Chapter 1

The Development of China's Transportation Infrastructure and International Connectivity

Wu Wenhua
Institute of Macroeconomics of Nation Development and Reform Commission

March 2010

This chapter should be cited as
Wu Wehnha (2010), 'The Development of China's Transportation Infrastructure and International Connectivity', in Zhang, Y. (ed.), *Development of China's Transportation Infrastructure and International Connectivity*. ERIA Research Project Report 2009-7-5, Jakarta: ERIA. pp.1-27.

CHAPTER 1

Overview:

The Development of China's Transportation Infrastructure and International Connectivity

China is a large country with a vast and complex terrain, so that transportation infrastructure plays an essential role in its economic and social development. In general, the development of transportation infrastructure before China's reform and opening up was slow and poor. The trunk highways and railways linking the whole country were distributed very unevenly.

Since the reform and opening up, transportation infrastructure has developed very fast. In recent years, China's highway networks and high-speed railway networks have experienced very fast development.

With so many countries as its neighbors, the international connectivity of China's transportation infrastructure is of great significance for China, as well as for its neighbors. The construction of international transportation infrastructure networks has developed noticeably in accordance with the rapid development of China's economy and increasing economic relations between China and its neighbors.

1. Progress of the Transportation Infrastructure

Since the reform and opening up, especially after 1990s, Chinese government has given strategic priority to the development of transportation infrastructure which has made China achieve a significant improvement of its infrastructure networks. In 1978, the transportation infrastructure in China was quite backward. The total transport route mileage was only 1,235,100 km in 1978, including 51,700 km railways, 890,200 km highways, 136,000 km inland waterways, 148,900 km civil aviation and 8,300 km pipeline. By the end of 2008, the total transport route mileage reached 6,452,800 km, 5.2 fold of the size in 1978. It includes 79,700 km railways, 2,009,100 km highways, 122,800 km inland waterways, 2461,800 km civil aviation and 58,300 km pipeline. (See Table 1-1)

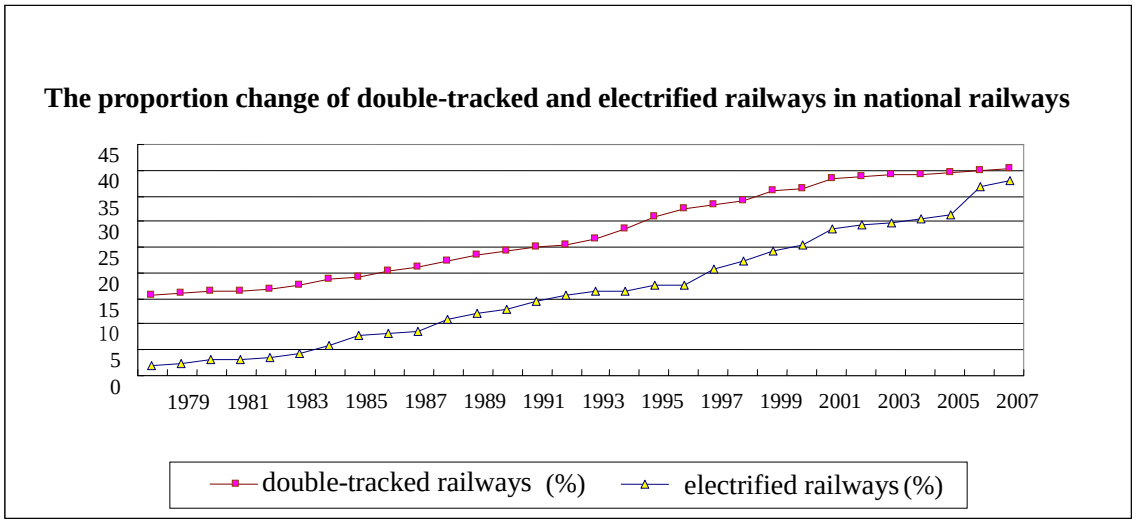
Table 1-1. Transport Route Length in China (10,000 km)

Year	Total Route	Railway Length	Highway (including village roads) Length	Highway (not including village roads) Length	Inland Waterway Length	Civil Aviation Route Length	Pipeline Length
1978	123.51	5.17	--	89.02	13.6	14.89	0.83
1990	171.8	5.78	--	102.83	10.92	50.68	1.59
2000	311.82	6.87	--	140.27	11.93	150.29	2.47
2005	558.64	7.54	141.47	193.05	12.33	199.85	4.4
2006	581.92	7.71	151.2	194.5	12.34	211.35	4.82
2007	618.27	7.8	162.15	196.22	12.35	234.3	5.45
008	645.28	7.97	172.10	200.91	12.28	246.18	5.83

Source: Yearbook of China Statistics 1990-2009, China Statistics Press.

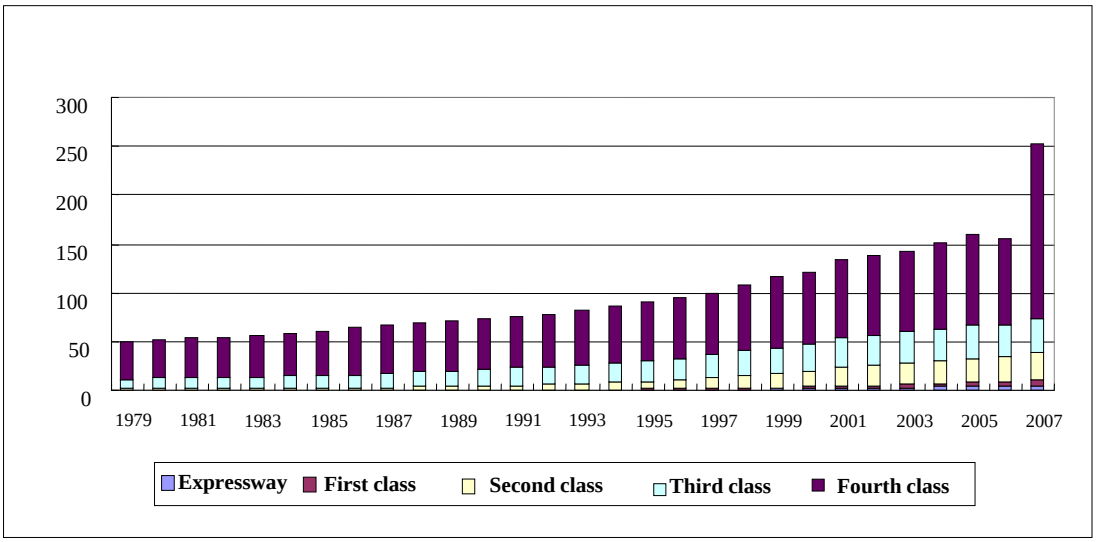
Noticeably, the quality of China's transportation lines has been greatly upgraded. During the period of 1978-2008, the length of double track railway increased by 21,000 km, a 3.6-fold increase. At the same time, the length of electrified railway increased by 25,000 km，a eleven-fold increase. In 2008, double track railways and electrified railways constituted 45.1% and 43.1% of total railways respectively, which made a substantial improvement in capacity and efficiency of the railway transportation system. The length of classified highways (including village roads) was 2,778,500 km in 2008, a 4.2-fold increase since 1978. Its proportion to the total highway length had jumped from 52.8% to 74.5%. The length of Class-II (second class) and above highway roads increased to 399,700 km, a 35.2-fold increase after 1978. It was a miracle that the express highway system grew out of nothing in China and reached to 60,000 km by the end of 2008, ranking second in the world. The role of the highway network as the backbone in China's comprehensive transportation system has been strengthened.

Figure 1-1. Development of the double-tracked and electrified railways (% of the total）



Source: Yearbook of China's Transportation Statistics

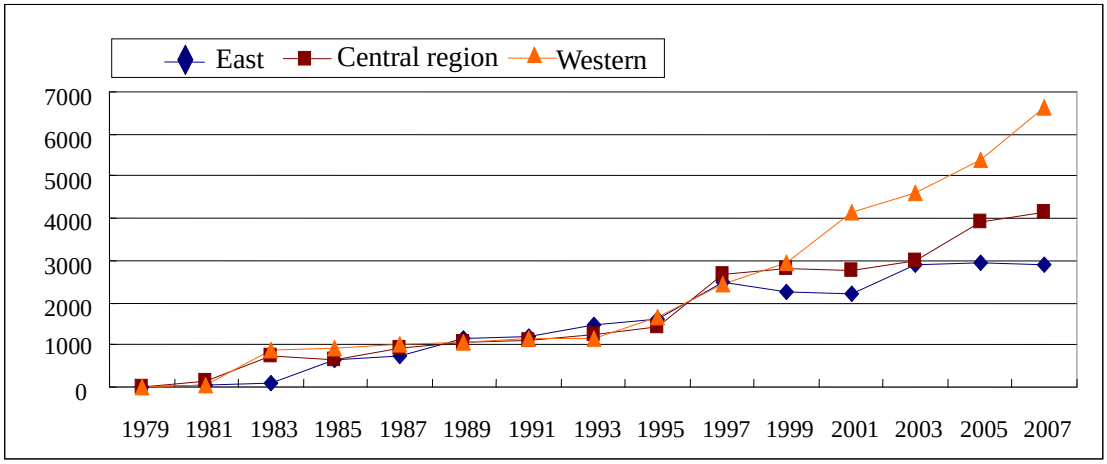
Figure 1-2. The structure of China's highways（10,000 km）



Source: Yearbook of China's Transportation Statistics

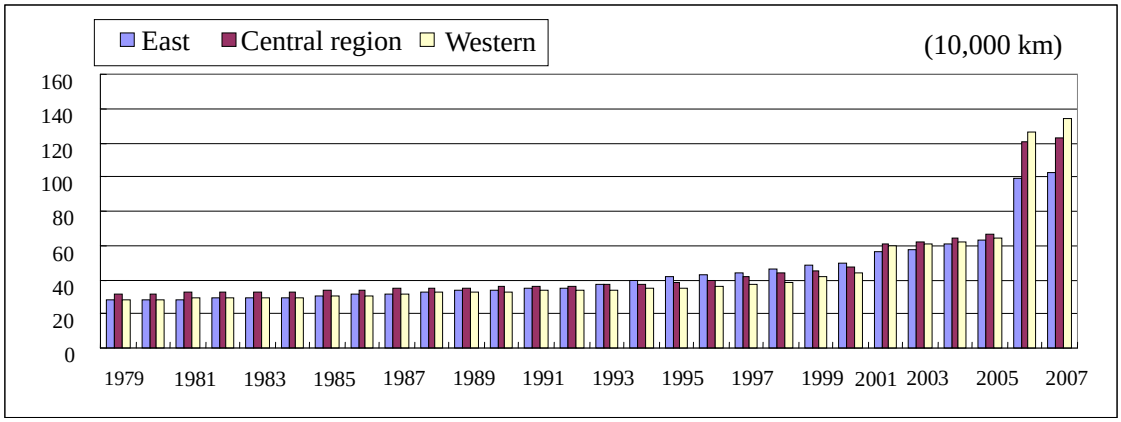
With the massive construction, the transportation infrastructure networks have gradually developed. Both the length and the density of railways have been remarkably improved. From 1979 to 2007, the density of railway networks increased from 1,183 km / thousand km² to 1,453 km/ thousand km² in eastern China, from 1,131 km/thousand km² to 1,381 km/thousand km²in central China, from 268 km/thousand km² to 365 km/thousand km² in western China. Access to highways becomes easier along with the increase of the highway density. In 2007, 99.0% of the towns and 88.2% of the villages had access to highways, while the number was 90.5% and 65.8% in 1978 respectively. The density of highways had increased from 93 km/ thousand km² in 1978 to 373 km/ thousand km² in 2007. There are148 cities that had built civil airports in 2007, while the number was only 80 in 1978. The development of airports with better service facilities including those in western China helps the connectivity of China's regions, as well as between China and the outside world.

Figure 1-3. Length of national railway in operation



Source: Yearbook of China's Transportation Statistics

Figure 1-4. Construction of highways by the Region (1979-2007)

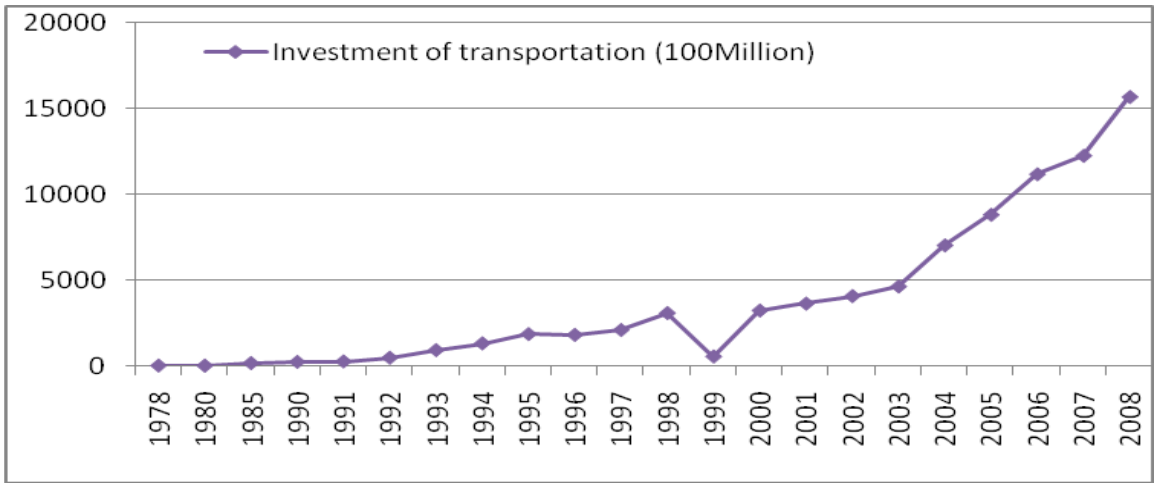


Source: Yearbook of China's Transportation Statistics

In order to further improve the economic and social development environment, Chinese government has increased its investments in transportation since the Eighth Five-Year Plan (1991-1995). In 1978, gross investment in fixed assets of transport industry was only ￥6.36 billion. The average annual investment in transport industry during the Sixth Five-Year Plan (1980-1985) and the *Seventh Five-Year Plan* (1986-1990) was ￥10.3 billion and ￥22.12 billion. Then, the investment increased to ￥81.23 billion in the Eighth Five-Year Plan (1991-1995), ￥199.71 billion in the

Ninth Five-Year Plan (1996-2000) and to ￥531.36 billion in the *Tenth Five-Year Plan* (2001-2005). Due to the ￥4,000 billion stimulus package for dealing with the global financial crisis, investment increased to ￥1,570.05 billion in 2008. The expanding investments plaid a vital role for the fast development of China's transportation industry.

Figure 1-5. Investment of Transportation (1978-2008)



Source: Yearbook of China's Transportation Statistics

1.1. The Development of highway network

After the reform policy, China's economic development entered into a new ear. Along the same line, highway infrastructure experienced a historical change. On the one hand, both central government and local governments paid more attention to the construction of highways, while on the other hand, an integrated highway network in the national wide began to be planned and constructed. From 1978 to 1989, the classified highway lines increased by 210,000 km and those with high grade and sub-high grade surface increased by 102,000 km. However, the development speed of transportation infrastructure still could not catch up with the growth rate of the demand. The shortage of highways was a bottleneck restricting the economic development.

In the late 1980s and early 1990s, the Ministry of Transportation (MOT) formulated the *National Trunk Highway Network Plan* comprising "five vertical and seven horizontal expressways". Massive construction of expressway networks started as soon as the plan was approved by the State Council. In addition to the construction of national trunk expressways, China also paid more attention to the construction of inter-provincial corridors in western China. The class-II and above highways to provincial capitals and district cities were built and upgraded. Highways were connected to most towns and administrative villages, with 98.5% of towns and 85.8% of villages connecting to highways.

By late 1990s, a basic highway network was established in China. However, the highway networks were unevenly distributed. In eastern China, the density is high and also with higher grade of the quality, while in central China and especially in western China with low density and low quality.

From late 1990s, the highway network expanded rapidly. In 1998, China implemented a proactive fiscal policy and prudent monetary policy in order to deal with the impact of Asian financial crisis, which promoted the development of transportation infrastructure, especially highways. China built 4,000 km expressways in operation every year, and annual investment in expressways reached ￥140 billion during late 1980s and early 21 century. In 2005, Chinese government adopted the *National Expressway Network Plan*. The new expressway network is composed of seven expressways radiating from Beijing, nine north-south expressways and eighteen east-west expressways. Its total length reached 85,000 km, including 68,000 km trunk lines, 17,000 km regional lines, connecting lines and others. By the end of 2008, the main part of national trunk highway network had been established. The framework of national trunk highway network was primarily built up, with 70% national expressways in operation and most planned highways being built.

By the end of 2008, the length of highways reached 3,730,200 km, a 4.3-fold increase from 1979, including 155,300 km national highways, 263,200 km provincial

highways, 512,300 km town highways, 1,011,100 km country highways, 67,200 km accommodation highways, 17,210,000 km village roads. The length of Class-II and above highways increased to 399,700 km.

Massive construction of expressways was initiated in late 1980s. The length of expressways was 522 km by the end of 1990 and 2,141 km by the end of 1995. By the end of 2001, the length of expressways in China reached to 19,400 km, ranking second in the world. The length of expressways opened to traffic was 60,300 km by the end of 2008. The expressway network, based on "five vertical and seven horizontal expressways", was established in general.

1.2. The Development of Railway Network

Before reform and opening-up, China had few major trunk lines, such as Jiaozhi Railway (Jiaozuo-Zhicheng), Chengkun Railway (Chengdu-Kunming), Guikun Railway (Guiyang-Kunming) and Xiangqian Railway (Zhuzhou-Guiyang). These lines constituted the basic framework of railway networks in China.

From 1978 to late 1990s, China speeded up the construction of trunk railway lines. By the end of 1997, the railways in operation had a length of 66,000 km, ranking first in Asia. China had 12,000 km electrified railways and became the ninth country in the world owning more than 10,000 km electrified railways. China built Jingjiu Railway (Beijing-Kowloon), a north--south rail corridor, and Nankun Railway (Nanning-Kunming), a southwest rail corridor. Meanwhile, China advanced the technology to upgrade the existing equipments and transport capacity. The establishment of Daqin Railway (Datong-Qinhuangdao), a heavy haulage railway, and Guangshen Railway (Guangzhou-Shenzhen), a quasi-high-speed railway improved further the capacity and quality of China's railway system.

From late 1990s, the construction of railway networks entered into a period of fast development in China. The State Council approved the *Mid-long Term Railway Network Plan* in 2004 which made the construction speed of railways accelerated. The

construction of passenger railways, high-speed railways and intercity railways started. So far, these railway lines have been built or under construction, including Beijing-Shanghai high-speed line, Shijiazhuang-Taiyuan passenger line, Wuhan-Guangzhou passenger line and Guangzhou-Zhuhai intercity line. Some regional railway projects aiming at building, upgrading and extending railways, including Fuzhou-Xiamen Railway, Qianan-Caofeidian Railway and Lanzhou-Chongqing Railway also started. In 2008, the Chinese Central government allocated ￥15 billion to upgrade railway infrastructure to stimulate domestic demand and to ease global financial crisis. As a result, the construction of passenger railways and intercity passenger railways has entered into another new period.

By far, the railway networks have covered all the provinces, autonomous regions and municipalities. Railway networks in western China have enlarged their scales and also have enhanced their regional corridors with huge transportation capacity. A national railway network connecting east-west, north and south has been developed.

Table 1-2. The Length of Railways in Operation, 2001-1008 (km)

Year	New Track Length	New Operational Route Length	Single-Track To Double-Track Railway Track Length	Double-Track Railways in Operation	Electrified Railways
2001	1522.0	1246.0	889.0	1503.5	2680.3
2002	1952.8	1994.2	858.7	538.5	920.1
2003	1574.8	1118.7	222.6	627.9	617.2
2004	1169.6	1501.1	650.5	399.8	413.7
2005	919.7	1230.0	414.7	486.3	865.7
2006	949.0	1657.3	1184.9	856.0	4034.5
2007	1120.5	743.6	1447.5	725.7	930.6
2008	2808.1	1730.1	2210.2	1955.8	1959.3

Source: Yearbook of China's Transportation Statistics.

Now, the railway networks in China tend to increase the speed of existing trunk railways, including Jingha Railway (Beijing-Harbin), Jinghu Railway (Beijing-Shanghai), Jingguang Railway (Beijing-Guangzhou), Longhai Railway (Lanzhou-Lianyungang), Zhegan Railway (Hangzhou-Zhuzhou), and Jiaoji Railway (Qingdao-Jinan). By gradual upgrading the system, the speed of China's railways are much higher, with 24,000 km at the speed above 160 km/h, 6,227 km above 200 km/h, 1,019 km above 250 km/h. Meanwhile, a group of high speed passenger lines and intercity lines began to be built one after another, including Jingjin Line (Beijing-Tianjin), Wuguang Line (Wuhan-Guangzhou), Hewu Line (Hefei-Hankou), Hada Line (Harbin-Dalian), and Jinghu Line (Beijing-Shanghai). In addition, the construction of Jinghu (Beijing-Shanghai) high-speed railway symbolized a new era of high-speed railways in China.

Due to the fact that Chinese economy depends more and more on foreign resources and markets, it is necessary for China to have a global strategic view to seek sustained and steady economic growth. As a result, cross-border transportation corridors connecting neighboring countries have been developed significantly.

China has many land neighboring countries. The economic development of China ties closely to its neighboring countries since reform and opening-up. The construction of international corridors was raised to a high level under the condition that the increasing economic exchanges between China and its neighbors require the better transportation facilities.

2. The International Transportation Connectivity

From the geographical perspective, there are four major transportation corridors connecting China and its neighboring regions. Each of them has great significance to

China's connectivity to the outside world. Thus, the development of international transportation corridors has been greatly emphasized by the Chinese government.

2.1. The Structure of international transportation connectivity

Northeast Asian Corridor

Northeast Asian Corridor includes China-DPRK Corridor, China-Russia Corridor and China-Mongolia Corridor.

China-DPRK Corridor includes:

- The corridor links Dandong port (Liaoning Province) with DPRK, comprising highways and railways. It is the most fast and convenient 24-hour corridor with a high-volume traffic capacity from China to DPRK.
- The corridor links Tumen port (Jilin Province) with northern part of DPRK, composing railways and highways.

China-Russia Corridor includes:

- The train-air-truck corridor links Huichun Port (Jilin Province) with harbors in Russia to the Sea, composing highways and railways in China side.
- The corridor links Suifenhe port (Heilongjiang Province), Dongning Port (Heilongjiang Province) with Russia, composing highways and railways.
- The corridor links Manzhouli port (Inner Mongolia Autonomous Region) connecting Russian railway networks to Europe. It is composed of highways and railways. Its annual freight traffic volume is above 25,000,000 ton.

China-Mongolia Corridor includes:

- The corridor links Erenhot port (Inner Mongolia Autonomous Region) with Mongolia, comprising highways and railways. It is the most important corridor between China and Mongolia. As an indispensable part of Asia-Europe continental land bridge line, it connects railway networks in Russia through Mongolia.
- The corridor links Ganqimaodao port (Inner Mongolia Autonomous Region)

with Mongolia, comprising highways. Railways to Ganqimaodao Port are under construction in China. It will be a major energy transportation corridor.

- This corridor links Ceke port (Inner Mongolia Autonomous Region) with Mongolia, comprising highways and railways in China. It will be a major energy transportation corridor.

Central Asian Corridor

Central Asian Corridor includes China-Kazakhstan Corridor, China-Kyrgrzstan Corridor, and China-Tajikistan Corridor.

China-Kazakhstan Corridor includes：

- The corridor links Alataw Pass port (Xinjiang Uygur Autonomous Regions) with Kazakhstan, comprised highways, railways and pipeline. As an important part of the second Eurasian land bridge line, it connects Russian railway networks to Europe through Kazakhstan.
- The corridor links Korgas port (Xinjiang Uygur Autonomous Regions) with Kazakhstan, comprising highways, railways in China. It goes to Central Asian countries via Kazakhstan.
- The corridor links Jeminay port，Baketu port，Dulat port, Ahitubiek port (Xinjiang Uygur Autonomous Regions) with Kazakhstan. However, these ports are so small that has limited capacity for the regional transportation.

China-Kyrgyzstan Corridor

- This corridor links Turgart port (Xinjiang Uygur Autonomous Regions) with Kyrgyzstan, comprising highways. A part of China-Kyrgyzstan-Uzbekistan railway will be constructed along this corridor in the future.

South Asian Corridor

South Asian Corridor includes China-India Corridor, China-Nepal Corridor, China-Pakistan Corridor, China- Myanmar Corridor, China-Vietnam Corridor, and China-Laos Corridor.

China-India Corridor：

- This corridor links Nathula Pass port (Tibetan Autonomous Region) with India, comprising highways. It was shut down for a long period because of the tension along the border area, and re-opened in 2006. Until now, its function is still quite limited.

China-Nepal Corridor includes:

- The corridor links Zhangmu Port (Tibetan Autonomous Region) with Nepal. This highway corridor is a crucial one connecting China and South Asia. The operational Qingzang Railway (Qinghai-Tibet) and planned Lhasa-Shigatse-Nielamu Railway in Tibetan Autonomous Region will link railways in Nepal and India. They will help to form a better China-South Asian Corridor.\
- The corridor links Yadong Port (Tibetan Autonomous Region) with Nepal. This highway corridor is a crucial one connecting China and South Asia. The planned Lhasa-Shigatse-Yadong Railway will connect railways in Nepal and India to form a better China-South Asian Corridor.

China-Pakistan Corridor:

- This corridor links Khunjerab Port (Xinjiang Uygur Autonomous Regions) with Pakistan, comprising highways. It has much room for improvement.

Southeast Asian Corridor

Southeast Asian Corridor includes China-Myanmar Corridor, China-Vietnam Corridor, and China-Laos Corridor.

China-Myanmar Corridor:

- This corridor links Ruili port, Wanding port, Houqiao port, Mengding port (Yunnan Province) with Myanmar, mainly composed of highways. Railways and the gas and oil pipeline are planned to be constructed to connect harbors of Indian Ocean in Myanmar. It will be a train and truck Corridor linking China and Indian Ocean.

China-Laos Corridor:

- This corridor links Mohan Port (Yunnan Province) with Laos, comprising two-way highways. Its function is quite limited.

China-Vietnam Corridor includes:

- The corridor links Pingxiang port, Dongxing port, Shuikou port, Longbang port (Guangxi Province) with Vietnam. The railways and highways connecting Youyiguan (Pingxiang) have a high traffic capacity. It is mainly highways linking other ports in this corridor.
- The corridor links Hekou port, Tianbao port (Yunnan Province) with Vietnam. The Hekou-Vietnam Section is composed of railways (Kunming-Hekou Railway), highways and waterways (Yuanjiang River). It has much potential for improvement.

2.2. The Outlook of the Future Development

China's future strategy on transportation is to build a modern comprehensive transportation system, which will provide low-cost, safe, efficient and convenient services to sustainable economic development.

Since 2004, the State Council has approved ten comprehensive transportation plans, which comprise a relatively comprehensive transportation system guiding China's modern transportation development. By implementing the *Comprehensive Transport Network Mid-long Term Development Plan* and other related plans, the total length of transportation routes will be more than 3,380,000 km (not including city and village roads) in 2020. The total length of highways will be 3,000,000 km (not including village roads), including 650,000 km Class-II and above highways and 100,000 km expressways. The total length of railways will be 120,000 km, 50% of them with double-track lines and 60% with electrified lines. There will be a modern transportation network that could generally meet the demand of China's economic development.

China will increase investment in international transportation corridors to speed up

the construction of the international transportation networks that link different regions and countries. China will stick to the principle of "mutual benefit, win-win and common prosperity" in developing the international transportation corridors.

During the process of development of international transportation corridors, China and its neighboring countries will cooperate closely on the projecting, investing and financing based on trust and mutual benefit. The factors influencing the constructions of transportation corridors between China and its neighboring countries, such as history, construction conditions, functions and potential demands, are too different at the same pace. It depends on demands, feasibilities and capacity of relating partners.

2.3. The Mechanism of International Cooperation

The development of international transportation corridors will benefit both China and its neighboring countries. Meanwhile, as the major content of regional cooperation in Asia, the international transportation connectivity will surely benefit all countries in the region.

China has made great efforts to promote cooperation on the development of the international transportation corridors. Many mechanisms have been developed for the development of the international transportation connectivity.

- Bilateral cooperation, mainly between China and its neighboring countries. They have cooperated in the planning and implementing of highways, railways, waterways and other projects connecting them. Although each country has actively made its effort for the construction of the agreed projects, China has plaid a key role in providing the fund and technology to facilitate the transportation connectivity.
- Regional cooperation, mainly through East Asia cooperation and the Shanghai Cooperation Organization (SCO). In East Asia, China has taken part in many forms of cooperation under the framework of "10+1" (ASEAN plus China), "10+3" (ASEAN plus China, Japan and Korea), East Asian Summit (EAS, 10+3 plus India,

Australia and New Zealand) and Northeast Asian Cooperation (China Japan and Korea). The role of the regional cooperation has been strengthened along with the progress of the regional cooperation mechanisms. Due to its special geographical location, China has actively participated all regional projects and plaid an important role in promoting the regional infrastructure networks.

- International cooperation. The infrastructure connectivity is well beyond the regional dimension. China and other countries have closely cooperated on projecting and constructing the international highway and railway linkage lines, for example, Asia-Europe Corridor networks.

Since reform and opening-up, especially in the new century, China has actively promotes and taken part in the construction of international transportation corridors. So far, the infrastructure in China and its neighboring countries have been improved. However, the international infrastructure connectivity is far behind the demand of the fast developing economic relations. China will invest more into cross-border transportation corridors along with increasing demand of transportation capacity and growing national strength. China will be a more responsible country for enhancing the development of international transportation infrastructure networks.

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