Chapter 7
Global Village in High-Speed Rail Environment

In the seven continents of the world, except for Antarctica, there are the HSR applications. The development of HSR also promotes regional integration. The high compatibility of HSR is the basis of its international interconnection. Various types of HSR promote the integration of different regions. The WHSR promotes regional integration, and the MHSR promotes the promotion of the continents village, the SSR promotes global integration which is called the global village. Therefore, we must pay attention to the development of HSR. Whichever country has the core technology of HSR (WHSR, MHSR and SSR), the country owns the world.

Since the birth of HSR, the HSR experienced "four times of development", "three times of leap". At present, many countries and regions in the world have planned, built and operated high-speed rail.

Compared with other modes of transportation, HSR has strong conveying capacity, fast speed, good safety, highly punctuality rate, low energy consumption, less impact on the environment, land conservation, comfort, convenience, considerable economic benefits and good social benefits. Moreover, with the unique technical advantages to adapt to the new needs of modern social and economic development, HSR has become an inevitable choice for the development of countries around the world. The development and operation practice of China's HSR shows that the HSR has a great development space and potential in China, so we should make full use of the latecomer advantage to realize the leaping development of China's HSR. The HSR has created a new growth point for urban development, promoted the integration of central cities and satellite towns, enhanced the radiation effect of central cities on surrounding cities, and strengthened the "the same city effect" of neighboring large cities. In particular, with the development of HSR in various countries around the world, in the near future, the HSR will become the main ground transportation mode connecting countries in various regions, and will open the "global village" era together with air routes. Traveling around the world on HSR will become tourism fashion. Therefore, with the continuous improvement of HSR technology, the HSR between countries and regions around the world is like a bus, with many shifts and short intervals, without the congestion of freeway and the delay of air plane,

Q. Hu and S. Qu, *A Brief History of High-Speed Rail*,
https://doi.org/10.1007/978-981-19-3635-7_7

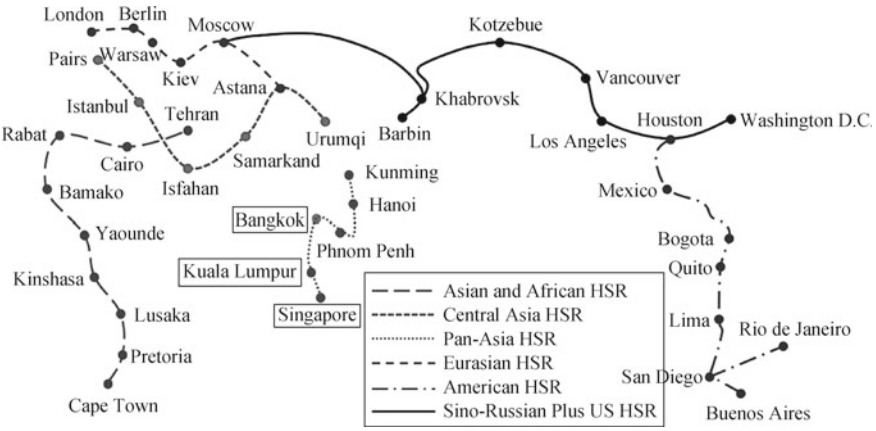


Fig. 7.1 The global integration under the HSR environment

so that the travel time is reduced and the "same city effect" of the whole world is reached. Therefore, the upsurge of HSR construction has been launched worldwide. See Fig. 7.1.

7.1 The Continental Integration Under HSR Environment

At present, the four most mature countries in the development of HSR technology are Germany, France, Japan and China. French HSR trains (TGV) have become the world's most popular HSR technology with its excellent power control and intelligent protection systems. Among the countries with HSR lines already in operation, there are 6 countries using French technology for HSR train. Japan is the first country in the world to conduct research on HSR. Shinkansen technology is also known as the safest HSR technology in the world. Both CRH of Mainland China and the HSR of Taiwan adopt Japanese Shinkansen technology. China is the country with the latest start of HSR, but is also the fastest-growing country. China has designed five types of HSR trains such as CRH1, CRH2, CRH3, CRH5 and CRH380 through the introduction of HSR technology such as Japan, Germany and France. China has become the country with the longest mileage, fastest operation and largest line network in the world.

7.1.1 The European Village Under HSR Environment

Europe derives its name from the Greek mythology "Europa" (Greek: Ευρώπης). Europe is located in the northwestern part of the Eastern Hemisphere, bordering the Arctic Ocean to the north, the Atlantic Ocean to the west, and the Mediterranean

Sea and the Black Sea in the Atlantic Ocean to the south. Europe is bordered with Asia east to the Ural Mountains and the Ural River, southeast to the Caspian Sea, the Greater Caucasus Mountains and the Black Sea. Europe faces North America across the Atlantic Ocean, the Greenland Sea, the Danish Strait to the west, bordering the Arctic Sea to the north, and faces Africa across the Mediterranean Sea to the south (The dividing line is: Strait of Gibraltar). The northernmost end of Europe is Norwegian Nova Kok, the southernmost tip is the Maroki corner of Spain, and the westernmost end is the Portuguese Rocca. Europe, the world's second-largest continent, is only a little larger than Oceania, and it is called the Eurasian continent combined with Asia, and called Asian and European continents combined with Asia and Africa.

In 1994, a meeting of the European Commission was held in Germany, and it decided to implement the resolution to build and expand the pan-European transportation network. In 1998, the International Iron League began to organize further research on the European HSR network, and required the all-European HSR network to be formed in 2020. The European HSR network can be seen in Fig. 7.2.

7.1.2 The Asian Village Under HSR Environment

Asia (the ancient Greek language: Ασία; Latin: Asia), is the largest and most populous continent in seven continents. Most of Asia is located in the northern and eastern hemispheres. The dividing line between Asia and Africa is the Suez Canal. East of the Suez Canal is Asia. The dividing line between Asia and Europe is the Ural Mountains, the Ural River, the Caspian Sea, the Greater Caucasus Mountains, the Turkish Straits and the Black Sea. To the east of the Ural Mountains and the Greater Caucasus Mountains, the Caspian Sea and the Black Sea are Asia. The West is connected to Europe, forming the largest land mass on the continent which is called Eurasia.

The Trans-Asian Railway (TAR) is a unified freight rail network that runs through Eurasia. Representatives from 18 countries in Asia officially signed the Intergovernmental Agreement on the Asian Railway Network in Busan, South Korea on November 10, 2006. The plan for the Pan-Asian Railway Network, which has been planned for nearly 50 years, was finally implemented. According to the agreement's plan, in the near future, the four gold corridors of the "Steel Silk Road" will connect the two continents of Europe and Asia, and the crises-crossing trunk lines and feeder lines will weave a huge network of economic cooperation. According to the HSR line construction plan of China, Japan and other countries, the Asian ring, centered on China, east to Japan, west to Saudi Arabia, south to Malaysia, and north to Russia, will be realized by 2050. The Pan-Asian Line and Central Asia Line will form the Asian HSR network. However, at present, the countries concerned have to face the arduous task of unifying technical standards, coordinating customs, and quarantine and security inspection procedures, raising huge construction funds, and unifying the pace of construction. The Asian HSR network is shown in Fig. 7.3.

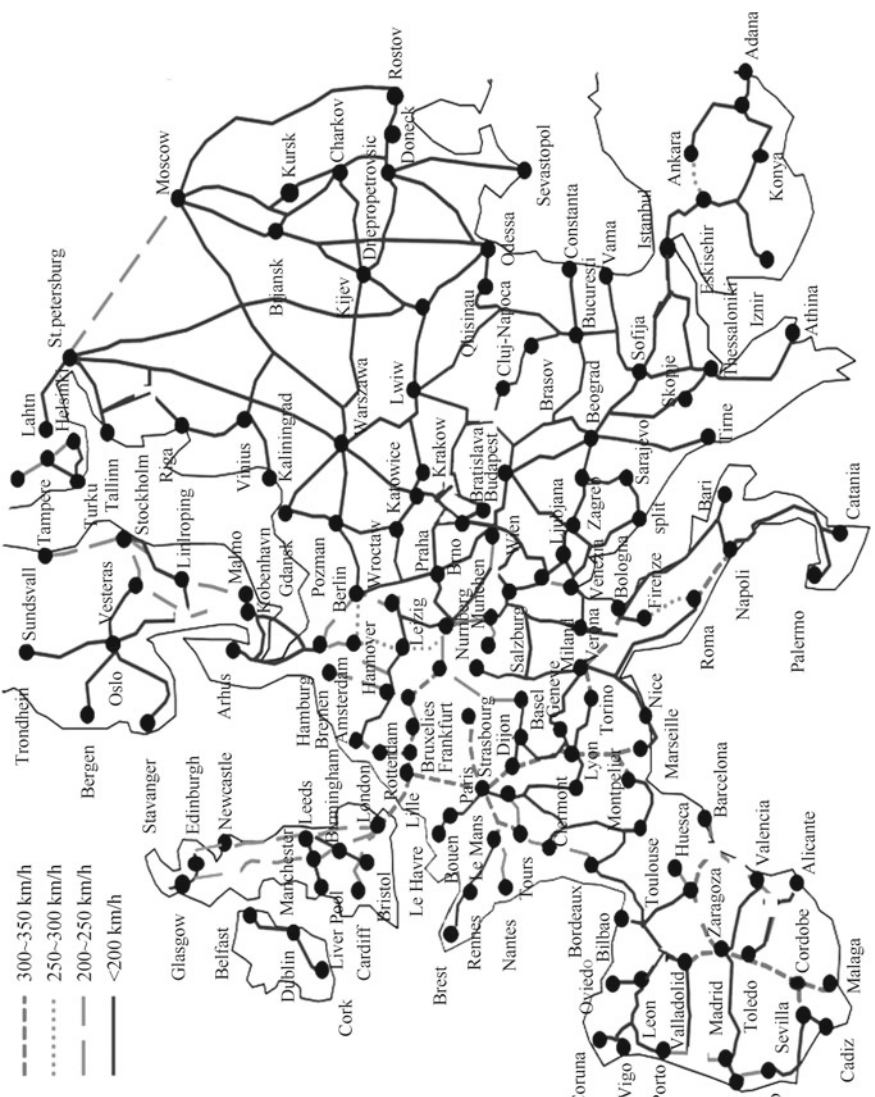


Fig. 7.2 European HSR network

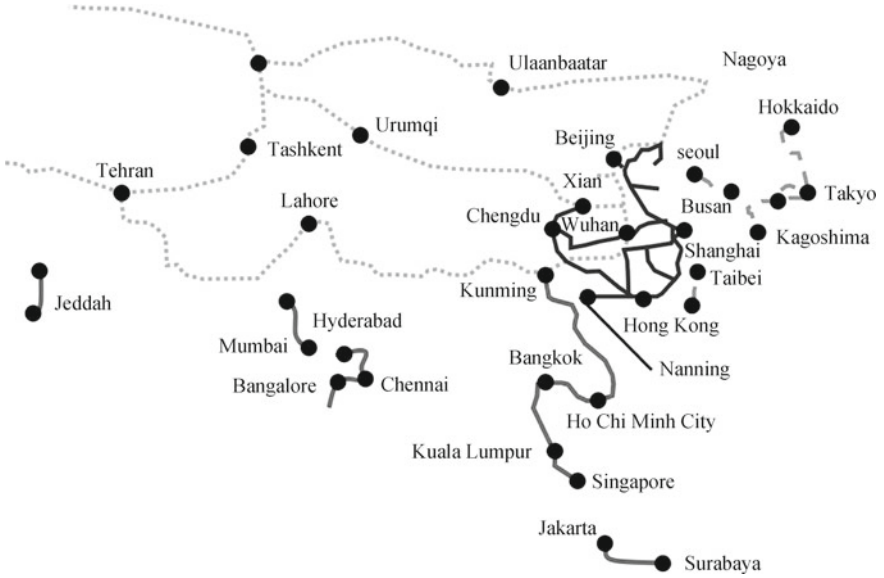


Fig. 7.3 Asian HSR network

(1) China—Pakistan—China—Kyrgyzstan—Uzbekistan Rail. On April 20, 2015, China and Pakistan signed a framework agreement for the joint feasibility study of the No.1 rail trunk line (ML1) upgrade. The No.1 rail line runs from Karachi to Lahore and Islamabad to Peshawar, with a total length of 1,726 km. Figure 7.4 shows the China—Pakistan HSR line.

The idea of the Trans-Asian Railway is called the "Silk Road", which runs from Singapore, through Bangladesh, India, Pakistan and Iran to Istanbul, Turkey, and finally extends to Europe and Africa (Fig. 7.5).

(2) Southeast Asia line. The Southeast Asia Line starts from Kunming of China, and is divided into three branches connecting Myanmar, Thailand and Cambodia. It is directly connected to Malaysia through Thailand. The Pan-Asian Line is a fast-moving ground transportation channel between China and Southeast Asia. It can improve the efficiency of tourism, economic and trade

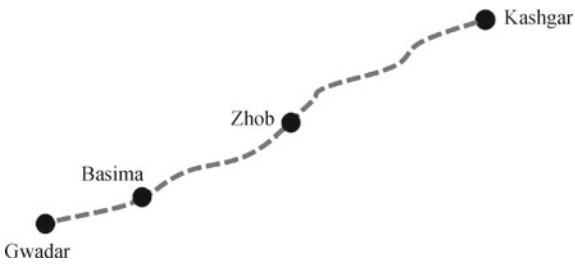


Fig. 7.4 The China—Pakistan HSR line

Fig. 7.5 The "Silk Road" of HSR

interactions between Southeast Asia, and promote the development of regional integration. See Fig. 7.6.

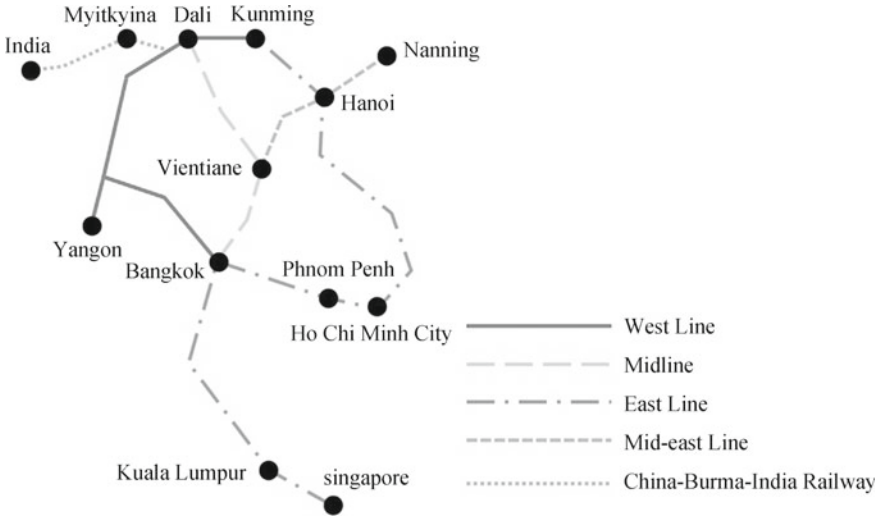
There are three programs through Kunming of China: First program is the east line program, from Singapore through Kuala Lumpur, Bangkok, Phnom Penh, Ho Chi Minh City, Hanoi to Kunming; Second program is the mid-line program from Singapore through Kuala Lumpur, Bangkok, Vientiane, Shangyong, Linyi, Xiangyun (Dali) to Kunming; Third program is the western route program from Singapore to Kuala Lumpur, Bangkok, Yangon, Ruili to Kunming. The quasi rail will replace the narrow rail.

The first plan: Singapore—Kuala Lumpur—Bangkok—Phnom Penh—Loc Nink of Ho Chi Minh—Hanoi—Lao Cai—Kunming. The total length of it is 5328 km. This line will also establish a branch line to connect Vientiane, the capital of Laos. The line is Vientiane—Tha Khet—Xinyi (Vung Ang Port). The total length of the branch line is 585 km. This line will also build a new road linking Vietnam, Laos and Cambodia with a total estimated cost of $1.8 billion.

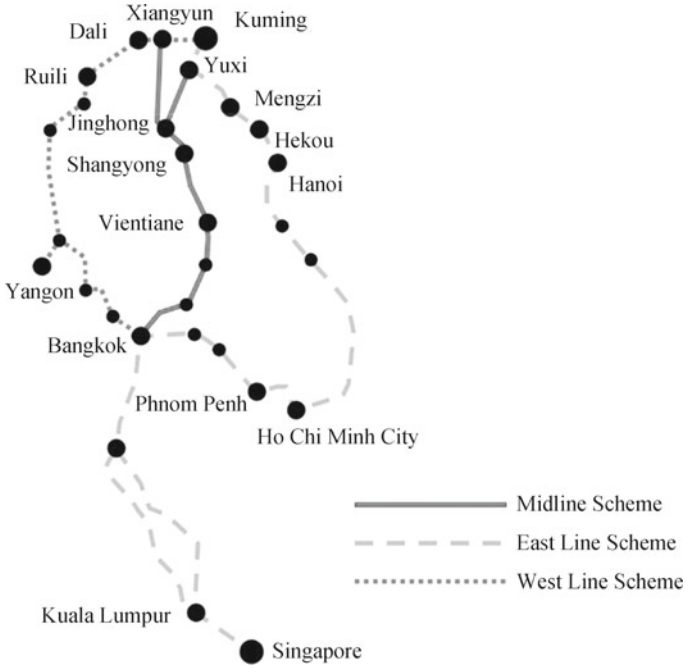
The second plan: Singapore—Kuala Lumpur—Bangkok—Yangon—Kunming. The total length of it is 4559 km. In this line selection scheme, new sections will be built in Thailand, Myanmar and China to connect. The total length of the new road section is 1127 km, and the estimated total cost is $6 billion for the Trans-Asian Railway ASEAN channel.

The third plan (3A line): Singapore—Kuala Lumpur—Bangkok—Vientiane—VungAng—Hanoi—Kunming. The estimated cost of it is $1.1 billion.

The fourth plan (line 3B): Singapore—Kuala Lumpur—Bangkok—Vientiane—Kunming. The new line of the road network in Laos and China has a total length of 1300 km. The estimated cost of it is $5.7 billion.



(a) Transasia railway planning drawing



(b) East, midline and west line plan

Fig. 7.6 The HSR line of Southeast Asia

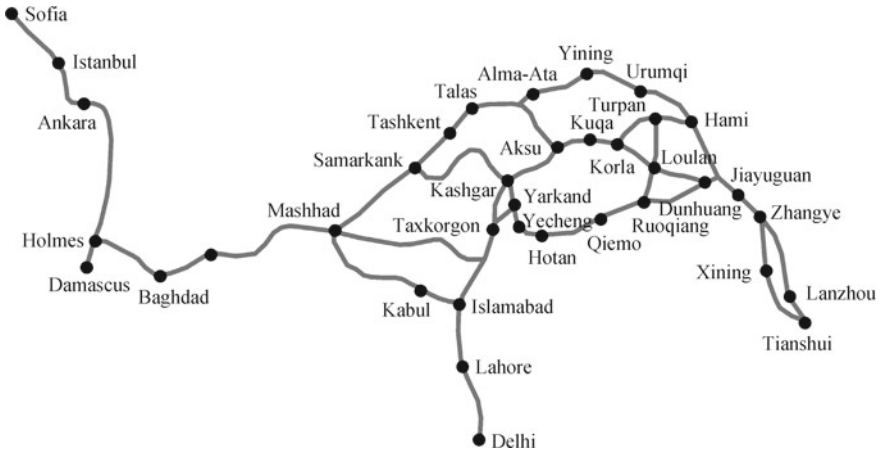


Fig. 7.7 HSR loop line of Asia pacific

The fifth plan (3C line): Singapore—Kuala Lumpur—Bangkok—Pacxe—Xavannakhet—Dong Ha—Hanoi—Kunming. The new line in this line has a total length of 616 km and an estimated cost of $1.1 billion.

The sixth plan (3D line): Singapore—Kuala Lumpur—Bangkok—Vientiane—Kunming. The line selection project is a combination of renovation and construction. The estimated cost of it is $1.1 billion.

(3) Central Asian line. Based on the China's four Xinxiang rails, this line is through the three cities of Harbin, Hohhot and Lhasa, respectively, to connect with Japan, Kazakhstan, India and other countries, and based on this, it continue to penetrate the Middle East, and finally reach Saudi Arabia. The line is conducive to cooperation between China and Middle East countries in energy, food, health, labor and many other aspects. It is the "Silk Road" for strengthening cooperation in the Asia–Pacific region. See Fig. 7.7.

7.1.3 The American Village Under HSR Environment

America is a combination of South America and North America. It is also the abbreviation of "Americas", also known as the new land. North America is located in the northern hemisphere. East Atlantic Ocean and West Pacific are north near to the Arctic Ocean, south to the Panama Canal and South America. In addition to including the Panama Canal to the north of North America, North America also includes the Caribbean Sea in the West Indies. South America is located in the southern part of the Western Hemisphere, with the Atlantic Ocean to the east, the Pacific Ocean to the west, the Caribbean Sea to the north, and facing the Antarctic across the Drake Strait.

Fig. 7.8 The HSR network planning of North America

North America has not yet built the HSR in the real sense. The two largest countries in North America, Canada and the United States, have developed industries and the prosperous economies. Both two countries are now planning and they all have the conditions to build the HSR. Major cities in Canada are basically along the border of U.S., connecting Montreal from Quebec in the east, Ottawa in the capital, Toronto to the largest city, and Vancouver to the West coast of the Pacific Ocean. The U.S. has a vast territory and a population of more than 300 million, it is a highly developed economy. The total industrial and agricultural production scale ranks first in the world. Figure 7.8 shows the HSR network planning of North America.

South America is large in size and there are not many countries in it. Brazil is a well-developed industrial and agricultural country. It is a BRICS country. Other countries such as Argentina, Colombia, Venezuela, Peru, Chile and Ecuador are large countries. However, due to the financial, technical and political reasons, the HSR has not been built yet. Recently, Brazil has planned to build the HSR, especially in the capital city of Brasilia and Rio de Janeiro and São Paulo, as well as coastal cities. It is believed that in the near future, countries will soon build HSR according to the economic development, and will connect different countries' HSR lines in the ring coastline. South America will be linked to the U.S. and Canada by HSR from Panama, Costa Rica, Nicaragua, Honduras, Guatemala and Mexico. Figure 7.9 shows the HSR network planning of South America.

Fig. 7.9 The HSR network planning of South America

7.1.4 The African Village Under HSR Environment

Africa is located in the western part of the Eastern Hemisphere, South of Europe, West of Asia, the Indian Ocean to the southeast, and the Atlantic Ocean to the west, and longitudinal across the equator.

Africa is located in the westernmost part of the eastern hemisphere as the second largest continent in the world. Africa is bordered by the Atlantic Ocean in the west, Indian Ocean in the east, Europe across the Mediterranean Sea in the north, Asia in the northeast, and the equator runs through the Central Region. There are 57 countries and regions, of which Sudan has the largest area and Nigeria has the largest population. The rails are mostly narrow gauge, meter-rail, wide-track, and quasi-rail railways left by the original colonists with different specifications and different gauges. According to the characteristics of terrain and layout, most countries not only promote the standard gauges at home, but also connect together on the coastal quasi-rails. African countries will be linked by HSR when the economy sufficiently developed. Repairing the HSR along the coastline will reduce many of the cost. For example, Egypt has begun planning to build a 1000 km of HSR from Cairo to Aswan.

HSR is a high-input and high-cost project. At present, the routes with better comprehensive benefits of HSR are widely distributed among urban clusters with high population density and economic development. The large cities in Africa have experienced rapid population expansion in recent decades, but the degree of economic development has not been correspondingly improved. It is difficult to support the cost of HSR operations in the short term. Figure 7.10 shows the HSR network planning of Africa.

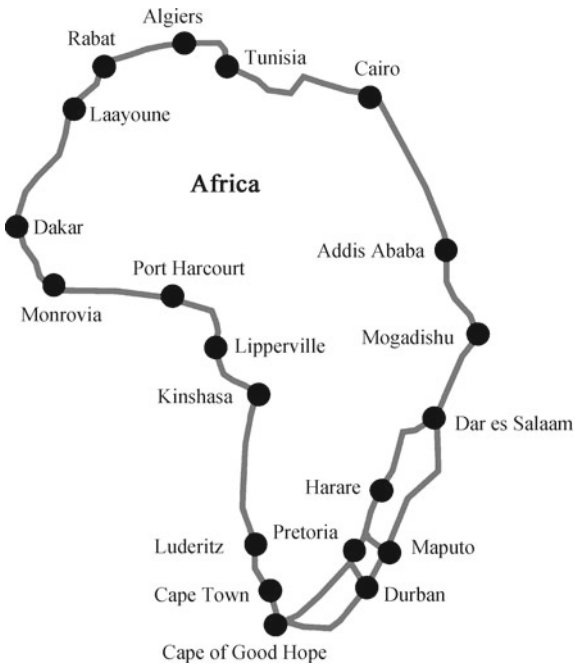


Fig. 7.10 The HSR network planning of Africa

7.2 The Regional Integration Under HSR Environment

As a safe, reliable, fast and comfortable, large capacity, low carbon emission and environmentally friendly transportation mode, HSR has become an important trend in the development of the world transportation industry. The HSR planning route of world can be seen in Fig. 7.11.

7.2.1 The Asia-Europe Integration Under HSR Environment

The HSR has created a new growth point for urban development, promoted the integration of central cities and satellite towns, enhanced the radiation effect of central cities on surrounding cities, and strengthened the "same city effect" of neighboring large cities. In particular, with the development of HSR in various countries around the world, in the foreseeable future, high-speed rail will become the main ground transportation mode connecting countries in various regions, and will open the "global village" era together with air routes. Traveling around the world by HSR will become tourism fashion. Therefore, with the continuous improvement of HSR technology, the high-speed rail between countries and regions around the world is like a bus, with many shifts and short intervals, without the congestion of freeway and the delay of air plane. The travel time is reduced and the "same city effect" of the

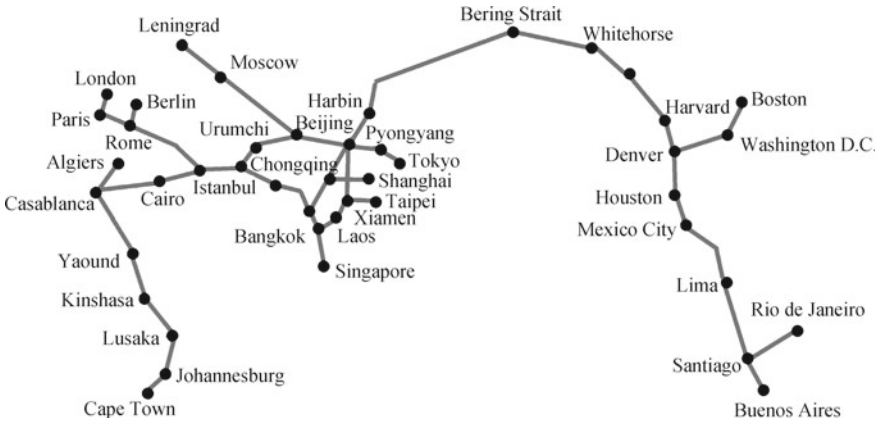


Fig. 7.11 The HSR planning route of world

whole world is reached. Therefore, the world has set off the upsurge of construction of HSR. Figure 7.12 shows the Asia-Europe HSR network.

Fig. 7.12 The Asia-Europe HSR network

7.2.2 *The Africa-Europe Integration Under HSR Environment*

The most concentrated HSR in Europe is in the western developed countries in the west. Apart from the fact that these countries have basically built a HSR network, they will consider the links with other countries. At the same time Europe will consider the three Nordic countries, HSR links Copenhagen (Denmark), Helsinki (Finland), Oslo (Norway). In addition, countries with better conditions, such as Poland, Romania, Bosnia and Herzegovina, are also preparing to build HSR. After the construction of HSR in the African the Spanish HSR can be considered to connect with Africa through the Gibraltar Strait Undersea Tunnel. Figure 7.13 shows the Europe-Africa HSR network.

Fig. 7.13 The Europe-Africa HSR network

7.2.3 *The Europe-Asia-Africa Integration Under HSR Environment*

The HSR is a revolution of road traffic and its main advantage is fast and safe. Countries with economic strength in the world are all planning to build the HSR, and many countries are jointly planning to build a transnational HSR network. Among them, 17 countries around China and China itself are negotiating the construction of the Asia-Europe Railway and the Trans-Asian Railway. Some routes of the Asia-Europe Railway and the Trans-Asian Railway are already under construction. Figure 7.14 shows the world HSR network planning.

The HSR network planning is mainly composed of three main lines: Pan-Asian Line, Asia-Europe Line and Transoceanic China-US Line. The details are as follows:

① The Pan-Asian line mainly connects to China and Southeast Asia such as Vietnam, Laos, Singapore and Bangkok.
② The Eurasian line mainly connects China, Russia, Britain, France and other Asian and European regions.
③ The China-US Transoceanic Line departs from Harbin, China, passes through the eastern part of Russia, crosses the Bering Strait, and travels through Canada to the United States.

According to China's HSR planning, in the near future, the world will form a HSR network as the main road transport channel, entering the "global village" era.

7.3 The Global Integration Under HSR Environment

In view of the considerable economic benefits and immeasurable political influence of high-speed rail, many countries in the world have invested in the construction of HSR. More than 20 countries including Germany, France, Italy, Spain, the United Kingdom, Japan, China, South Korea, the United States, and Brazil have opened

Fig. 7.14 The world HSR network planning

Fig. 7.15 The global HSR integration

HSR lines, and two countries, Russia and India are planning and preparing for the construction of HSR. Figure 7.15 shows the Global HSR integration.

① Eurasian HSR line: It starts from London, passes through Paris, Berlin, Warsaw, Kiev, after Moscow, and is divided into two routes, one into Kazakhstan, the other pointing to the Far East of Khabarovsk, and then enters Manzhouli, China.
② Central Asian HSR line: The starting point is Urumqi, this line runs through Kazakhstan, Uzbekistan, Turkmenistan, Iran, Turkey and other countries, and finally arrives in Germany.
③ Pan-Asian HSR line: It starts from Kunming, passes through Vietnam, Cambodia, Thailand, Malaysia, and finally arrives in Singapore. Process: The China-Myanmar rail tunnel starts in June.
④ China-Russian and Canadian-American HSR line: It starts from the northeast of China and travels north through Siberia to the Bering Strait. It builds a tunnel across the Pacific Ocean to Alaska, then from Alaska to Canada, and finally to the U.S.

7.3.1 Asia Pacific Loop Restarts "Silk Road"

According to the HSR construction plan of China, Japan and other countries, the Asian ring centered on China, east to Japan, west to Saudi Arabia, south to Malaysia, and north to Russia, the Asian HSR network formed by the Pan-Asian and Central Asian lines will be realized by 2050. See Fig. 7.16.

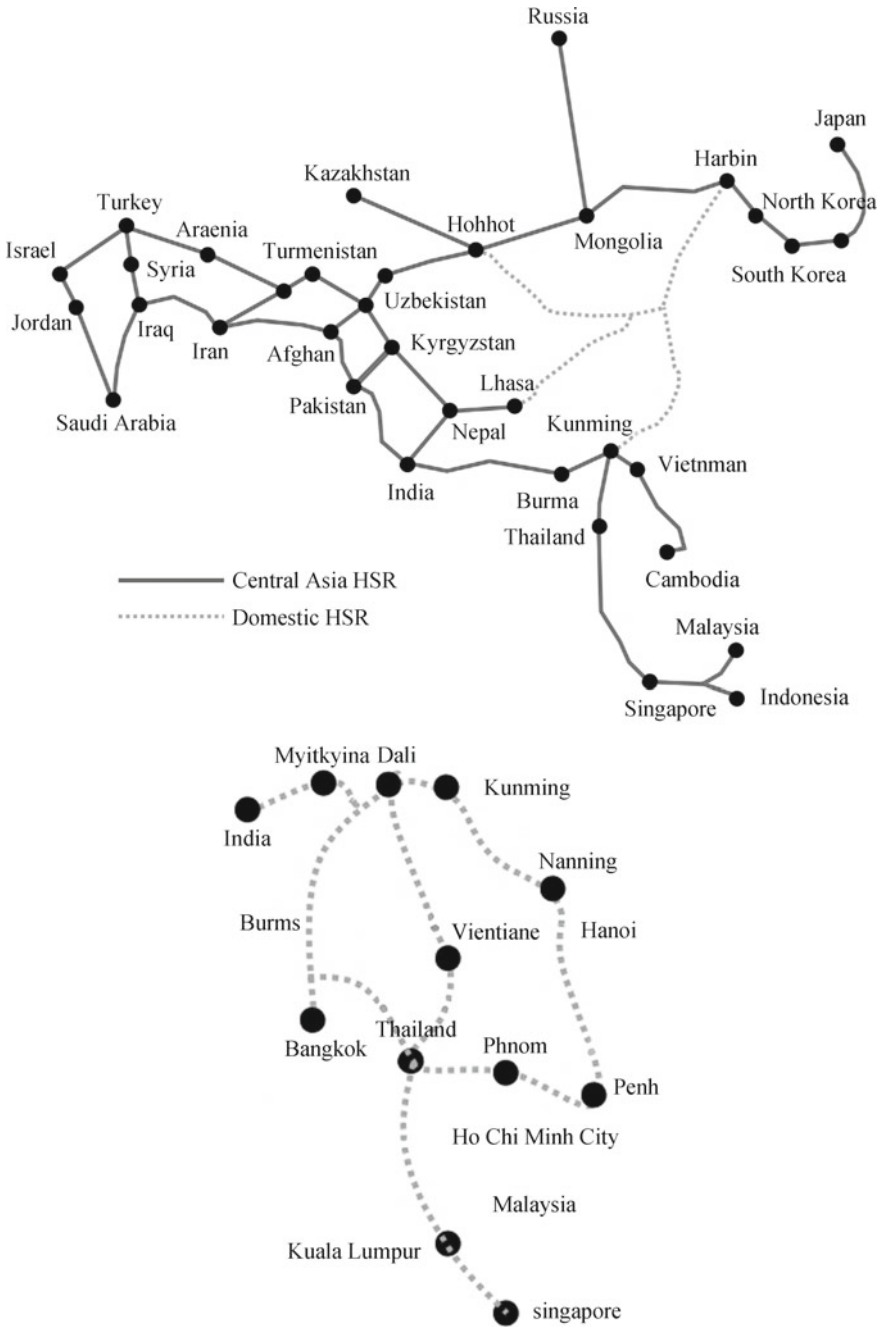


Fig. 7.16 The schematic of HSR line of Pan-Asian

7.3.2 Trans European Network Promotes European-African Integration

European HSR project "Trans European Network" is dedicated to building fast intercity trains through Germany, France, Spain, Italy, the United Kingdom and other countries, shortening travel time between EU cities and promoting EU economic development and achieving European integration. The current HSR network in Europe is mainly centered on France, and it is extended to the internal railway network of other European countries through the northern line, the Atlantic line, the southeast line and the Mediterranean line to form a European intercity express train network. Among them, the northern line is the main channel for the British, Dutch and Germanic TGV to enter France. France goes straight to Spain through the Atlantic line and the southeast line connects France with Switzerland and Italy.

7.3.3 Eurasian Green Line Integrates "Pacific Rim Economic Circle"

The Eurasian HSR project starts from London and passes through Paris, Berlin, Warsaw, Kiev, and after Moscow, it is divided into two routes, one enters Kazakhstan, the other leads to Khabarovsk which is far away from the Far East, and finally enters China. The construction of the Eurasian HSR will accelerate the passenger and cargo transportation between the EU, Russia and China, weaken the barriers to regional cooperation caused by space constraints, and promote the integration of the "Pacific Rim Economic Circle". The traffic artery that runs through Eurasia will recombine the production factors of the countries along the route. China can become the driving force of the east, the EU is the driving force for the west, Russia is the driving force for the north, India is the driving force for the south, and progress in all directions will converge in the Middle East. The schematic of Eurasian HSR line can be seen in Fig. 7.17.

7.3.4 China-US Transoceanic Line Promotes the Formation of the "Global Village"

The connection between China's HSR and the US's HSR can be achieved mainly through two paths. One is entering Europe through China's Europe-Asia line, and then entering the Americas through Europe. However, in view of the science and technology in short time, it is difficult to realize HSR lines across the Atlantic hence, the above line cannot be implemented. The other one is that China's HSR may pass through the northeastern part of Russia, across the Bering Strait, into Canada, and finally into the U.S. This route is mainly from Beijing in China, through the Harbin

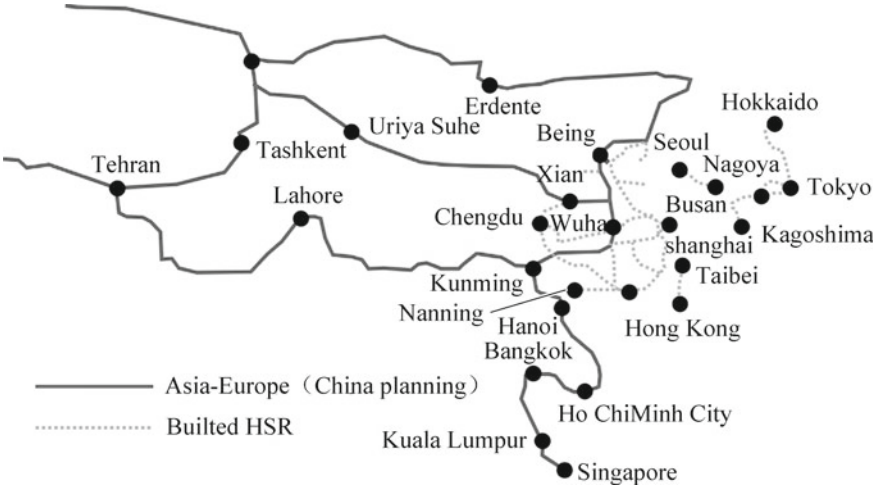


Fig. 7.17 The schematic of Eurasian HSR line

in the northeast to Russia's Yakutsk, through the eastern part of Russia to the Bering Strait, through the construction of the underwater tunnel into the Canadian western city of Fairbanks, along Whitehorse Fort McMurray and Edmonton, across Canada into Harvard, the northern city of the United States, and connected directly to Denver, the central city of the United States, through Harvard. The second planning route needs to overcome two technical problems along the way: on the one hand, it needs to cross the severe cold region of Russia in the east, and the HSR needs to overcome the safe operation under the cold and snowy conditions. Currently, it is basically solved successfully; On the other hand, crossing the Bering Strait, building a submarine tunnel is another technical problem that needs to be overcome. The technology is still in the process of tackling key problems. See Fig. 7.18.

China intends to cooperate with Russia, Canada and the United States to build a HSR line stretching 10,000 km that spans the Bering Strait and connects the two

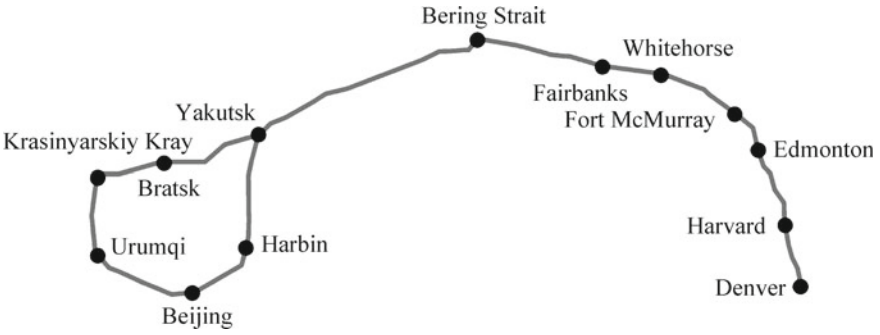


Fig. 7.18 The China-US HSR planning route

continents of Asia and the United States. The planned route runs north from the northeast, arrives at the Bering Strait via Siberia, crosses the Pacific Ocean by tunneling, arrives in Alaska, then goes to Canada, and finally arrives in the United States.

7.4 The Global Village Under SSR Environment

With the maturity of HSR technology, HSR will gradually replace the traditional railway lines and become a ground transportation method that competes with aviation. The HSR can not only shorten the travel time between regions, accelerate regional economic cooperation, but also have a strategic significance for the future world political situation. The planning and investment of the HSR is an important way to achieve integration with the world at an early date. Therefore, as a normalized vehicle that satisfies people's daily travel, the HSR in China has begun to transform into internationalization and globalization. Today, the HSR in China represents not only a means of transportation, but also the level of HSR and the spirit of the times, is a display of comprehensive strength.

By 2020, the total mileage of the global HSR will reach 42,000 km and the world will enter the "high-speed rail" era. With the integration of HSR in Asia, Europe, America and Africa, we can travel the world on HSR. China is standing at the forefront of the world's rails. China cooperates with the world to cope with global challenges, plan for the future, and create a better life for mankind.

7.5 Summary

In 1964, the world's first HSR was opened in Japan, and the first round of "high-speed rail heat" was launched worldwide. However, due to the technical problems, HSR has not been vigorously developed, and the operating speed is lower than 300 km/h. In 1995, French HSR technology became the technical standard for all-European HSR trains and was exported overseas. The second round of "high-speed rail heat" was launched worldwide. However, due to the economic downturn in the world, especially the limited economic capacity of developing countries, HSR was only built and operated in large and economically developed countries. In 2008, with the development of China's HSR, the world set off a third round of "high-speed rail heat". The HSR technology was developing in an advanced, mature, economic, applicable and reliable direction. In 2012, HSR was built and operated in developing counties because of the reduction of construction costs and the economic development of developing countries.

The development of the HSR has a major impact on national and regional development strategies. At present, most countries in the world have begun to build a transnational HSR, as soon as possible to achieve the rapid road access between countries and regions, eliminate the impact of geographical restrictions between

countries, and accelerate exchanges and cooperation between regions and regions. Considering the overall situation of national development, the development of the HSR has far-reaching strategic influences.

Strategically speaking, it helps to protect the national security. Considering the overall development of the world, The HSR has a profound impact on the world's political economy. The HSR can promote world integration and realize the "global village".