

# Past, Present and Future Development of China's Railways

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The railway is the main building block of the freight and passenger transportation system in today's China, and could be called an artery of the national economy. Although present-day China has seen rapid development of roads, shipping, aviation, and other systems for moving goods and people, the road system in particular has undergone tremendously rapid development to the point where it now competes with the railways. However, rail remains the prime mover of people and heavy freight over middle-to-long distances.

## China's Railways to Present

China's first railway, the Songhu Line, was built in 1874 in Shanghai, symbolizing the beginning of modern transportation in China. During the 75 years between the first railway and the establishment of the People's Republic of China in 1949, a total of 21,800 km of track were laid. After 1949, new track construction increased the total by 187%, reaching 62,615 km by 1995. Of this total, 54,616 km were constructed by China Railways; an additional 2965

km were built by joint ventures, and regional railways contributed 5034 km. The network includes about 17,000 km of double track and 9700 km of electrified track. Diesel-powered trains service 24,749 km. In 1995, the total number of passenger trips exceeded 1.22 billion and the total number of passenger-km reached 354 billion km. Freight carried by rail totalled 1.59 billion tonnes or 1.283 trillion tonne-km.

Rail accounts for 45% of all passenger mileage and 40% of all freight mileage. These statistics show how rail remains unshaken as the pillar of China's transportation system. In a country like China, with a huge population spread across a vast geographical territory, aiming at rapid development while faced with the challenges of unequal distribution of natural resources, the vast numbers of people and huge volume of goods need appropriate methods of transport. The unique technological and economic advantages of rail guarantee that it will continue playing a central role in China's transportation system.

If we look at China's railways in terms of the traffic density expressed as passenger-tonne-km, defined as the sum of pas-

senger-km and tonne-km, the 1994 figure was 30.066 million; the 1995 figure was 30.317 million, indicating the increasing density of people and goods moving over rail. The volume of passenger and freight traffic in China is tremendous, and is without question among the highest in the world. Nearly every single km of rail in China is in heavy use, with the result that the railways are straining to serve as the primary transport link for passengers and freight. Many trains are running near or over capacity.

Although China's railways have made continuous development to cope with the rapid growth of the national economy and to open up the nation to the outside world, there is still a pressing need for more passenger and freight service. In short, there is much more to be done; there is a considerable gap between what the railways can deliver and the unfulfilled needs, representing a formidable contradiction between service and demand. The bottlenecks and route limitations hindering rail capacity at present can be alleviated with proper planning and adjustments. Sections under particularly heavy use may be restricted to certain designated freight and passenger trains only. For example, the managements of various railway lines such as the Shanghai Railway Bureau, the Guangzhou Railway Bureau, the Liuzhou Railway Bureau and the Chengdu Railway Bureau are under considerable pressure just to move people and distribute and deliver goods within their jurisdictions. The problem is particularly severe in busy and heavy-traffic areas such as in the Jiaying, Pingshi, and Xujia districts. Bottlenecks at these sections mean that only an estimated 30% to 50% of freight needs are met. In terms of China's overall need, freight transportation is estimated to be meeting somewhere between 50% and 70% of overall demand. Passenger service also falls short of demand, meeting somewhere between 60% and



Waiting room at Shenzhen Station

(Y. Akiyama)

80% of the total. The above demonstrates that the rail transportation market in China is huge and growing.

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### Future Development

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Development of railway lines has been crucial to the economic development of the areas they run through. One way to appreciate the importance of new construction is to note that national and regional development is constantly pressing the rail system to expand more rapidly. Dr Sun Zhongshan (founder in 1911 of the Republic of China) predicted early this century that China would need to develop some 160,000 km of rail by the mid-century. Chairman Mao Zedong upped the figure, aiming for a total of 200,000 km. The present 60,000 km is considered a major bottleneck preventing economic development. Given the pressing need for expansion and development, both these founding fathers of modern China were right on target in their vision. Personally, I believe the railways have now reached the rapid-growth stage and are heading for maturity. This will propel the national economy into rapid development and urbanization. The volume of goods and passengers is expanding rapidly compared to the urban network capacity and is inducing the need for expansion and improvement of the network, facilities and rolling stock. Taking the railway as an example of China's modern development, it is reasonable to assume that by 2000, overall demand for rail passenger service will increase to 1.6 billion passengers, and the demand for rail freight will increase to about 2 billion tonnes. The total length of passenger and freight railways must reach 80,000 or 90,000 km to match this demand. Freight volume alone must increase at an annual rate of 8% to satisfy growing demand.

However, due to the constraints, most



*Train stewardess and passenger at Nanjing Station*

*(S. Kubo)*

notably the lack of capital, development will not match demand. If present trends continue, there will only be 70,000 km of track. Accordingly, freight will only grow at an annual rate of 4%. By 2000, China's railways will only be able to service 1.5 billion passengers and 1.8 billion tonnes of freight. Thus, the contradiction between rail capacity and growing need has yet to be resolved.

To meet the ever-growing demand, the national railways has identified two major strategies: continual improvement to existing infrastructure, and building new lines. New lines include: Beijing-Kowloon, Nanning-Kunming, and Zhanjiang Port-Haikou (including ferry link to Hainan Island). Improvement of existing infrastructure includes double-tracking, converting from steam to diesel, and from diesel to electrification, and other such developments.

To effectively achieve the goal of mov-

ing freight and people smoothly at high speeds, China Railways has adopted the slogan, 'Speed up for passenger need, increase freight weight.' pointing to the need to provide faster transportation with greater carrying capacity.

The Guangzhou-Shenzhen Line has already achieved speeds of 160 km/h on limited express trains. The Shanghai-Nanjing and Shenyang-Dalian Lines have increased average speeds up to 140 km/h. The Datong-Qinhuangdao Line has upgraded its weight capacity of tracks to carry 10,000-tonne coal trains. On trunk-line sections from Zhengzhou-Wuhan and Shanghai-Xuzhou, etc., the weight capacity has been upgraded to handle 5000-tonne wagon-load trains. This shows that, to some extent, the contradiction between supply and demand is being ameliorated by a variety of methods.

### Key Construction Projects

China's rail system is most comprehensive in the NE and N Central regions and along the East coast. In the NW, SW and South, lines are relatively scarce. One reason is because railways are intimately linked with urbanization and most of China's big cities are concentrated in these areas. In urban areas, the pace of economic development and the availability of transportation infrastructure interact to reinforce growth. Cities are densely populated and urban economies tend to be more advanced economically. Furthermore, it is relatively easy for adjacent urban areas to link and form a megalopolis.

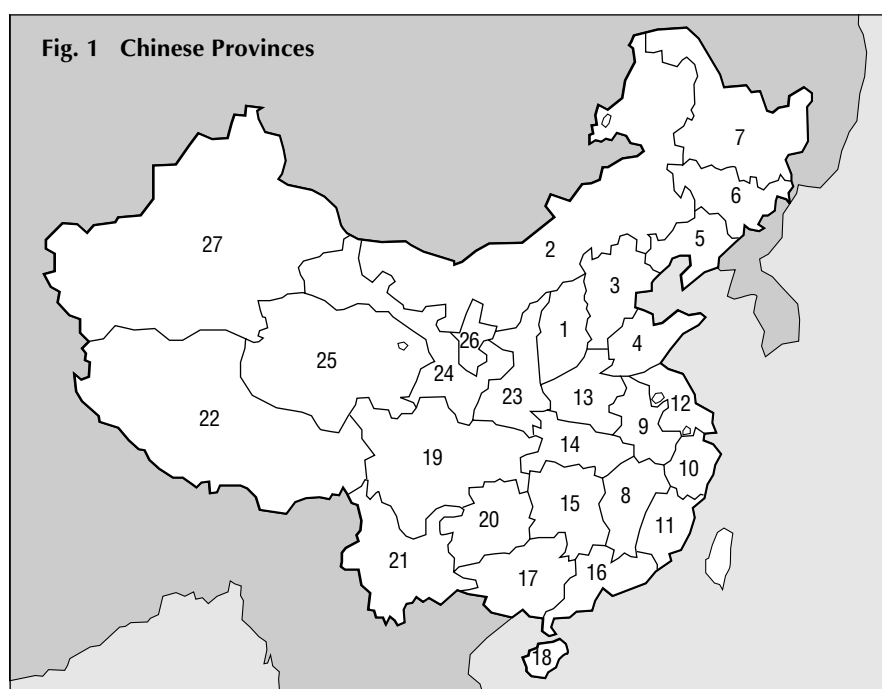
The transportation corridor created by dense urban railway development allows movement of large volumes of people and goods in a limited area, bringing scale merits. Analysis by region (Table 1) reveals important trends.

NE and N China have the strongest railway presence. Historical conditions are the major reason for this pattern. The fact that the average railway penetration rate in the NW exceeds that of E China, S Central China and SW China, is the result of specific policies after 1949.

New railways built from the 1950s to 1970s reflected the national strategies of regional self-reliance, military preparedness, emphasis on heavy industry and dispersion of economic development to all parts of the country, but most especially the west. A total of 156 key construction projects with major planning, building and renovation were undertaken in Lanzhou, Xian, Luoyang, Baotou, Wuhan, Chengdu, Taiyuan, Datong, Zhanjiang, Zhuzhou, Changchun, Jilin, Shijiazhuang, Anshan, and other cities. At the same time, inter-city lines were built, such as the Baotou-Lanzhou Line, the Jining-Erlian Line, and the Jining to Mengmiao-Baolai Line.

In the 1980s, national policy emphasized implementation of regional transportation to foster regional economic development and to increase the pace of urbanization. Economic development of

the urban economy was seen as critical to development of the country as a whole. At the same time, it was decided to put special emphasis on the following major rail construction projects. This policy



**Table 1 Proportion of Chinese Cities with Railway Service**

Regions and Provinces*1			
1. Shanxi	14/15 *2 (93.3%)	13. Henan	26/27 (96.0%)
2. Inner Mongolia Autonomous Region	17/17 (100%)	14. Hubei	19/31 (61.2%)
3. Hebei including Beijing and Tianjin	27/29 (93.1%)	15. Hunan	22/27 (81.2%)
4. Shandong	30/40 (75%)	16. Guangdong	15/26 (57.6%)
<b>Average North China:</b>	<b>90.35%</b>	17. Guangxi Zhuangzu Autonomous Region	12/12 (100%)
5. Liaoning	24/25 (96%)	18. Hainan	1/4 (25%)
6. Jilin	22/23 (95.6%)	<b>Average South-central China: 70.23%</b>	
7. Heilongjiang	25/27 (95.2%)	19. Sichuan	20/27 (74%)
<b>Average North-east China: 94.70%</b>		20. Guizhou	9/10 (90%)
8. Jiangxi	14/17 (82.5%)	21. Yunnan	8/12 (66.6%)
9. Anhui	16/18 (88.8%)	22. The Tibet Autonomous Region	0/2 (0%)
10. Zhejiang	17/29 (58.6%)	<b>Average South-west China: 57.65%</b>	
11. Fujian	10/18 (55.5%)	23. Shaanxi	10/12 (83.3%)
12. Jiangsu including Shanghai	18/32 (58%)	24. Gansu	10/13 (76.9%)
<b>Average East China: 68.64%</b>		25. Qinghai	3/3 (100%)
		26. The Ningxia Autonomous Region	3/4 (75.0%)
		27. The Xinjiang Autonomous Region	7/17 (41.1%)
		<b>Average North-west China: 75.26%</b>	

\*1 Province Nos. correspond to map above  
 \*2 No. of cities with railways/Total No. of cities (%)

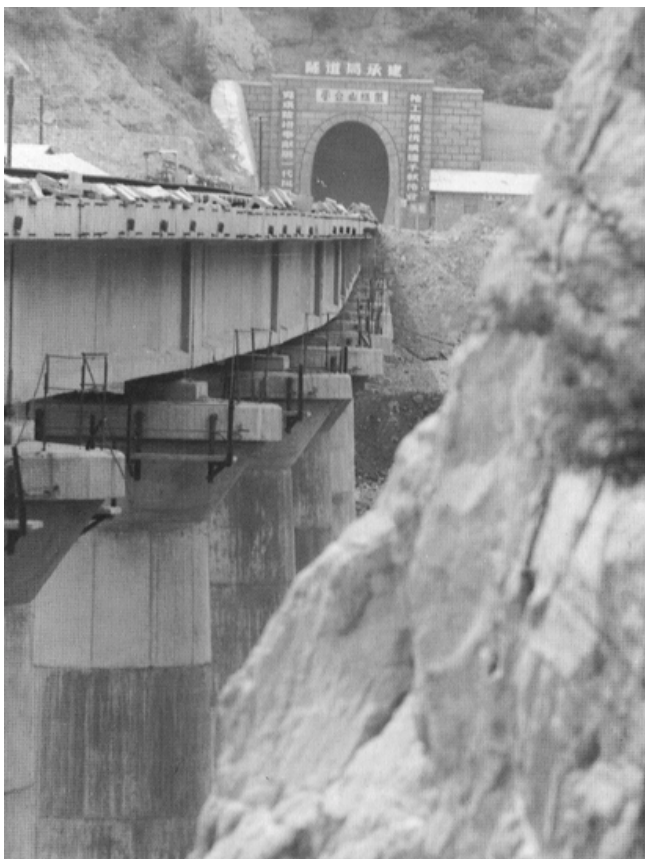
was summed up by the slogan 'Occupy the north, link the centre, and aim at the south'. In terms of concrete railway policy, this meant building new lines in the north, center and south, such as the northern line from Datong to Qinhuangdao, and the central line linking Anhui Province, Jiangsu Province, Shanghai City, Zhejiang Province, Jiangxi Province and Fujian Province. In the south, the focus is on Guangzhou, as demonstrated by the construction of the Hengyang-Guangzhou Line, and other major construction projects involving Guangzhou.

In the 1990s, China's leadership decided to focus on transportation bottlenecks affecting the pace of national economic development. A strategy was devised to break the bottlenecks in order to trans-

port fuel, freight and a large volume of passengers at greater efficiency and speed. Implementation of the 'Triple West' Road (Shanxi Province-western Inner Mongolia-Shaanxi Province) was speeded up to transport coal from mines to outlying areas. New construction work was accelerated along the north-south corridor (Beijing-Guangzhou Line) and the Beijing-Shanghai Line, and in the southwest corridor (Nanjing-Kunming Line) and the Jiangxi-Guizhou Line. New construction was also carried out in the northeast corridor (through Shanhaiguan) and in the northwest corridor (Xi-Kang Line). Some of these projects involved double-tracking, electrification and other improvements.

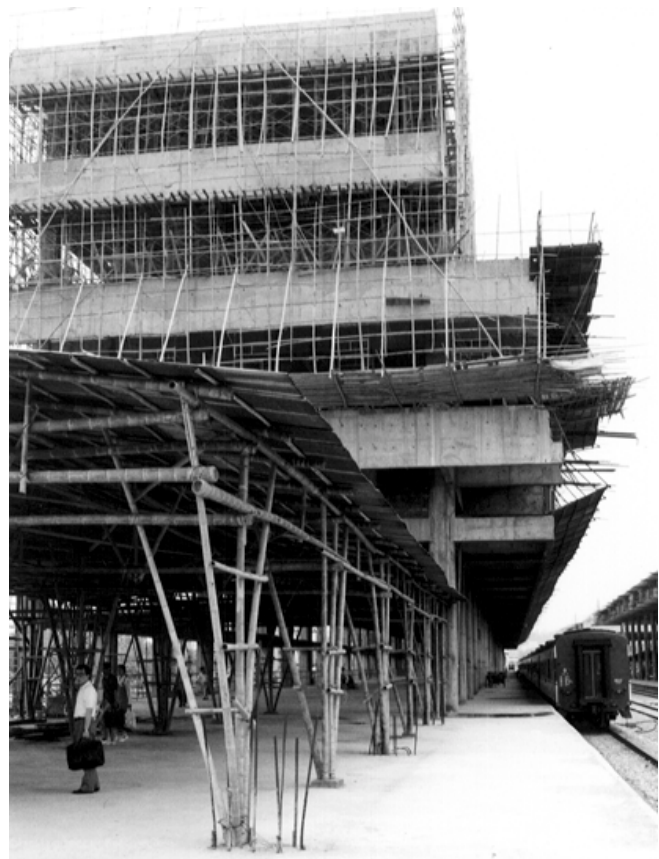
By the end of this century, more than 6000 km of new track will have been laid

as part of the development thrust, and the total rail length will reach 70,000 km. In addition, to increase speed, and improve the technical level and transportation efficiency, China Railways has singled out development of container freight and high-speed trains as leading projects. For container freight, heavy-duty diesel engines and electric locomotives have been imported from America, France and other countries. In development of high-speed rail services, comparative research is being conducted on the high-speed train technologies of Japan, France, Germany, Sweden and other countries. China is already planning to build its first high-speed line linking Beijing and Shanghai.



Yuntaishan Tunnel on Houma-Yueshan Line

(Railway Gazette International)



Guangzhou-East Station under construction

(Y. Akiyama)

### Construction and Financing

From 1949 until 1985, most of the capital for building China's railways came from central government. The money dispensed to the National Railways came from the state budget. Starting in 1985, the national government replaced internal allocations by loans. By 1988, a new reform introduced levy raising and other forms of development funding. The government agreed to allow the railways to charge freight fees of 0.002 yuan per tonne-km from 1 March 1991. From 1 July 1992, the fee was increased to 0.012 yuan tonne-km, then again to 0.027 yuan on 1 April 1993, and finally to 0.028 yuan on 1 April 1996.

To serve future social needs, China's railways are aiming to offer passenger and freight service over about 70,000 km of track by 2000. To reach this goal, an additional 7400 km must be laid while maintaining and improving old stock. To keep on schedule, a budget of 30 billion yuan per year is required between 1996 and 2001. Furthermore, according to



First Beijing-Kowloon Line train bound for Shenzhen leaving Beijing-West Station on 1 September 1996 (Asahi Shimbun)

current statistics, the indebtedness of China Railways to both domestic and international lenders is 30 billion yuan. Indebtedness is increasing at more than 3 billion yuan per year. Between 1990 and 1995, about 10 billion yuan was paid in interest and principal, but the indebtedness remains large and China Railways faces a relatively serious capital shortfall. To alleviate the worsening financial situation, in October 1981, the Railway Ministry, national government and regional

governments started joint investment in railway construction (following the example of Sanmao and the Beijing model). According to preliminary studies, some 5000 km have been laid using this investment program with investments totalling 15 billion yuan. Although most of the lines are local branch lines and relatively small railways, the financing scheme offers a model solution to a difficult situation and is upheld as a paradigm for railway development.

In 1980, China Railways started using foreign capital for construction projects. Over little more than a decade, more than US\$3 billion was borrowed from various sources. The foreign capital was by-and-large earmarked for constructing trunk lines, and for purchasing rolling stock and modern equipment. These projects were beneficial to the development of the railways and reflect the national policy of modernization.

Foreign capital for new construction came from various sources including the World Bank, the Japanese government, the Asian Development Bank, etc. To raise more money, the Railway Ministry won approval to issue 10 billion yuan of railway bonds. After the allocation system was reformed, it was decided to hold bank loans for railway development at about 1 billion yuan per year, represent-



Beijing-West Station

(S. Kubo)

ing some 15%-20% of total investment. Financing of new lines is typified by the new high-speed line between Beijing and Shanghai, which required a primary investment of 80 billion yuan, calculated at 1994 values and not including monies disbursed for preparation. An additional 15 billion yuan was earmarked for acquisition of rolling stock. Thus, the total investment is about 95 billion yuan. The principle funds were raised as follows:

- By relying on domestic capital while vigorously attracting as much foreign capital as possible.
- By promoting stock issues as the main funding technique, but also by borrowing as a secondary source.
- By promoting joint stock holdings as the main source with other forms of stock holding as a secondary source.
- By bearing in mind that some funds should be set aside for investment in business diversification and other related development projects.

From the above points, the primary funding channels and actual amount of funds needed for the construction project can be estimated as described below.

### **Funding Beijing-Shanghai High-speed Line**

**Freight charges:** At present, the investment funds raised directly by China Railways are collected at a rate of 0.028 yuan per tonne-km. From the expected increase in freight and increased railway capacity between 1996 and 2005, funds accumulated in this manner will total about 60 billion yuan.

**High-speed levies:** The Beijing-Shanghai High-Speed Line will run through three major railway administrative regions: the Beijing Bureau, the Jinan Bureau, and the Shanghai Bureau. If the Railway Ministry allows the Bureaus to levy an average of 1 yuan per person and

an additional 1 yuan per tonne of freight, the total revenue accumulated will approach 17 billion yuan from 1996 to 2005.

**National budget:** Allocations from the national budget can be supplemented by drawing on capital in society at large by issuing stock, etc. Since construction of the high-speed line is a fundamental national development project, it is reasonable to expect that money amounting to about 4 billion yuan will be set aside from the national budget.

**Bank loans:** The national government can ask the National Development Bank to provide about 15 billion yuan of long-term loans at low interest for construction of the high-speed line.

**Domestic bonds:** If the above four capital resources can be secured, the new line can be funded without resorting to domestic bonds. If funding comes up short for some reason, it will be possible to issue a number of High-Speed Railway Construction Bonds to national enterprises, various financial bodies and individuals.

**Foreign capital:** Use of foreign capital will focus primarily on acquisition of high-speed rolling stock, telecommunications, and signalling equipment. Key funding channels will include:

- Issuing stock in overseas stock markets. Stock will be offered by China Railways in two primary markets: Hong Kong

and New York. The stock will be available to investors worldwide and is expected to raise about US\$500 million.

- Issuing foreign bonds. It would be best if the bonds were issued in the name of the People's Republic of China by the Finance Ministry. The estimated revenue is in the range of US\$500 million.
- Raising international loans from foreign governments, financial institutions and commercial banks. These sources can be expected to provide about US\$400 million.
- Leasing rolling stock.

In conclusion, the first priority is to raise as much investment funding as possible from a wide variety of international sources, especially from foreign governments and the World Bank. A total of US\$1.5 billion is expected to be raised this way. At the same time, since construction of the Beijing-Shanghai High-Speed Line is a long-term project requiring huge investment sums, additional money could be borrowed from international banks in order to make efficient use of available capital. ■



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