession. SZL12 commenced operation in November 2022, and SZL13 will commence service in 2023.

Operation mode of the subway system

3.6 At present, SZMC is responsible for operating 15 of the 16 SZ Metro lines with 369 stations and a total length of about 517 km. In November 2022, the average daily patronage of 12 of the subway lines operated by SZMC³⁴ was about 5.31 million.³⁵ Meanwhile, MTRSZ is operating one line (i.e. SZL4) with 23 stations and a total length of 31.3 km. In 2021, the average weekday patronage of SZL4 was 0.54 million.³⁶

3.7 In spite of the involvement of two operators in running separate subway lines in the system, the following design of the SZ Metro system has been conducive to promoting convenience of usage and seamless travelling experience of commuters:

- (a) **integrated planning of the subway network** – SZ Metro is an integrated system with its four phases of construction guided by a series of development plans successively laid down by the Shenzhen government since 1994 to cope with the socio-economic development of the municipality.³⁷ The continuity in planning process ensures the connections between the subway lines and transfer stations are well planned, without the need for commuters to leave the stations when interchanging between lines even if they are administered by different operators. The involvement of private operators in constructing and operating the subway lines has also been controlled by the Shenzhen government under BOT or PPP agreements to ensure the subway lines operated by different operators function as an integrated system;

³³ MTR Consulting has 83% stake in the joint venture company. Other shareholders are the China Railway Electrification Bureau (Group) Co., Ltd. (中鐵電氣化局集團有限公司) (15%) and a subsidiary of the Shenzhen government (2%).

³⁴ SZMC’s other three subway lines commenced operation between November and December 2022 and patronage statistics as at November 2022 was not yet available.

³⁵ See 深圳市地鐵集團有限公司(2023b).

³⁶ See MTR Corporation Limited (2023a).

³⁷ The latest plan was announced in 2017, putting forward the development direction of expanding the subway system to 32 lines by 2035. See 深圳市規劃和國土資源委員會(2017).

- (b) **fare calculation and adjustment mechanisms** – both SZMC and MTRSZ adopt the same distance-based sectional fare structure that is set by the Shenzhen government for calculating the fare for travelling across the entire subway system regardless of the operator used.³⁸ Fare adjustment is also regulated by the Shenzhen government which laid down a framework in July 2020 to provide for the establishment of a fare setting mechanism and the procedures for fare adjustment;³⁹
- (c) **payment modes** – apart from single journey tickets, both operators accept a range of payment modes including (i) Shenzhen Tong Card (深圳通卡); (ii) Shenzhen Tong Preferential Card (深圳通優惠卡); (iii) Shenzhen Metro Ticket QR Code (深圳市地鐵乘車碼); (iv) Financial Integrated Circuit Card (金融IC卡); and (v) China T-union Card (全國交通一卡通); and
- (d) **fare concessions** – both operators offer the same fare discounts and concessions such as (i) 5% discount off regular fare for commuters paying with Shenzhen Tong Cards, or with China T-union Cards issued by local banks when riding on ordinary class carriage; (ii) subway-bus transfer concession of RMB0.4 (HK\$0.5) per trip for commuters using payment modes mentioned in (i); and (iii) free rides for specified groups of commuters including the elderly and the disabled.⁴⁰

3.8 According to MTRCL, the early years of operation of SZL4 have seen high growth in traffic demand. The resulting heavy congestion in the stations, coupled with a number of serious service disruption incidents, had affected commuters' perception of MTRSZ's service performance.⁴¹ With the expansion of the capacity of SZL4 by converting the four-car trains into six-car trains between early 2013 and early 2015, the congestion issue eased. In 2021, both SZMC and MTRSZ had met the targets set for nine service performance indicators including train service delivery,

³⁸ For regular service, the fare is RMB2 (HK\$2.3) for the first 4 km travelled, RMB1 (HK\$1.1) for every 4 km in the 4 km to 12 km section, RMB1 (HK\$1.1) for every 6 km in the 12 km to 24 km section, and RMB1 (HK\$1.1) for every 8 km in the section beyond 24 km. The travelling distance is determined based on the shortest route between the starting and destination stations.

³⁹ The fare adjustment framework came into effect on 1 January 2021 and is valid for five years. Under the framework, subway fares would be set based on the operating costs of the whole subway network, while coupling with the affordability of public finance and commuters.

⁴⁰ According to the fare adjustment framework laid down in July 2020, fare concessions offered by subway operators are subsidized by the Shenzhen government under specified schemes to be agreed with the operators.

⁴¹ See 廣東城市公交網(2012).

train punctuality, and reliability of specific facilities. For example, both operators had achieved over 99.9% on the indicators of train service delivery and train punctuality.^{42, 43}

Recent developments

3.9 Notwithstanding the adoption of the fare adjustment framework since January 2021, the Shenzhen government has yet to implement a new fare adjustment mechanism and adjust the fare level of subway services. MTRCL has iterated that the long term financial viability of its SZL4 will be impacted if a fare adjustment mechanism and a suitable fare increase cannot be implemented soon, since operating costs continue to increase while the fare level has not been adjusted since it operated the line in 2010.⁴⁴

3.10 With regard to future development of the subway network, the Shenzhen government has unveiled the fifth phase construction plan of SZ Metro. The plan features the implementation of 13 projects over 2023-2028, of which 10 will be for construction of new lines. The total length of the new subway lines and extensions will be about 226.8 km. Yet, the development and financing models and whether private contractors will be involved in the projects have yet to be announced.

4. Tokyo

4.1 Japan has been renowned for its well-established railway system that provide reliable and efficient transit within cities and across different regions of the country. In Tokyo, railways have been an important transportation mode in this most populous city of Japan with a population of 14 million (11% of the nationwide total population) as at October 2021.⁴⁵ According to the latest “Person Trip Survey”, railways were found to account for the largest modal share in the “Greater Tokyo Area” (東京都市圏) at 33% in 2018.⁴⁶ The Greater Tokyo Area is made

⁴² See 深圳市地鐵集團有限公司(2023a) and MTR Corporation Limited (2023a).

⁴³ According to the rules governing the administration of subway operation (《深圳市城市軌道交通運營管理辦法》), a fine of RMB100,000 (HK\$113,770) will be imposed on a subway operator in case a serious safety or service disruption incident occurs due to violation of specified provisions. However, the fine is not set aside for providing fare concessions to passengers.

⁴⁴ See MTR Corporation Limited (2023a).

⁴⁵ See Statistics Bureau of Japan (2022).

⁴⁶ Other major transit modes included private cars (27%) and walking (23%). See Japan Research Center for Transport Policy (2020).

up of Tokyo and the adjacent prefectures of Saitama (埼玉縣), Chiba (千葉縣), Kanagawa (神奈川縣), and the southern part of the Ibaraki prefecture (茨城縣).

4.2 At present, there are some 30 operators offering railway services in the Greater Tokyo Area, most of which are private operators running independent railway lines or networks. These operators offer services ranging from subway services in the city centres and urban areas, to railway services linking urban and suburban areas and inter-city railway services. As at 2020, the total length of the railway system in the Greater Tokyo Area was about 2 460 km.⁴⁷

Development of the railway system

4.3 The railway system in Tokyo is a mature system with over 100 years of development involving both the public and private sectors. Roles and approaches of each sector are set out in the ensuing paragraphs.

*Public sector (see **Appendix 3** for more details)*

4.4 The national government has not only laid down the long-term master plan for the railway development and service improvement in the Greater Tokyo Area, with the master plan being updated every 15 years to keep pace with the socio-economic development of the region,⁴⁸ it has also been responsible for approving railway development projects, licensing railway operation, providing financial and other relevant support, and overseeing the overall development of the railway system. In Tokyo, the national government further partners with the local government on the development and operation of **Tokyo Metro** and **Toei Subway**, the two **major subway networks**:

- (a) **Tokyo Metro** – at present, Tokyo Metro operates nine subway lines with 179 stations to serve central Tokyo. It is managed by the Tokyo Metro Company Ltd. which is a joint-stock company formed in 2004 following the restructuring of the then Teito Rapid Transit Authority (“TRTA”) (帝都高速度交通營團).⁴⁹ Tokyo Metro Company Ltd. is co-owned by the national government (53.4%) and the Tokyo metropolitan government (46.6%); and

⁴⁷ See 國土交通省(2022).

⁴⁸ The latest version of the master plan was released in 2016.

⁴⁹ TRTA was a statutory corporation established in 1941 to take over the operation and development of Tokyo Metro which was initially developed by private operators in the 1920s.

- (b) **Toei Subway** – Toei Subway commenced operation in 1960 and now comprises four subway lines with 106 stations to serve mainly areas not covered by Tokyo Metro, so as to meet the rising transport demand in central Tokyo. Toei Subway is administered by the Bureau of Transportation under the Tokyo Metropolitan Government, and the construction works have been subsidized by the national and local governments.

4.5 Yet in the past few decades, the authorities have been gradually moving away from operating railways. For Tokyo more specifically, **East Japan Railway Company** (“JR East”), one of the six regional passenger railway companies spun off from Japanese National Railways (“JNR”) (日本國有鐵道) which was privatized in 1987,⁵⁰ currently provides conventional intra-city railway services and cross-region high-speed railway services in the Greater Tokyo Area and adjacent regions.

Private sector

4.6 Meanwhile, there are eight major **private operators**⁵¹ which developed their railway networks decades ago on land acquired in designated suburban areas after obtaining railway development rights and operation licences from the national and local governments. They have combined railway development with real estate development, as well as diversifying into other businesses such as hotel, retail sales, power supply, recreation facilities and other transport services, to serve the communities in the vicinity of the railway lines. These commercial and community building activities have helped private operators in growing demand for and sustaining usage of their transport services, and enable them to finance their railway development projects and operations without involving government subsidy.⁵² Some private companies have also formed partnerships with the local governments to establish third-sector railway operators to develop and run local railway lines which have financial sustainability issues due to high development and operating costs but relatively low ridership.

⁵⁰ The privatization was allegedly to address concerns about inflexible and inefficient management and poor financial performance of JNR.

⁵¹ The eight major private operators are: (a) Tobu Railway Co., Ltd. (東武鐵道株式會社); (b) Seibu Railway Co., Ltd. (西武鐵道株式會社); (c) Keisei Electric Railway Co., Ltd. (京成電鐵株式會社); (d) Keio Corporation (京王電鐵株式會社); (e) Odakyu Electric Railway Co., Ltd. (小田急電鐵株式會社); (f) Tokyu Railways (東急電鐵株式會社); (g) Keikyu Corporation (京濱急行電鐵株式會社); and (h) Sotetus Holdings Inc. (相模鐵道株式會社).

⁵² Yet, private operators may obtain low-interest loans from the Development Bank of Japan or interest subsidy from the national government for certain types of railway development projects. See Miki and Ieda (2019), Saito (1997) and Shoji (2005).

Operation mode of the railway system

4.7 While the railway operators in Tokyo run their networks independently, they have been making conscious efforts to complement each other's networks and ensure the commuters are connected within central Tokyo, and between central Tokyo and suburban areas or other regions across Japan (see [Appendix 4](#) for the Tokyo railway system map). For example, the two subway networks i.e. Tokyo Metro and Toei Subway, complement each other with their lines covering different parts of central Tokyo which altogether reportedly carry, on average, over 8 million passengers daily. Despite their independent administration, the two subway operators have adopted a coordinated system of line colours, line codes and station numbers to facilitate ease of reference by commuters.⁵³ The high traffic demand in central Tokyo has also been met by the conventional railway lines offered by JR East such as the Yamanote Line (山手線).⁵⁴ Besides, JR East has provided conventional and high-speed railway lines connecting central Tokyo with other major cities in the Greater Tokyo Area.

4.8 Private operators running suburban railway lines/networks are usually the sole operators in their respective service areas due to the high entry costs. However, there are cases where multiple railway operators compete in services that connect the same pair of cities via different routes. For example, there are three railway operators, i.e. JR East, Keikyu Corporation and Tokyu Railways, which connect central Tokyo to Yokohama through three different routes. Such competition benefits commuters as it prompts railway operators to improve their operation efficiency and service quality (in terms of speed and comfort) and maintain their fares at a competitive level to attract patronage.⁵⁵

Development and operation issues and relevant measures to address them

4.9 The involvement of multiple railway operators in developing and operating independent railway networks in the Greater Tokyo Area has inevitably posed challenges to the connectivity of different networks. The related issues of concern

⁵³ Each line has a different colour, and there are alpha-numeric codes for each station. For example, Tokyo Metro uses the colours of silver (Line 2), orange (Line 3), red (Line 4), sky blue (Line 5), teal (Line 7), gold (Line 8), green (Line 9), purple (Line 11) and brown (Line 13). For Toei Subway, it uses the colours of rose (Line 1), blue (Line 6), leaf (Line 10) and magenta (Line 12).

⁵⁴ The Yamanote Line is a circular line with 30 stations connecting the major urban centres in central Tokyo. The major stations such as Tokyo, Ueno, Ikebukuro, Shinjuku, Shibuya and Shinagawa also serve multiple lines operated by different operators.

⁵⁵ See International Transport Forum (2016).

include: ⁵⁶ (a) **inconvenience of transferring between different networks;** ⁵⁷ (b) **missing links between stations under different networks due to reasons such as high development cost,** ⁵⁸ and **lack of incentive to improve service quality;** ⁵⁹ and (c) **separate fare systems for different railway operators.** ⁶⁰

4.10 The national government has set policy directions and devised measures to improve the coordination of railway development and operation among railway operators in the Greater Tokyo Area to address issues mentioned in paragraph 4.9 above. Some of the measures, as highlighted in the paragraphs below, came as early as in the 1950s when post-war economic boom had led to heavy demand on railway transport and pushed for enhancements in the railway system to ease congestion and improve efficiency of operation.

Adoption of through services to reduce transfer between networks

4.11 The national government has encouraged railway operators to adopt “through service” (also known as “direct-through rail operation”) since the 1950s to address the connectivity between different railway networks. Through service refers to the reciprocal arrangement between two operators to run their trains on the other operator’s tracks to provide a seamless connection of two separate networks, thereby enabling passengers to use services of different operators without the need to change trains.

4.12 Through service arrangements have been made based on voluntary negotiation and mutual agreement between railway operators covering, among others, alignment of their rail tracks, train and platform standards, fare collection system and operation schedule. As at 2020, 39% (or about 975 km) of the total length of railway networks in the Greater Tokyo Area, covering subway, suburban

⁵⁶ See International Transport Forum (2016) and Le et al. (2022).

⁵⁷ As the Greater Tokyo Area grows geographically, average travel distances become longer. Many railway users in the area have to change trains for home-to-work or home-to-school activities at least once at transfer stations, even in a single journey. This also causes congestion in main transfer stations and lowers efficiency of the railway system. See International Transport Forum (2016).

⁵⁸ For example, there has been a long discussion to build an 800 m rail link between the Tokyu Kamata station and the Keikyu Kamata station which are administered by two private companies. The proposed link between the two stations will improve the accessibility of the Haneda Airport of Tokyo and bring considerable social and economic benefits to the surrounding areas. See Le et al. (2022).

⁵⁹ Including initiatives such as enhancing station facilities and expanding their service capacity.

⁶⁰ Each railway operator has its own fare table, so commuters traveling across different railway networks are always required to pay an initial fare when entering a railway line of another network. This arrangement adds cost to passengers’ trips and arouses concern about high costs for commuters who travel a short distance on each network.

and JR East lines had been operated with through services, up somewhat from 35% in 2010.⁶¹ Through services have not only helped reduce journey time and improve convenience for commuters, alleviate congestion at transfer stations, but they have also increased service demand and revenue for railway operators. Nonetheless, through service has been seen as one of the factors aggravating the issue of train delay in Tokyo as delays of subway lines may spill over to the suburban lines under through service arrangements.^{62, 63}

Subsidy scheme to support and incentivize enhancement of network linkages and service quality

4.13 The national government launched a subsidy scheme in 2005 pursuant to the Act to Enhance the Convenience of Urban Railways (都市鐵道等利便増進法) to support railway enhancement projects initiated by railway operators in the major metropolitan areas, including the Greater Tokyo Area. The subsidy scheme supports projects that involve (a) the construction of new lines to connect existing lines to eliminate transfer and reduce travelling time of commuters; and (b) improvement of facilities within or around railway stations to reduce transfer time and ensure seamless connections of existing stations.

4.14 The subsidy scheme adopts a vertical separation approach characterized by the national government and local government providing grants for constructing the relevant infrastructure or facilities under a subsidized project⁶⁴ to the infrastructure constructor or owner which should either be a semi-government corporation⁶⁵ or the Japan Railway Construction, Transport and Technology Agency (“JRJT”).⁶⁶ The railway operators in turn lease the relevant infrastructure or facilities from the infrastructure constructor or owner for their operations. The financing arrangement helps relieve the financial burden on the operators and remove their barrier to implementing the relevant service enhancements. A major enhancement project implemented in the Greater Tokyo Area is the Eastern Kanagawa Line which

⁶¹ See 國土交通省(2022).

⁶² While the subway system itself is largely within the city centre, the lines extend far out via extensive through services onto suburban railway lines. As such, there are many cases of through services using subway trains on suburban railway lines and vice versa.

⁶³ See Ito (2014) and Kurosaki (2017).

⁶⁴ For each approved project, the national government will provide grant amounting to one-third of the construction cost and the local government another one-third. The remaining balance will be borne by the infrastructure constructor or owner through loan financing.

⁶⁵ The shareholders of a semi-government corporation are typically local governments and private railway operators.

⁶⁶ JRJT, established in 2003, is an incorporated administrative agency tasked with, among others, constructing new high-speed railway lines, undertaking infrastructure enhancement projects, and providing subsidies to support the development of railway facilities.

connects three existing lines (Sotetsu Line, Tokyu Line and JR Tokaido Freight Line) to provide through service linking the western part of Yokohama and the central part of the Kanagawa Prefecture with central Tokyo. JRTT was responsible for constructing the new links, with a total length of some 12.7 km already completed and comprising the 2.7 km Sotetsu-JR link opened in November 2019 and the 10.0 km Sotetsu-Tokyu link opened in March 2023.

Enhancing interoperability of payment systems and offering transfer discounts to commuters

4.15 The national government has set out the strategic direction of building a seamless railway system with quality services for commuters in its railway development master plan. It has encouraged railway operators to cooperate in enhancing interoperability of their payment systems and offering transfer discounts to commuters with a view to improving their usage experience and helping them reduce their travelling costs. With regard to payment systems, JR East launched a smartcard ticketing system (Suica card)⁶⁷ in November 2001 allowing commuters to ride on its train lines with a single card. Suica card has been made interchangeable with another smart card, Pasma card, since March 2007 when the Pasma Company Ltd.⁶⁸ issued Pasma cards to allow people to travel on its train and bus services in the Greater Tokyo Area with a single card. The interoperability feature of the two smartcard systems enables commuters to use either card for fare payment across networks/transport services operated by the participating operators. In 2013, the interoperability feature was further enhanced to cover eight other smartcard systems being adopted in different regions of Japan.

4.16 In addition, the railway operators have cooperated to offer transfer discounts to commuters to address concern about high fares charged on trips requiring transfer without involving government subsidy. At present, Tokyo Metro offers the following transfer discounts: (a) ¥70 (HK\$4.1) off the total fare for adults transferring between Tokyo Metro and Toei Subway; (b) a maximum of ¥20 (HK\$1.2) for adults and ¥10 (HK\$0.6) for children when transferring between designated sections of Tokyo Metro and JR lines; and (c) a maximum of ¥30 (HK\$1.8) for adults and ¥10 (HK\$0.6) for children when transferring between designated sections of Tokyo Metro and private railway lines. As for Toei Subway, transfer discounts of ¥20 (HK\$1.2) for adults and ¥10 (HK\$0.6) for children are offered to commuters transferring between designated sections of Toei Subway and private railway lines.

⁶⁷ Suica card is a prepaid rechargeable contactless card to be used initially on the JR East network in the Tokyo metropolitan area and later included other adjacent areas. This fare card is charged for each journey by simply touching the terminals displaying the Suica card logo.

⁶⁸ The Pasma Company Ltd. was formed in February 2004 through joint investment by 11 railway and 19 bus operators.

Recent developments

4.17 In the Greater Tokyo Area, the connectivity of the railway networks operated by different railway operators and user-friendliness of their services have gradually improved over the years, thanks to (a) the efforts of the national government to put forward various network and service enhancement measures and provide financial assistance where necessary; and (b) the voluntary cooperation of the operators in implementing the related measures. Nonetheless, population ageing and the outbreak of the COVID-19 pandemic have resulted in reduced railway ridership and affected the profitability of the railway operators in recent years, further affecting their incentive to invest in network and service improvement projects. As such, the national government has approved the railway operators to increase their fares from March 2023 to cover the costs of installing barrier-free facilities at their railway stations to better meet the needs of older travellers. In addition, the national government has committed to supporting efforts to further improve connectivity of the railway networks, including enhancing integration of the services of Tokyo Metro and Toei Subway, to ensure seamless travelling experience of commuters.

5. Concluding remarks

5.1 Despite differences in the scales, business models and operation modes of the railway systems in Hong Kong, Shenzhen and Tokyo, railways have been playing an important role in facilitating urban development and contributing to the sustainable economic development of the respective places (see [Appendix 5](#) for the key features of their railway systems). The MTR system in **Hong Kong** has been functioning as an integrated railway network under the management of MTRCL after the merger of its operations with those of KCRC in 2007 for improving operation efficiency and effectiveness of resources utilization. MTRCL has also been renowned for its successful application of the R+P model for financing development of the MTR system.

5.2 The **Shenzhen** government has involved MTRSZ in the development of SZ Metro lines to draw on its experience, expertise and financial resources for expanding the subway network. Notwithstanding the involvement of both state-owned and private enterprises in the operation of the 16 subway lines in Shenzhen, SZ Metro functions as an integrated network as connections of different railway lines and transfer stations have been well-planned in the construction plans of the system. Seamless travelling experience of commuters is further promoted by adopting common fare calculation and adjustment mechanisms, payment modes and fare concessions across the entire network regardless of operators.

5.3 In contrast to Hong Kong and Shenzhen, **Tokyo** has a long history of railway development with high level of involvement of the private sector in building railway lines connecting the suburban areas with central Tokyo, thereby contributing to urban development of the metropolitan area. In the early years of development, private operators mainly financed the building of railway lines with their own resources and diversified into other businesses to build service demand and support their railway operations. However, due to the high costs of railway development and declining ridership in recent years, the public sector has played an increasing role in constructing new lines, enhancing existing networks and supporting operation of unprofitable railway lines.

5.4 To address issues about inconvenience associated with transfer between networks operated by different operators and differences in their ticketing and payment systems, as well as missing links in the railway system due to operators' lack of incentives to invest in new links, the Japanese government has over the years (a) encouraged operators to adopt "through services" when enhancing existing railway lines or building new lines; (b) implemented a subsidy scheme to support enhancement of railway networks and station facilities to improve connectivity and enhance commuter convenience; and (c) promoted cooperation among operators in ensuring interoperability of their payment systems and offering transfer discounts to commuters.

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Mass Transit Railway system map



Source: MTR Corporation Limited (2023b).

Shenzhen Subway system map



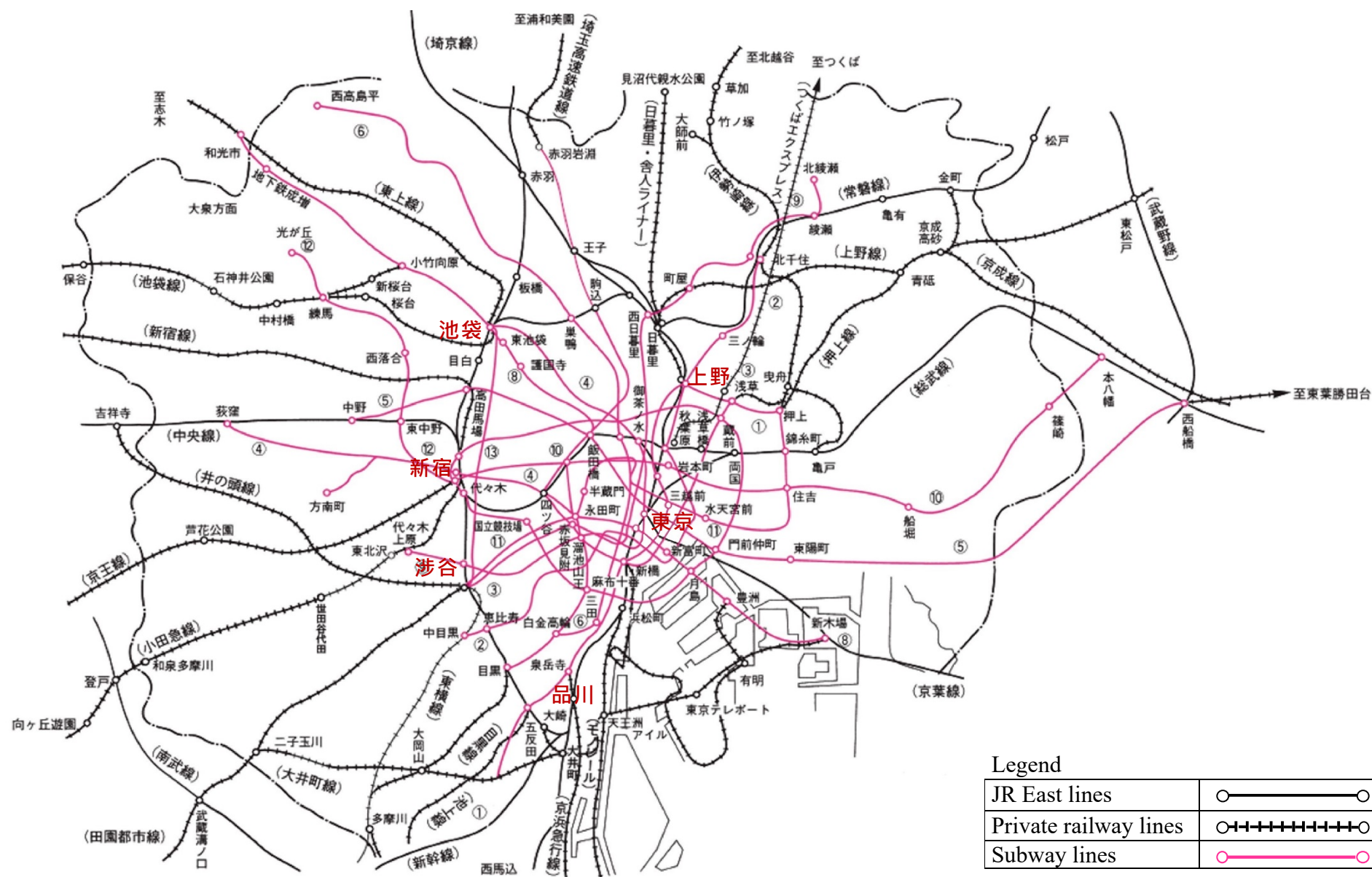
Source: 深圳市地鐵集團有限公司 (2023c).

Railway system in Japan: development mode and roles of the public sector

- The Japanese national government has all along played the leading role of laying down the long-term master plan for the railway development and service improvement in the Greater Tokyo Area. It is also involved in updating the master plans, exercising approval, licensing and supervisory powers, and providing financial and other relevant support to the overall development of the railway system.
- With regard to construction and operation of the railway networks, the national and local governments had participated in the establishment of the national, cross-region railway networks, and the subway networks in the city centres over the past century or so. Yet, they have reduced their presence in running railway networks in the past few decades with gradual privatization of their railway operations. For example, the state-owned Japanese National Railways (“JNR”) (日本國有鐵道) had been tasked with developing and operating the nationwide railway networks, including the cross-region high-speed railway (shinkansen) lines. It was privatized in 1987 because of its alleged inflexible and inefficient management and poor financial performance.
- East Japan Railway Company (“JR East”), one of the six regional passenger railway companies spun off from JNR, took over the railway operations and infrastructure in the eastern regions of Honshu (本州), which is the largest island of Japan containing main cities such as Tokyo, Osaka, Hiroshima, Nagoya, Kyoto and Yokohama, in 1987. JR East currently provides conventional intra-city railway services and cross-region high-speed railway services in the Greater Tokyo Area and adjacent regions. Unlike JNR which was restricted to provide railway services only, JR East has leveraged on the assets taken over from JNR such as the infrastructure and railway stations to diversify into a wide portfolio of businesses including real estate, hotel management and retail sales to help generate traffic flow and support its railway operations.
- As to the high-speed rail, the national and local governments have in recent years increased their involvement in the construction of new railway lines and enhancement of the existing networks in light of the high costs of the projects.

- The public sector has also been involved in the development of the subway networks in central Tokyo, with Tokyo Metro and Toei Subway being the two major networks in the area. Tokyo Metro was first developed by private operators back in the 1920s. Though there had been a general national policy to limit the development and ownership of transportation infrastructure in central Tokyo to the local government prior to the 1920s, private operators were encouraged to participate in the development of Tokyo Metro due to a lack of financial resources of the local government in building a large and costly subway network (see Aoki (2002)). The Tokyo Metro was later brought under public control of the then Teito Rapid Transit Authority (“TRTA”) (帝都高速度交通営団) in 1941 to better coordinate the development efforts. TRTA was initially a statutory corporation established with funding of the national and local governments as well as private operators, and was restructured in 2004 to a joint-stock company, and renamed Tokyo Metro Company Ltd., which is now owned by the Japanese government (53.4%) and the Tokyo metropolitan government (46.6%). Tokyo Metro has also engaged in other businesses such as real estate and retail businesses. Recently, the Japanese government has planned to launch an initial public offering of the shares of Tokyo Metro Company Ltd., bringing down the shareholding of the national and local governments to 50%.
- Meanwhile, the Bureau of Transportation under the Tokyo Metropolitan Government has been tasked with building the Toei Subway with subsidy of the national and local governments since the mid-1950s in areas not covered by Tokyo Metro in order to meet the rising transport demand in central Tokyo. It also operates an automated guideway transit line as well as bus and tram services.

Tokyo railway system map



Source: 國土交通省(2022).

Railway systems in Hong Kong, Shenzhen and Tokyo

	Hong Kong's MTR system	Shenzhen's subway system	Tokyo's railway system
A. Background information			
Population	• 7.3 million as at end-2022	• 17.7 million as at end-2021	• 14.0 million as at October 2021
Commencement of development	• 1975	• 1998	• Over a century ago
Modal share of railway services	• 41.6% of public transport passenger journeys in 2022	• 60.6% of public transport passenger journeys in 2021	• 33.0% of all transit modes in 2018 (for the Greater Tokyo Area)
B. Features of the railway system			
Total route length	• 271 km as at May 2022	• 548 km as at March 2023	• 2 460 km as at 2020 (for the Greater Tokyo Area)
Number of operators	• One	• Two	• About 30
Average daily patronage	• 4.03 million passenger journeys in 2022	- Shenzhen Metro Group Co., Ltd. – 5.31 million as at November 2022 - MTR Corporation (Shenzhen) Limited (“MTRSZ”) – 0.54 million during weekdays in 2021	- Tokyo Metro – 5.2 million in 2022 - Toei Subway – 2.8 million in 2017 (latest available) - Information not available for other operators

Railway systems in Hong Kong, Shenzhen and Tokyo

	Hong Kong's MTR system	Shenzhen's subway system	Tokyo's railway system
B. Features of the railway system (cont'd)			
Business models for developing lines/networks involving multiple private operators	Not relevant	- Shenzhen Metro Line 4 ("SZL4") – "rail-plus-property" development model for financing its development, concession to operate and maintain the line for 30 years was granted to MTRSZ under a build-operate-transfer arrangement - SZL12 and SZL13 – private-public partnership ("PPP") model for financing their development, operators were granted the concession to operate and maintain the respective lines for 30 years	- Railway networks developed in the early years had been self-financed by private railway operators, which had also diversified into other businesses to support their railway operations - PPP approach has more commonly been adopted recently for development of new lines or enhancement of existing networks with higher public involvement due to high costs of development
Operation modes	Operating as an integrated network since the merger of operations of the MTR Corporation Limited and Kowloon-Canton Railway Corporation in 2007	Operating as an integrated network despite involvement of more than one operator	Operators run their networks independently with separate fare systems. Nevertheless, they may cooperate to improve network connectivity, commuter transfer and payment convenience where appropriate
Measures/features to promote commuter convenience for networks run by multiple operators	Not relevant	- Integrated planning of the subway network to ensure connectivity and seamless transfer between lines - Adopting common fare calculation and adjustment mechanisms, payment modes and fare concessions across the entire network regardless of operators	- Encouraging operators to adopt "through services" when enhancing existing networks or building new lines - Implementing a subsidy scheme to support enhancement of railway networks and station facilities to improve connectivity and enhance commuter convenience - Promoting cooperation of operators in ensuring interoperability of their payment systems and offering transfer discounts to commuters

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Note: ^ Internet resources listed in this section were accessed in May 2023.