Design of China Railway Going Global Scheme

JIN Jing1,a
1China Academy of Railway Science Co., Ltd. Beijing, China
*a65254631@qq.com

Abstract—Chinese government put forward with “Belt and Road Initiative” in 2013, which prioritized infrastructure connectivity among countries along “Belt and Road” and gave a systematic framework for railway going global. This paper briefing on current system of world high-speed railway market with induction method, through quantifying planned railway length in different regions, divides international high-speed railway projects into four sub-systems, namely strategic railway projects, demonstration railway project, assistance railway projects and commercial railway projects, listing the features and proposes schemes for participating in international railway projects under different sub-systems. The research focuses on category-based international railway projects, and applies top-level design method for the Chinese enterprises to involve in international railway projects, which is of theoretical and applied significance for decision-making for going global.

1. INTRODUCTION
In 2013, the Chinese government put forward with the strategic conception of “jointly building the “Belt and Road” vision and actions. Railway is the backbone of transportation industry and the key infrastructure for economic and trade connectivity, meanwhile, railway “going global” is an important part of the national “Belt and Road” initiate. The major task for “Belt and Road” initiate is to achieve interconnection with neighboring countries, and to prioritize the railways connected with China, which are conducive to consolidating national defense security, safeguarding overseas interests, and safeguarding the security of national energy supply and other strategic materials. Through giving the brief introduction of world high-speed railway market, this paper divides foreign railway projects into three categories, elaborating on the features of each category, and finally, proposes strategies to involve in the international railway market.

2. OVERVIEW OF WORLD HIGH-SPEED RAIL MARKET
According to High Speed Lines in The World issued by UIC on 27th February 2020, an overview of high-speed railway operation, construction and planning was presented. Based on latest statistics, the overall high-speed railway length 104,413 km, including 52,484 km high-speed railway in operation, 11,960 km high-speed railway under construction. 11,383 km planned high-speed railway, and 28,586 km high-speed railway under long-term planning, which indicates over 39% of total high-speed railway is under planning and will be built during the next few decades. This brings a huge potential market for railway going global.

When segmentation of markets is probed, Asia Pacific, Europe and Middle-East are the markets with the great potential with high-speed planned length of 14,087 km, 10,843 km and 7,206 km respectively, which is far ahead of Africa (4714 km), North America (2608 km) and Latin America (511 km). Asia
Pacific region, Europe and Middle-East region accounting for over 80% of total high-speed railway planning length, indicating the ambition for these regions to promote high-speed railway development.

Table 1 Planned railway length (km) comparison between different regions

| Regions        | Planned railway (km) |
|----------------|----------------------|
| Africa         | 4714                 |
| Asia Pacific   | 14087                |
| Europe         | 10843                |
| Latin America  | 511                  |
| Middle-East    | 7206                 |
| North America  | 2608                 |
| **Total**      | **39969**            |

For Asia Pacific region, India (4634 km), Thailand (2641.5 km) and Australia (1749 km) are the top leading three countries in railway planning; for European countries, Russia, Iran, France and Poland are top leading countries in railway planning with 2629, 1768, 1725 and 1680 km respectively; for Middle-East region, Turkey (5173 km) and Iran (1768 km) is among the top two leading countries in high-speed railway planning, far ahead of other countries [1].

3. CATEGORIES OF FOREIGN PROJECTS

According to the importance of foreign railway projects to national security and economic interests, from the perspectives of maintaining national strategic security, supporting economic and trade and production cooperation, facilitating diplomatic cooperation, and elevating industrial development, foreign railway projects can be divided into four types according to the importance of the project, namely strategic railway projects, demonstration railway projects, assistance railway projects, and commercial railway projects[2].

3.1. Strategic railway projects

The characteristics of strategic railway projects are that they are of great strategic significance. They usually can transform the current pattern of China’s import and export material transportation and elevate regional influence. Besides, strategic railway projects involve many countries and are difficult to coordinate. It is difficult for countries along the route to reach a consensus on building a transport corridor due to the complex geopolitics. Also, the barrel effect is obvious. The role of the strategic railway corridor depends on the shortcomings of the corridor, that is, there are missing sections or bottlenecks in the corridor.

Table 2 listing of strategic railway projects

| No. | Project Type       | Country       | Project                                      | Length km |
|-----|--------------------|---------------|----------------------------------------------|-----------|
| 1   | High-speed railway | Iran          | Tehran-Isfahan High Speed Rail               | 410       |
| 2   | High-speed railway | Turkey        | Kars Province-Idir Province (Turkey East-West High Speed Rail) | 2000      |
| 3   | High-speed railway | Malaysia Singapore | Malaysia – Singapore High Speed Rail         | 350       |

3.2. Demonstration railway projects

Many overseas countries participating in the “Belt and Road” vision and actions are still in the process of economic development. Domestic products are abundant but the quality of transportation infrastructure is low or poor, and there is a strong demand for industrial cooperation. The construction of railway projects will create conditions for the development of relevant industries in the target country, and it will also facilitate the promotion of industry and capacity complementarity between China and the target country.
In the 1970s, the Tanzania-Zambia Railway, which was aided by the Chinese government, was opened to traffic and became the main traffic trunk linking Tanzania and Zambia railways, providing a sea channel for Zambian exports. The Tanzania-Zambia Railway, as a precedent for China to utilize foreign railway projects to strengthen unity and cooperation with developing countries, has won the friendship of most African countries, and has played an important and positive role in enhancing China's international status and international prestige. Africa still maintains sound diplomatic relationship with China. From development perspective, as China's economic size and international influence have increased, China's exchanges with the world have become more extensive. It is of important diplomatic and strategic significance to actively assisting developing countries in Africa and other regions to build railways, helping people improve people's livelihood, establishing a national image for China, and winning more respect and support on the international stage. For this type of projects, maximum design speed is relatively low below 200 km/h, with the purpose of elevating conventional railway infrastructure of building a new conventional railway. Since high-speed railway construction is expensive and time-consuming, therefore, it is not the optimal choice for most developing of under-developed countries with poor railway infrastructure.

Table 4 listing of Assistance railway projects

| No. | Project Type          | Country    | Project                     | Length km |
|-----|-----------------------|------------|-----------------------------|-----------|
| 1   | Conventional railway  | Nepal      | Geelong-Kathmandu (China-Nepal railway) | 80        |
| 2   | Conventional railway renovation | Tanzania, Zambia | Tanzania-Zambia railway renovation | 1860      |

3.4. Commercial railway projects

In the context of economic globalization, "going global" to carry out transnational operations is an inevitable choice for companies to improve their international competitiveness. The "Going Global" of China Railway will enhance the influence and profitability of Chinese railway enterprises in overseas markets by entering the overseas conventional railway and high-speed railway construction market, and realize the development and growth of the railway industry in both domestic and foreign markets. Railway "going global" is not only limited to the field of railway construction, it can also actively move towards direct investment in developed countries to build factories, set up research and development institutions, mergers and acquisitions or cooperation with enterprises with higher technology, and establish joint ventures to develop transnational operations. This positive attempt and practice will help China Railway to attract international high-end talents, improve the overall technical level, innovation
capabilities and transnational operating capabilities of railway-related enterprises, and elevate international competitiveness of China railway. Railway companies usually spontaneously involve in commercial foreign railway projects.

Table 5 listing of commercial railway projects

| No. | Project Type     | Country  | Project             | Length km |
|-----|------------------|----------|---------------------|-----------|
| 1   | High-speed railway | India    | Delhi-Patna         | 991       |
| 2   | High-speed railway | Thailand | Bangkok-Phitsanulok | 380       |
| 3   | High-speed railway | Turkey   | Halkali-Kapikule    | 229       |

4. SCHEME PROPOSED FOR RAILWAY GOING GLOBAL

China is located on the west coast of the Pacific Ocean, at the head of the Eurasian Continental Bridge and the starting point of the "Silk Road" economic belt. At the same time, China is located in eastern Asia and connected with 14 neighboring countries. Regional trade relations with neighboring countries are enhancing, and political and economic cooperation is promoted. Railway “going global” should actively connect with the railway planning and construction of countries along “Belt and Road”, and give priority to promoting interconnection projects with railways along the “Belt and Road” and neighboring countries, and strive to build an international railway grand capacity corridor to support the construction of the Silk Road and Economic Belt [3].

4.1. Scheme for strategic railway project

Among the strategic railway projects, Eurasian Corridor is the basic support of the Silk Road and Economic Belt. This corridor is not only the main transportation route of the ancient Silk Road, but also the key area of the New Silk Road and Economic Belt. West Asian countries are China’s important energy supply sources. The western end of the European Economic Circle is one of the most economically and technologically developed regions in the world.

The key issue of the Asia-Europe corridor is to connect the missing sections in Central Asia, build a railway corridor with standard gauge, connect China with West Asian countries, and create a large-capacity international corridor with standard gauge across Asia and Europe. However, the geopolitics of Central Asia are complicated with competing interests of the United States, Russia and other countries. China should be prepared to fight a long-term "protracted war", carry out a top-level layout design for the route selection of the Asia-Europe corridor, and try to avoid the Russian North-South railway corridor, under the premise of reducing the conflicts of strategic interests with the United States and Russia, it is advisable for China to actively seek out the interests of Central Asian countries, seize favorable international opportunities, seek common ground while reserving differences, adopt flexible paths, build the corridor section by section, and finally realize the strategic goal of building a large capacity corridor for the Eurasian railway [4]-[5].

The China-Pakistan Corridor, the Pan-Asian Corridor and the Bangladesh-China-India-Myanmar Corridor are mainly located in Southeast Asia and South Asia. China has obvious geographical advantages in this region. Among them, Pakistan and Myanmar have established comprehensive strategic partnerships with China and had close cooperation. China-Pakistan Corridor connecting China with Gwadar Port and China-Myanmar Corridor connecting China with Kyaukphyu Port will enable China to break through the strategic containment of the Pacific Strait of Malacca, and transfer the landing points of strategic materials such as energy, food, and minerals from the Pacific to the Indian Ocean, and from West Asia and other important regions. Energy supply will be more secure, and railway
corridor has a very important strategic significance for transforming the regional transportation pattern [6].

The China-Pakistan and China-Myanmar corridors involve Pakistan and Myanmar and other countries, and have close relations with China. In addition, the railway infrastructure construction and operation capacity is weak and the railway construction demand is strong. It can give full play to China’s edge in railway design, construction, equipment supply, operation and maintenance and financing. In terms of comprehensive advantages, a package of cooperation in corridor construction should be carried out to promote the implementation of corridor planning and construction as soon as possible, and integrate Chinese railway standards into the corridor to further consolidate China’s geographic advantages in South Asia.

Countries along the Pan-Asian Corridor such as Thailand, Laos, Malaysia, Singapore and China have good bilateral relations and close economic and trade cooperation with China [7]. The construction of the Pan-Asian Corridor will realize the interconnection of relevant countries, connecting industrial parks and logistics centers along the route, and building the most important platform and channel for trade cooperation and close exchanges in Southeast Asia. Especially in the context of Sino-US trade friction, it is important for promoting China’s foreign trade. The strategic hinterland and the promotion of stable economic and trade growth are of important strategic significance.

The Pan-Asian Corridor involves many ASEAN countries, and China has close economic and trade cooperation with them, and has good diplomatic relations. Indonesia, Myanmar, Malaysia, etc. are the main markets for Chinese railway enterprises to contract projects. Most of the countries in the region are developing countries with limited economic strength, and most of the construction funds need to be borrowed or financed from other countries, and the railway construction and operation experience is lacking. This region is an important destination for China going global, which is conducive to the formation of an interconnected and inter-Asian railway network, and is of great significance to further promoting intra-regional economic and trade cooperation. Therefore, China can focus on participating in the competition in the Southeast Asian market and trying to embed Chinese railway standards into the corridor. However, the competition between China and Japan in this region is fierce, and they both expect to increase their influence within the scope of economic radiation. The relevant countries often take advantage of the eagerness of China and Japan to seize the market, as well as China’s strategic intention to build international corridors, and negotiate “prices” for corridor projects., putting forward conditions that are not easy to be accepted. For this type of project, it is crucial for us to fully communicate with the target country to clarify the positioning and role of the project. If the strategic value of the project to China is prematurely or excessively emphasized, it can often be used by the target country as a bargaining chip in negotiations, asking for prices, making the project into a disadvantageous position; secondly, it is necessary to accurately grasp the market demand and carefully prepare the project technology, and the key issues in the investment and financing, construction mode, and construction standards of the target country's relationship, should be tailored to local conditions, and a win-win technology plan for the target country that is more competitive than the competitors will be formulated; again. It is necessary to pay close attention to the real-time trends of competitors such as Japan. Japan has a deep relationship with Southeast Asian countries. Its leading banks have provided many loans with additional clauses to invest in Southeast Asia. Its leading companies have also obtained construction, technical services and technical services for these projects. The equipment manufacturing share is also a competitive item, and media and public opinion are often used to disseminate unfavorable news about China's railways. In view of this type of situation, the government and enterprises need to deal with it properly.

4.2. Scheme for Demonstration railway project

Through implementing the national strategic requirements, railway "going global" layout should give priority to building interconnected international transportation corridor with railways as the backbone. At the same time, for regions or countries that cannot achieve interconnection, priority should be given to countries and regions that are closely related to China’s foreign trade politics, highly dependent on
strategic resources and have great potential for railway development, and give full play to China’s railway design, construction, and equipment supply, Operation and maintenance, etc., actively carry out a package of cooperation, establish an international brand for the railway "going global", give full play to the sound demonstration role of the project, guide the future railways to better participate in the railway competition in the region, and contribute to the construction of the “Belt and Road”.

The characteristics of the demonstration railway project have following features: First, the level of cooperation is high. The project construction needs to be in line with the strategic interests of the two countries. Both governments are willing to fully support the project development and escort the smooth implementation of the project; second, the entire industrial chain is covered through fully involving in project investment and financing, survey and design, construction and construction, operation and maintenance, mobile equipment, technical standards and other aspects of the entire industry chain. The prospects for project benefits are good. Railway engineering projects should produce sound economic benefits to support the virtuous cycle of project operation. Besides, the project organization demonstration is of great significance, and the construction company should make full preparations and careful organization, avoiding various risks, which can play a good exemplary role for similar project construction.

According to the previous international cooperation of China railways, Indonesia’s Jakarta-Bandung high-speed rail and Moscow-Kazan high-speed rail are highly valued at the government level and actively promoted at the corporate level. With the support of the governments of both sides, construction companies carefully organize and carefully construct the projects, which is constructive to creating demonstration projects of China railway going global.

4.3. Scheme for assistance railway project
Promoting friendship diplomacy is also one of the important missions of the railway to "go global." Through the construction of foreign aid railway projects, deepening the friendship between China and foreign countries, demonstrating the responsibility and elevating the image of China will help expand China’s influence in the world, and enhance China's soft power. The characteristics of foreign aid projects are that the political and diplomatic effects are significant and the economic benefits are low. Such projects mainly start from the perspective of maximizing the support of the international community, with little consideration of the economic benefits. For countries with assisted railway projects, railway technology, project fund, construction materials and management personnel are lacking, and railway infrastructures are poor. These projects always provide various preferential conditions for Chinese companies and encourage them to undertake projects; meanwhile, for assistance railway projects, long-term support from the government level is required for project operations.

Due to the large investment, long project cycle and low economic benefits of this type of project, it is advisable to minimize risks in terms of project selection and participation content. The target country should be politically stable, friendly with China in terms of diplomatic relationship, with certain reputation in the international community. It is not advisable to choose countries with frequent regime changes, prominent social and ethnic conflicts, and complex international relations, to avoid failing to achieve the expected political benefits after the project is invested. At the same time, taking into account the political and cultural environment and technological foundation of the target country, the participation of Chinese companies in the surveying, construction, operation, maintenance and other links should be considered as a whole.

4.4. Scheme for commercial railway project
At present, China’s economy has shifted from high-speed growth to medium- and high-speed growth, the mode of economic development has shifted from extensive growth of scale and speed to intensive growth of quality and efficiency, and the economic structure has shifted from incremental expansion to the in-depth adjustment of inventory adjustment and simultaneous optimization of incremental growth. The “going global” railway is not only conducive to promoting the construction of the “Belt and Road” at the national level, promoting capacity cooperation with countries along the route, and advancing the
industry and capacity complementarity between China and related countries, and at the enterprise level, it is also conducive for Chinese companies to make full use of domestic and international markets, actively undertake overseas commercial railway projects, expand the development space and economic growth points of enterprises in the international market, and gradually establish an international brand of enterprises.

The characteristics of commercial railway projects are as follows: Firstly, the pursuit of economic benefits is the main goal. Chinese companies participate in commercial railway project competition to earn direct economic benefits or potential benefits such as the international market. Secondly, enterprises are the main players in international market competition, with more spontaneous collaboration among enterprises and less direct support from the government level. Thirdly, fierce market competition requires Chinese companies to have rich practical experience in international competition. Fourthly, commercial railway projects cover a wide range, including design consulting, equipment manufacturing, construction, operation and maintenance, investment and financing, talent training and other, with areas ranging from Asia, Africa to Europe and the United States, from low-end to top, from a single link to the entire industrial chain.

5. CONCLUSION
International railway construction is a complex systematic engineering, which brings great challenge and opportunities for China to participate in. Different railway projects with various political background and commercial purposes requiring Chinese company to adopt different strategies tailoring to specific conditions of the railway project and considering bilateral diplomatic relation between two countries. Political, economic, social, and technological risks on various projects should be precisely evaluated before involvement. This paper takes an initiative study on international railway projects from the perspective of strategies suggestion, through proposing strategies on different categories of international railway project, which provides reference on risks and opportunities for Chinese railway enterprises and the competent government agencies to go global.

ACKNOWLEDGMENT
Fund Project: Youth Project of China Academy of Railway Sciences “Research on international talent training mode facing the demand of ‘Railway going out’”, contract No. 2019YJ175.

REFERENCES
[1] UIC.High-speed Lines in the World [EB. OL]. https://uic.org/IMG/pdf/20200227_high_speed_lines_in_the_world.pdf.
[2] Liu Yuming, Liu Yanhong, Zhang Jing. Research on Critical Success Factors and Their Impact Mechanism on Construction Projects under Going-global Strategy of China’s Railway[J]. Journal of the China Railway Society, 2019, 41(1):29-35.
[3] Wang Fei. Research on the layout of international railway passages for the "Belt and Road"[J]. Railway Transport and Economy, 2018, 40(4): 13-17.
[4] Cui Yanping. Analysis of China-Europe International Railway Transportation Channel System[J]. China Railway, 2017, (11): 41-45.
[5] Cui Yanping. Research on the Planning and Layout of China-Europe International Railway Transport Corridor[J]. Railway Economic Research, 2018, (4): 1-5.
[6] Deng Xiaoyi. Research on the plan of the China-Pakistan Economic Corridor Railway Corridor ML-1 Line Haweilian Land Port[J]. Railway Transport and Economy, 2020, 42(5): 86-91.
[7] Wang Gengjie. Research on the Development Countermeasures of China-Laos Railway International Combined Transport Logistics [J]. Railway Transport and Economy, 2017, 39(11): 1-4.