



UIC Map of the South Korea's High-Speed Rail Lines

Located on the southern half of the Korean Peninsula in Eastern Asia, South Korea has a population of 48.9 million people, which ranks 25th in the world. It is listed as a predominantly urban country, with 83 percent of the population residing in urban areas. The capital of Seoul has almost 9.8 million people, with Busan following with 3.4 million. Ranking as the 13th largest economy,

South Korea has a GDP of \$1.549 trillion, with a GDP per capita of \$31,700 (ranks 40th in the world). South Korea currently operates over 400 km (250 miles) of high-speed rail lines, with an additional 235 km (140 miles) planned or under construction according to the International Union of Railways (UIC). The map above displays South Korea's current and planned high-speed rail network.

SYSTEM DESCRIPTION AND HISTORY

South Korea experienced significant growth between the 1960s and 1990s, with nearly 70 percent of the country's population distributed along the Seoul to Busan corridor. Development along this corridor caused major roadway congestion. High-speed rail was chosen as the mechanism to efficiently handle the intense population growth along this and other corridors.

The project to connect Seoul with Busan was developed in two phases: Seoul to Daegu was completed in 2004 and Daegu to Busan was completed in 2010. This line segment consists of 46 percent tunnels and 26 percent viaducts, which is an indication of the country's mountainous terrain. Several sources also highlight the fact that upgrades were also made to the conventional line from Daejeon to Mokpo. The table below contains information regarding the current high-speed line segments, along with other segments under construction or planned for future development.

UIC Table of South Korea's High-Speed Rail lines

| Stage | Speed | | Year Opened | Length | |
|----------------------------|-------|-----|-------------|------------|------------|
| | km/h | mph | | km | miles |
| In Operation: | | | | | |
| Seoul – Daegu | 300 | 185 | 2004 | 330 | 205 |
| Daegu – Busan | 300 | 185 | 2010 | 82 | 51 |
| TOTAL | | | | 412 | 256 |
| Under Construction: | | | | | |
| Osong – Gwangju | 300 | 185 | 2014 | 186 | 116 |
| Planned: | | | | | |
| Gwangju – Mokpo | 300 | 185 | 2017 | 49 | 30 |
| GRAND TOTAL | | | | 647 | 402 |

The 412 km (256 mile) Seoul to Busan high-speed rail line includes 10 stations along the line, with the first three located in the Seoul metropolitan area. One source indicates that all of the stations were designed as multi-purpose nodes, comprising two- to eight-story high buildings, with both underground and above ground floors.

Sources: "Privatization Versus Public Works for High-Speed Rail Projects"; "TGV South Korea"; *Advancing High-Speed Rail Policy in the United States*; *High-Speed Lines in the World*.

ECONOMICS AND FINANCE

The South Korean high-speed rail system is a government developed and operated system. It was a publicly funded project administered through the Korean High-Speed Rail

Construction Authority. The government agency Korail operates the country's rail services (high-speed rail operations are performed by Korean Train Express (KTX), a new agency under Korail), and the Korea Rail Network Authority builds lines and improves existing lines. Several sources highlight that South Korea chose to publicly finance and construct the system instead of participating in a public-private partnership because it had an objective of acquiring the technological knowledge and capability to build high-speed rail lines. The French TGV technology was chosen, with the core system contract led by Alstom. The contract included the supply of the core system and technology transfer, which consisted of the manufacture in South Korea of 34 out of the 46 trainsets. The first phase of the network (Seoul to Daegu) cost an estimated \$17 billion, with funding coming from two sources:

1. South Korean Government: 45 percent (35 percent contributions and 10 percent guaranteed loans).
2. Korea High-Speed Rail Construction Authority: 55 percent (24 percent foreign loans, 29 percent bonds, and 2 percent private capital).

Operating revenues will repay the loans incurred by the Korea High-Speed Rail Construction Authority.

RIDERSHIP AND TRANSPORTATION SYSTEM IMPACTS

Korail indicates reductions of travel time from 4 hours 10 minutes to 2 hours 40 minutes between Seoul and Busan on the KTX trains and 4 hours 42 minutes to 2 hours 56 minutes between Seoul and Mokpo, with the conventional line improvements mentioned above. These travel time improvements have led to steady passenger levels of around 37,000 as described in the table below.

South Korea's High-Speed Rail Passenger Traffic

| Year | Passengers (thousands) | Passenger-Km (millions) |
|------|------------------------|-------------------------|
| 2004 | 19,882 | 5,557 |
| 2005 | 32,370 | 8,937 |
| 2006 | 36,737 | 9,919 |
| 2007 | 37,315 | 10,028 |
| 2008 | 38,016 | 10,158 |
| 2009 | 37,477 | 9,937 |

Sources: *High Speed Rail Passenger Services: World Experience and U.S. Applications*; "Privatization Versus Public Works for High-Speed Rail Projects"; Korail website; *High-Speed Rail: A Study of International Best Practices and Identification of Opportunities in the U.S.*



Korean Train Express (KTX) train in Seoul Station, South Korea

Fares for the KTX high-speed rail service are reported as being 1.3 times that of conventional express trains (Saemaul and Mugunghwa services). However, this marginal increase in price is combined with the travel time between Seoul and Busan being reduced from almost 5 hours to less than 3 hours. The table below shows reported 2009 fares and travel times for the three levels of passenger rail service.

| Depart | Arrive | KTX | | Saemaul | | Mugunghwa | |
|--------|---------|-------------|--------------|-------------|--------------|-------------|--------------|
| | | Travel Time | Fares (US\$) | Travel Time | Fares (US\$) | Travel Time | Fares (US\$) |
| Seoul | Daejeon | 1:00 | 18.53 | 1:47 | 12.90 | 2:10 | 8.66 |
| Seoul | Busan | 3:00 | 41.48 | 4:48 | 34.04 | 5:45 | 22.95 |

As the major travel corridor in the country, the Seoul to Busan corridor also sees travel by car, bus, and airplane. One source indicates that the KTX high-speed rail service provides fares that are approximately 62 percent of the competing air service. A 2007 paper estimates the KTX captures approximately 60 percent of all the intercity travel between the two major cities; conventional rail captures 5 percent; air 20 percent; bus 6 percent; and car 9 percent. After the opening of the KTX, air passenger counts reduced by nearly half and intercity express decreased by about a quarter between Seoul to Busan.

Source: High-Speed Rail: A Study of International Best Practices and Identification of Opportunities in the U.S.



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