

Railway to Lhasa: An Assessment

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On October 12, 2005, China announced the completion of a railway line to Tibet—one of the world's highest train routes. This railway line climbs 5,072m (16,640ft) above sea level and runs across Tibet's snow-covered plateau—dubbed the roof of the world. China's official *Xinhua* news agency while celebrating the achievement said that the equivalent of USD 3 billion had been spent on the challenging 1,118km (710-mile) section, after four years of construction.

The announcement of the completion of the railway line to Tibet coincided with the launch of *Shenzhou VI* carrying two astronauts (*taikonauts*) and was a calibrated exercise in projecting China's image as a world power with the technological capability to sustain itself.¹

Details of the Tibet Railway

Till the completion of the railway line, the Tibet Autonomous Region (TAR) covering an area of 1.2 million square km, was the only province inaccessible by rail in China. China's design for a railway network on the Tibetan plateau that would bring Tibet under Chinese control was conceived first by the Nationalist Government (1911–1949). Dr. Sun Yat Sen, then Director General of National Railway proposed to connect Lhasa with China but had to give up the proposal as many thought it 'fanciful and insurmountable.' Beginning in the 1950s, efforts were made to locate sites for construction of a line on the 'roof of the world.' The Korean War and the deterioration in Sino-Soviet ties delayed the Tibet railway.

In October 1994 the proposal to connect Lhasa by rail was made and under China's Ninth Five Year Plan (1996-2000) a preliminary route survey and feasibility studies were conducted. The Number One Survey and Design Institute of China's Ministry of Railways was instructed to prepare blueprints for a Golmud-Nagchu-Lhasa route and an alternative Lanzhou-

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Nagchu-Lhasa route. Consequently, the Tenth Five Year Plan (2001-2005) allocated a budget of around 19.5 billion *renminbi* (RMB) for the construction of a railway between Golmud and Lhasa. This project is the second phase of the line from Xining (the capital of Qinghai province) to Lhasa with a total length of 1,956km. The first 814km section from Xining to Golmud, a traffic hub in the western part of Qinghai province, opened to traffic in 1984.

Highlighting the national prestige behind constructing the railway to Lhasa, in November 2000, President Jiang Zemin stated: “[B]uilding the Qinghai-Tibet Railway is of great importance to development of communications and tourism, and will promote economic and cultural inter-flows between China’s hinterland and Tibet.”² In December 2000, the State Planning Commission summoned an appraisal meeting in Beijing, and submitted an official report to the State Council on construction of the Qinghai-Tibet Railway. In early February 2001, the State Council opened the premier’s work meeting, listening to the report by the State Planning Commission on construction of the Qinghai-Tibet Railway. The meeting approved the construction of the project.

The Golmud-Lhasa route stretches from Nanshankou in Golmud city (Qinghai province) to Lhasa via Nachitai, Xidatan, Kunlun Mountain, Chumar River, Tanggula Mountain, Amdo, Cona, Nagchu, Sangxiong, Nayake, Damxung, Ningzhong, Yangbajain Canyon and Deqen. About 564 km of the railway is located inside Qinghai Province, and 516 km in the TAR. Of the total track length of 1132 km, more than 960 km is above an altitude of over 13000 feet above sea level. More than 560 km of the railway track has been laid on permafrost earth. The railway line has been built in regions where the annual average air temperature is minus one to minus five degrees and winter temperatures dropping as low as minus forty degrees Celsius. The rail line will pass through thirty tunnels and bridges, covering a total distance of 37.5 km, and run parallel to the Golmud-Lhasa Highway. An engineering marvel on the Golmud-Lhasa rail is the Fenghuoshan Tunnel, the world’s highest. This tunnel was constructed by the 23rd Engineering Construction Bureau. The tunnel lies at the 7th mark section of Golmud-Lhasa stretch. Stretching 1,390 meters it is located 5,000 meters above sea level.³ The longest tunnel on the Lhasa railway is the 3345 meter Yangbajain No.1 tunnel. The tunnel is 4,264 meters above sea level, located 80 kilometers away from the regional capital Lhasa.⁴ The line will cross over the five major passes of Kunlun,

Hoh-Xil, Fung-ho, Thang-la and Nyenchen Thangla. It will also pass through eight well-known basins or flatlands, such as Shingta-Then, Chumar, Thogthen, Chutsen, Nagchu, Damshung, Yangpachen, and Lhasa. The main advantage of the Golmud-Lhasa line is that it is the shortest route linking Tibet's capital to China and requires the lowest investment running as it does through large swathes of flatland.

The railway to Lhasa is just the beginning of a concerted effort by China to put in place an ambitious infrastructure in its western region subsumed under the overall campaign termed the 'Great Western Development.' On the anvil are three other railway projects that will connect Tibet to the surrounding provinces. The first of these is the Gansu-Tibet Railway. The railway would extend from Yongjin County near Lanzhou in Gansu Province to Lhasa via Guanghe, Hezhi, Linxia, Dari, Shiqu, Yushu, Sog County and Nagchu to join the above mentioned Qinghai-Tibet Railway. It would pass through Gansu, Sichuan, Qinghai and Tibet, extending 2,126 km with 491 km in Gansu, 794 km in Qinghai, 99 km in Sichuan and 742 km in Tibet. It is estimated that around 1,394 km of the railway would be around 4,000 meters above sea level, and 1,771 km will have to be cut through an area of permafrost. The total investment on this railway line would amount to 63.84 billion Yuan (calculated according to 1995 prices).

Parallel to the Gansu-Tibet railway is the construction of the Yunnan-Tibet railway. This railway would extend from the western terminus of the Guangtong-Dali Railway in Yunnan Province to Lhasa in Tibet, via Hehuihe River, Lancangjiang River, Meili Mountain, Nujiang, Mainling, Nang, Sangri and Gunggar. Extending 1,594.4 km, it is estimated that the project would be completed in 10 years. The investment involved would total 63.591 billion Yuan (according to 1997 prices).

The last of the railway projects linking Tibet to China is the Sichuan-Tibet railway. This would extend from Dujiangyan close to Chengdu in Sichuan Province to Lhasa via Markang in Aba, Jinshajiang River, Gyangda, Lancangjiang River, Bome and Yunnan-Tibet Highway. It would cover 1,927 km, with 1,243 km in Tibet. About 1,180 km would have an average elevation of 3,000-4,000 m, with 132.5 km over 4,000 meters. Bridges and tunnels would add up to 819.24 km in length. The investment involved in this project is to the order of 76.567 billion RMB (according to 1995 prices).

Terrain Challenges to the Tibet Railway

The main technical difficulty facing the railway is the permafrost regions over which the railway has been built. These regions, if disturbed, may result in a permanently degraded environment. For engineers, it is far simpler to construct a railway line over rocky terrain. The problem with permafrost is that it is wet ground that moves with freezing and thawing depending upon the season. The Tibetan plateau in this way is worse than areas in Alaska, Siberia and Scandinavia, as there is more radiation during the summer months. The frozen earth is also unstable owing to a relatively high earth temperature. The railway presents, therefore, an engineering challenge of proportions not faced previously. For the engineers involved in the project the ultimate aim is to reduce the amount of heat ascending from the earth's surface, thereby increasing the reserves of frozen earth.⁵ In order to adapt to various frozen earth characteristics, different forms of roadbed have been adopted, such as the slab-stone ventilation roadbed, pipe ventilation roadbed (PVC pipes through the bottom), a sun-shaded roadbed, and a bridge-style road. The method most widely applied on the Qinghai-Tibet Railway is the slab-stone ventilation roadbed.

The other important technical aspect pertaining to the Tibet railway was the challenge of using locomotives at high altitudes. Conventional diesel locomotives face problems when oxygen is scarce and hence high performance engines had to be constructed. On November 15, 2002, the Qishuyan Locomotive & Rolling Stock Works, located near Shanghai unveiled the first of a new class of locomotives for the Tibet railway, the DF8CJ 9001. It is called "Holy Boat on the Snow Land." The DF8CJ, a type of AC electric transmission diesel locomotive for freight has been developed for fast and heavy-duty freight transportation on China's railway network. It is an ideal traction power equipment with high power and less maintenance because it not only meets the demand of single engine traction of 5000 tons and heavy duty at the maximum speed of 90km/h., but also meets the requirement of fast freight transportation at the maximum speed of 120 km/h. The locomotive, equipped with two 16V280ZJA diesel engines and AC-DC-AC transmission as its main transmission, has the following advantages: high power, high utilisation coefficient of adhesion, wide speed range of traction effort and easy maintenance. The engine generates 2700 kW at 5100 m altitude and 3400 kW at 2800 m. The maximum speed is 100 km/h. Many new structures and technologies have been incorporated

in the locomotive, such as imported IGBT AC transmission traction converter system, auxiliary AC electric transmission system, computer control system, AC asynchronous traction motor, dry water cooling system, electronic injection equipment for diesel engine, load-bearing type fuel tank structure, full power self-load testing performance resistance braking system and so on.⁶ The locomotive weighs 86 tons.

Strategic Aspects of the Tibet Railway

The strategic need for China to have a railway link with Lhasa overrides all other considerations. Addressing the Western Forum in Chengdu on October 22, 2000, Sun Yonfu, China's Vice Minister of Railways, said that China would build a railway to Lhasa "to promote the economic development of the Tibet Autonomous Region and to strengthen national defence."⁷

For China, the railway to Lhasa is both, economically and politically significant. It will make it possible for transporting mineral resources from Tibet to the Chinese mainland. According to official Chinese surveys, Tibet has proven deposits of 126 minerals, with a significant share of the world's reserves of uranium, lithium, chromite, copper, borax, and iron. Over the past four decades, the Chinese government has steadily escalated its mining activities on the Tibetan plateau. Earlier, during Mao's Great Leap Forward, thousands of prisoners and forced immigrants were dispatched to mining camps in Tibet and Qinghai. The mineral reserves in Tibet are distributed throughout the plateau. More than 50 salt and chemical plants have been built around the Tsaidam Basin, whose products are exported to the Middle East and Europe.⁸ Near the start of the line south of Golmud, there have been found mineral resources: Copper, cobalt and gold. There are possibly, large oil reserves along the railway line near Lhuenpola basin (4700 m) as well as near Jangtang and Kyegudo. There is an oil refinery and a potassium products plant at Golmud.

For the Chinese it will make the economic development of Tibet easier, as transportation prior to the railway line was limited to trucks on ramshackle highways. As of now the only connection between Golmud and Lhasa is a bumpy and poorly maintained road. A trip on this road takes three days. With trains, this journey can be reduced to 24 hours for freight and 18 hours for passenger trains. The railway will vastly increase transport capacity and speed, as well as mobility for passengers, who might

well be economic migrants to a new land opened up by the possibilities of better infrastructure.⁹

Politically speaking, the railway will make it easier to deploy Chinese troops into Tibet, thereby making it easier to enforce Beijing's authority over the Tibetans. A report in the *Qinghai Daily* on September 12, 2001 described the railway as the "political [front] line" in consolidating the south-western border defences and stabilising Tibet. Further, the TAR five-year plan states that building a railway in Tibet "is of the utmost importance for consolidating the south-western border of the motherland, exploiting rich natural resources along the railway and establishing close economic and political ties between Tibet and other parts of the country." The proposed railway would further remove the barriers preventing the complete integration of Tibet into China in both political and economic terms.

There are also security goals. At an international development conference held in Xining city, Qinghai province from July 21-24, 1998 where the feasibility and cost benefits of the Qinghai-Tibet railway were discussed by Chinese and Western scientists, the Chinese scientists admitted that while the extension of the railway could not be justified on economic grounds, there was a clear political need for the railway - particularly in order to strengthen border security.

Conclusion

The railway to Lhasa is a significant strategic development. China's 'Great Western Development' which earlier was confined to the western provinces has now reached Lhasa. The railway line with its technical features clearly establishes the improved transport and communication infrastructure in China with its capabilities for civilian and military use. While the railway in the near term might attract more Han migrants to Tibet, the other ongoing railway projects linking Tibet to its neighbouring provinces of Sichuan and Yunnan deserve more attention. If one were to go by the opinion expressed by certain Tibetan exiles, there is also the possibility of the railway being extended by the Chinese authorities from Lhasa to Shigatse, and from Shigatse onwards to Khasa (Zhangmu in Chinese), close to the Nepal border.¹⁰ The emergence of Nepal as a sphere of influence of China is not ruled out. For King Gyanendra in Nepal who is getting increasingly isolated by the international community, a Chinese

railway line to Nepal will provide strategic leverage against India. Also, apart from the existing Kodari highway to Kathmandu, China and Nepal have agreed to build another road linking Syaphrubeshi-Rasuwagadhi, though construction is yet to begin. Recently, China had sent 18 truckloads of arms to the Royal Nepalese Army through the Kodari highway. The railway to Lhasa thus has significant geopolitical ramifications.

References/End Notes

- ¹ Ironically, in the late 19th century to show its scorn for railways, the Qing administration in 1877 bought the first foreign built railway line in Shanghai – only to tear up the tracks and ban future constructions. See Robert Lee, *Tools of Empire or Means of National Salvation? The Railway in the Imagination of Western Empire Builders and Their Enemies in Asia*, Institute of Railway Studies and Transport History Working Papers, York University, May 2001.
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- ³ See, “World’s Highest Tunnel to be Constructed” <http://english.peopledaily.com.cn/200107/30/eng20010730_76096.html> Accessed on October 20, 2005
- ⁴ See “Longest Tunnel on Qinghai-Tibet Railway Completed” <<http://www.china.org.cn/english/2003/Oct/77142.htm>> Accessed on October 24, 2005.
- ⁵ “Permafrost warming a challenge to Tibetan train route” <<http://www.innovations-report.de/html/berichte/geowissenschaften/berichte-37706.html>> Accessed on November 10, 2005.
- ⁶ See Qishuyan Locomotive & Rolling Stock Works at <<http://www.qscn.com/english/Product.asp?flag=deatil&sid=9&pid=119>> Accessed on November 14, 2005.
- ⁷ Hans Schaefer, “The Construction of the Railway to Tibet” <<http://www.c2i.net/schaefer/tibetrail.html>> Accessed on 26 October 2005.
- ⁸ Hans Schaefer, Ibid.
- ⁹ See, “Qinghai-Tibet railway to drive economic development in Tibet” <http://news.xinhuanet.com/english/2002-12/03/content_648198.htm> Accessed on November 12, 2005.
- ¹⁰ See Gopal Khanal, “China extending railway to Nepalese border” <<http://www.studentsforafreetibet.org/article.php?id+586>>

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