KOTI RESEARCH

02 High-speed Rails of Korea
- The 20-year History and Today -

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1. Construction of High-speed Rails and Their Operating Situation in Korea

The high-speed rail project of Korea was launched as the construction policy was finalized in 1989 after its necessity began to be discussed in the mid-1970s. Even after the commencement of the construction of the high-speed test track in 1992, the project was not smoothly carried out, so there were sharp social conflicts triggered by the route change issue in the section going through Gyeongju and the controversy about how to run through the downtown sections of Daejeon and Daegu. Even until the latter half of the project implementation, a lot of twists and turns were experienced including the environmental issues around how to pass through Mt. Cheonseong and Mt. Geumjeong. Having been suspended for a long time, the project gained a resuming force as the 2nd modified plan was announced for the Seoul-Busan high-speed rail in 1998 due to the impact of the IMF crisis and the like.

The 2nd modified plan included the electrification of the Daegu – Busan section of the existing Gyeongbu conventional line in Phase 1 and the construction of a new line was to be pursued in Phase 2, for the project was divided into two phases. Ultimately on 1 April 2004, which was after twelve years had passed since the commencement of the test track construction in 1992 and after six years from the finalization of the 2nd modified plan, the high-speed rail of Phase 1 was opened for revenue service, opening the history of Korea's high-speed rails at last.

Beginning with the opening of the Gyeongbu HSR Phase 1 (Seoul-Daegu) in April 2004, the project phase 2 (Daegu ~ Busan) was opened in 2010, and the dedicated high-speed rails were constructed in the downtown sections of Daejeon and Daegu, making it possible to travel between Seoul and Busan in 2 hours 20 minutes. Compared with before the opening of the line, the travel time along the Gyeongbu corridor was almost halved.

After that, in order to expand the beneficiary areas of high-speed rails, upgrade and speed-up projects were continually carried out for the existing conventional lines in parallel with the construction of new high-speed rails. Currently, three high-speed lines including Gyeongbu, Honam, and Suseo and three speed-up lines including Gyeongjeon, Jeolla, and Donghae are being operated by mobilizing KTX and SRT high-

speed trains of motive-power concentration type with a top operating speed of 300 kph. In 2024, KTX-Cheongryong began to be operated at a maximum speed of 320 kph. For this service, the trains are of motive-power distribution type. Along the speed-up railways including Gangneung, Jungang, and Joongbu, KTX-Eum trains of motive-power distribution type are being operated.

In such projects to increase the high-speed rails in Korea, the design speed was not limited to 300 kph when building the speed-up railways and upgrading the conventional railways. As a result of analyzing the project costs after the opening of the Gyeongbu speed-up line, when comparing the construction cost of high-speed railways with the construction cost of conventional railways, we found out that the threshold value of the maximum design speed was 250 kph at which the time saving effect was maximized with a proper construction cost. So, we have applied it. Therefore, the speed-up railways to be newly built and the conventional railways to be upgraded have been constructed by adopting the maximum design speed of 250 kph, and these lines include Gangneung, Jungang, and Joongbu Inland.[1]

Thus, by promoting additional speed-up railway construction projects besides the construction of new high-speed rails, the operation of high-speed trains which connect the capital region with local areas speedily has been expanded, and accordingly, it has become possible to provide high-speed train services for local residents in small and medium-sized cities as well as in major local cities. Thus, the people's basic rights of mobility have been expanded, and at the same time, proper contribution has been made to the local economic development by promoting the development of the commercial development of high-speed railway station vicinity areas, meeting the business demand, and transporting tourists.

Table 1 Present Situation of High-speed Rails Open in Korea

HSR Lines (Including Speed-up Lines)		Sections Opened	Line Length (km)	Opening Date	Design Speed (km/h)	Operating Speed (km/h)
Gyeongbu HSR	Phase 1	Siheung Connection Line -Daegu North Connection Line	223.6	Apr. 2004	350	305
	Phase 2	Daegu South Connection Line – Busan Connection Line	122.8	Nov. 2010	350	305
	Other	Downtown sections of Daejeon and Daegu	45.4	Aug. 2015	350	305
Honam HSR	Phase 1	Osong Station – Gwangju Songjeong Station	182.3	Apr. 2015	350	305
	Phase 2	Gwangju Songjeong - Gomakwon	26,4	Jun. 2019	350	305

1 Kang, K.D., & Roh, B.K. (2024). High-speed Rail Network Expansion. 「The 20-year History of HSR Construction in Korea」, 74-190.

HSR Lines (Including Speed-up Lines)	Sections Opened	Line Length (km)	Opening Date	Design Speed (km/h)	Operating Speed (km/h)
High-speed Line in the Capital Region	Suseo - Pyeongtaek	61.1	Dec. 2016	350	300
Jeolla Line	Iksan Station – Yeosu Expo Station	180.4	Oct. 2011	200-230	200
Donghae Line	Geoncheon Connection Line – Moryang Station – Pohang Station	38.4	Apr. 2015	200	200
Gangneung Line	West Wonju Station – Gangneung Station	120.7	Dec. 2017	250	200
Jungang Line	Cheongnyangni Station – West Wonju Station	86.4	Dec. 2017	230	200
	West Wonju Station – Andong Station	86.4	Jan. 2021	250	250
Joongbu Inland Line	Pangyo – Choongju Station	99.2	Dec. 2021	250	250
Gyeongjeon Line	Samrangjin - Jinju	95.5	Dec. 2012	200	150

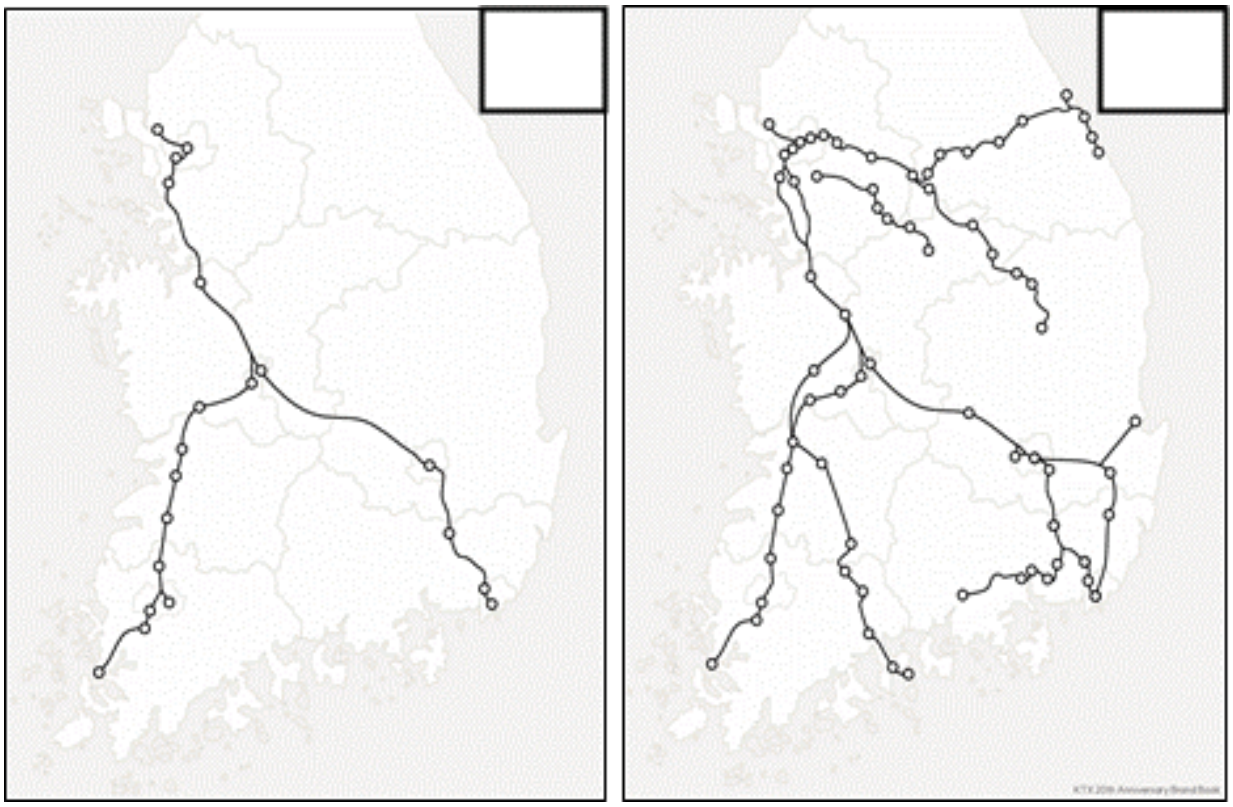
Source: 1) KORAIL(2024).「2023 Railway Statistics Yearbook」.
2) MOLIT, Korea National Railway, KORAIL, SR, Korea Railway Association, Korea Railway Foundation(2024).「The 20 Years of Korea High-Speed Rail History」.

Looking at each line, the Gangneung Line contributed to the successful hosting of the Pyeongchang Olympic Games 2018 by transporting sports teams, relevant people, and tourists not being impacted by the weather such as heavy snow. The Jeolla Line supported the successful hosting of the Yeosu Expo by transporting 1.38 million spectators of a total of 8.2 million for three months. Currently, the line is playing the key role in transporting the tourists visiting Yeosu, which amount to 10 million people annually.

Like this, the three high-speed rails and five speed-up rails having been operated since the opening of the Gyeongbu HSR have positioned as the core mode of transport by which to travel from one area to another, causing a lot of ripple effects such as the reduced travel time between different regions, the development of the MICE industry, and the promotion of the regional development.

The changes in the current high-speed rail and speed-up rail networks as of 2024, which is two decades after the opening of the high-speed rail Phase 1 in 2004, can be compared as shown in Figure -3. At the time of opening the KTX in April 2004, there were only two high-speed rails including Gyeongbu and Honam, and only twenty KTX stations. By completing the conversion of the Honam line also into double tracks and electrifying the line to connect Yongsan to Gwangju to Mokpo, it was opened in the form of operating only some sections at a higher speed than the operating speed of the conventional lines. At that time, the travel time by KTX was 2 hours 40 minutes between Seoul and Busan and 2 hours 47 minutes between Yongsan and Gwangju.
Having completed the construction of HSR Phase 2 in 2010, the Gyeongbu Line of KTX was completely

Figure 1 Changes in the HSR Lines and Their Stations



Source: KORAIL(2024).「The Brand Book Commemorating the 20th Anniversary of KTX Opening」.

opened, shortening the travel time between Seoul and Busan to 2 hours 23 minutes. Since then, KTX lines have been steadily increased. In December of the same year, the Gyeongjeon Line which runs between Seoul and Jinju was opened.

In October 2011, the Jeolla Line (Yongsan – Yeosu Expo) station was opened, and in April 2015, the Donghae Line (Seoul – Pohang) and the Osong – Gwangju Songjeong section of the Honam speed-up line was opened. By doing so, the travel time between Yongsan and Gwangju Songjeong has been reduced to 1 hour and 36 minutes.

In December 2017, the Gangneung Line (Seoul – Gangneung) was opened, helping to make the hosting of the Winter Olympics 2018 successful. And in January 2021, the Jungang Line (Cheongnyangni – Andong) was opened, and in December, the Joongbu Inland Line (Bubal – Choongju) was opened.

In December 2023, the Pangyo – Bubal section of the Joongbu Inland Line and the Seoul – Cheongnyangni section of the Joongang Line were opened, and currently, a total of eight lines and 69 stations are being operated as the high-speed rail network in Korea.[2]

2 KORAIL(2024).「The Brand Book Commemorating the 20th Anniversary of KTX Opening」.

2. The Opening of KTX Is a Speed Revolution

A. Changes in the Operating Speeds of the Railways in Korea

The development of the rail transport in Korea based on the indicators of the operating speeds can be seen from Table-2. Based on the Gyeongbu corridor which connects Seoul with Busan, the travel time along this Gyeongbu Line was 17 hours at the time of line opening, and in 1995 or five decades later, the travel time decreased to 9 hours 30 minutes as Tongil Trains were operated. As Saemaul trains were introduced in 1974, the travel time was reduced again from 4 hours 50 minutes to 4 hours 10 minutes. Again, as KTX was opened in 2004, a speed revolution was brought about, reducing the travel time to a two-hour range. And continued from the KTX-Sancheon trains developed by the local technology, KTX-Cheongryong trains began to be operated recently in 2024, making it possible to cover the region in 2 hours 17 minutes.

Table 2 Changes in the Operating Speeds of the Railways in Korea (Based on the Gyeongbu Line)

Year and Train Name	Average Speed (km/h)	Maximum Operating Speed (km/h)	Travel Time
Gyeongbu Line opened in 1905	26.5	60	17 hours
Tongil Trains in 1955	63	80	9 hours 30 minutes
Saemaul Trains in 1974	92	110	4 hours 50 minutes
Saemaul Trains in 1985	107	140	4 hours 10 minutes
KTX opened in 2004	162.6	300	2 hours 34 minutes
KTX-Cheongryong in 2024	182.8	320	2 hours 17 minutes

Source: Revised by the author by referring to Oh, J.H., Kwon, Y.J., Choi, J.S., & Lee, J.Y. (2017). 「KTX Economic Revolution」, Trust Books.

As the commercial services of KTX were launched by completing the converting the conventional Honam Line into double track and electrifying the tracks in addition to the Gyeongbu HSR on 1 April 2004, the HSR era was opened in Korea. The key to the competitiveness of high-speed rails lied, most of all, with the reduced travel time resulting from high-speed operations. Along the Gyeongbu corridor and the Honam corridor, the living sphere where any corner can be reached within 2 or 3 hours was realized, contributing to the enhancement of the national competitiveness as well as personal time savings, higher work efficiency, and higher utilization convenience. The travel time between Seoul and Daegu is 3 hours 3 minutes by Saemaul train and 1 hour 39 minutes by high-speed train, which are a half when compared with the previous travel time. The travel time between Seoul and Busan has been reduced from 4 hours 10 minutes by Saemaul train to 2 hours 40 minutes by high-speed train, or 1 hour 30 minutes down; the section between Seoul and Busan had been a long operating distance along the existing line. The travel time between Seoul and Mokpo has been reduced from 4 hours 42 minutes by Saemaul train to 2 hours 58 minutes, or 1 hour 44 minutes down.

Due to the operation of high-speed trains, the carrying capacity by rail has been doubled. The long-distance train operating frequencies along the Gyeongbu corridor and the Honam corridor rose from 128

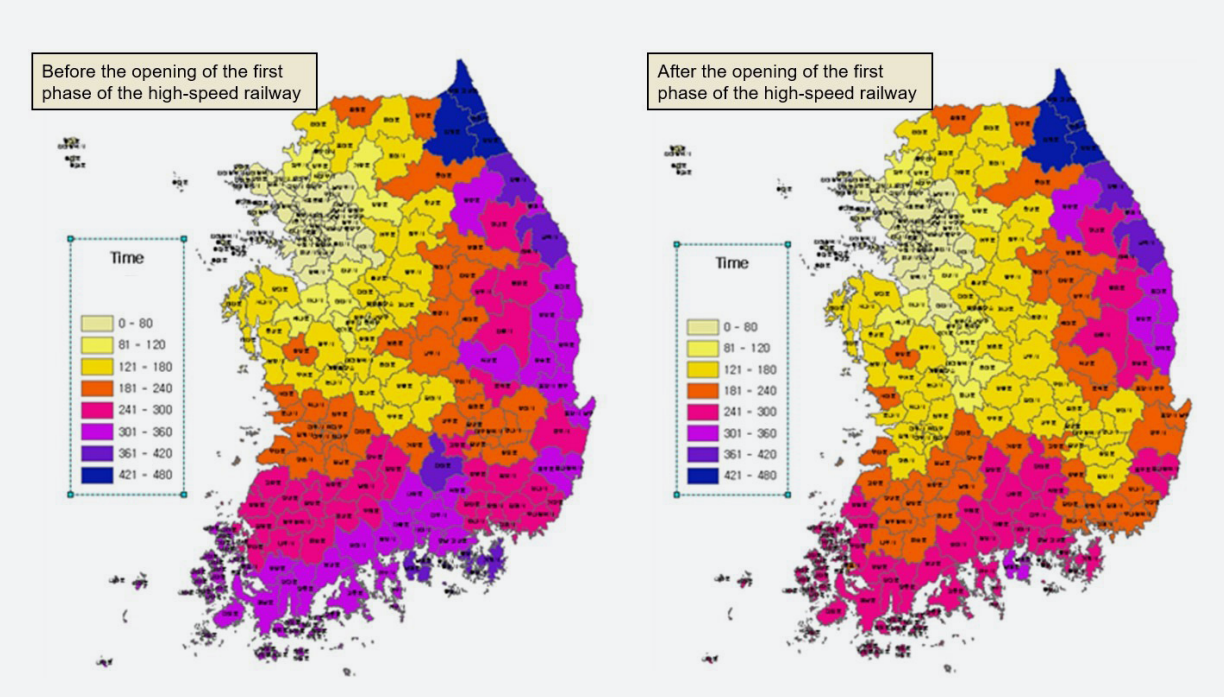
times in 2003 to 171 times in 2004 when the high-speed rail was opened, or 34% up. And the number of seats aboard increased 2.3 times from 47,296 to 107,830. Such a remarkable enhancement in the carrying capacity by rail, various benefits have been brought about such as the reduction of traffic congestion costs and logistics costs and the improvement of the environment. For the flights, the routes were shifted to overseas routes and specific domestic routes such as Jeju Island, and for the express buses, medium and long-distance and short-distance routes in areas where the high-speed rail services were not being offered were increased in number. As a result, the role division of domestic modes of transport such as rails, buses, and flights was efficiently restructured.

As the high-speed rail services entered into a stable stage following the initial faulty stage after the opening of the high-speed rail, KTX has been ingrained in people's daily life. The number of KTX passengers exceeded one million 14 days after the opening and 10 million on the 142nd day of the opening. As such, it hit records of increasing the number of passengers faster than in the case of Shinkansen of Japan and TGV of France.[3]

B. Territory Accessibility Changed by the Operation of HSR

The comparison of the total travel times when using the railways from each area to Seoul Around the time of opening the KTX Phase 1 is as shown in Figure-1. The population accessible to Seoul within four hours based on the door-door total travel time including the utilization of railways in different parts of the country

Figure 2 Total Travel Times from Each Area to Seoul around the Time of Opening the KTX Phase 1



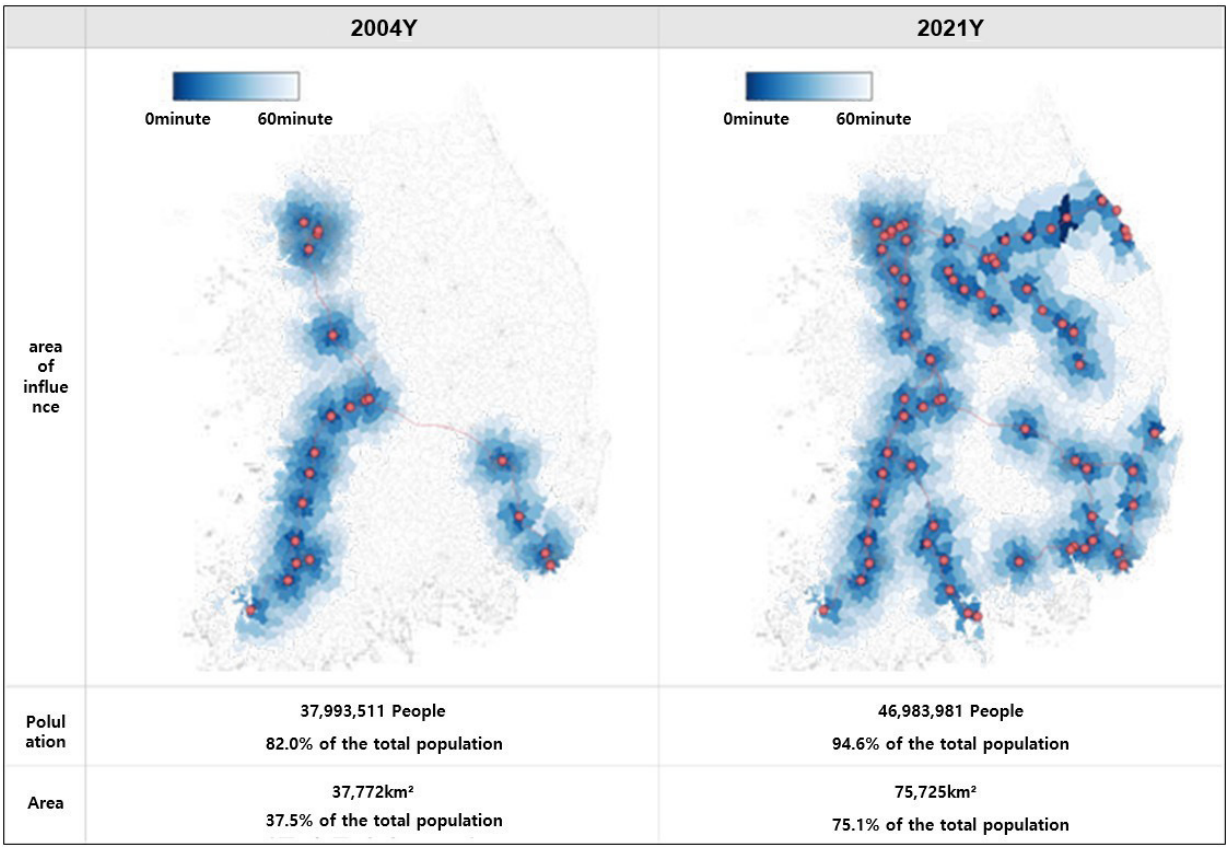
Source: Lee, C.W. (2003). 「A Study on the National Transportation System for a HSR Transport Era」, KOTI.

3 Kim, C.H. (2024). Completion of the First Stage of Gyeongbu High-Speed Railway Construction. 「20 Years of Korean High-Speed Rail History」, 14-39.

through the operation of high-speed trains along the Gyeongbu corridor and the Honam corridor amounts to about 44 million or 91% of the total population. Comparing it with 34 million or 70% of the total population before the opening of KTX, it was analyzed that there had been an effect of about 10 million passengers being increased by the opening of KTX.[4]

Also, the changes in the range of areas accessible by high-speed rail for the last two decades since the opening of the high-speed rail are as shown in Figure-2. After the opening of the Gyeongbu high-speed rail in 2004, due to the construction and operation of additional high-speed rails such as the Honam HSR, the Suseo-Pyeongtaek HSR, the Gangneung Line, the Joongang Line, and the Joongbu Inland Line, the accessibility to high-speed rail services has been significantly improved nationwide in 2021. The area accessible to high-speed rail services within 60 minutes was only 38% of the nation's territory and 82% of the total population in 2004, but due to the expansion of the high-speed rail services thus far, it rose to 75% of the nation's territory and 95% of the total population in 2021.[5]

Figure 3 Changes in the Influence Spheres of High-speed Rails (Areas Accessible in 60 Min.)



Source: Mun, J.S., & Kim, K.T. (2024). Socio-Economic Change Due to High-speed Rail.「20 Years of Korean High-Speed Rail History」, 120-135.

4 Lee, C.W. (2003).「A Study on the National Transportation System for a HSR Transport Era」, KOTI.

5 Mun, J.S., & Kim, K.T. (2024). Socio-Economic Change Due to High-speed Rail.「20 Years of Korean High-Speed Rail History」, 120-135.

3. What Has Been Changed Due to the Opening of HSR

A. What Has Been Achieved for the Last Two Decades Since the Opening of HSR in Korea

Korea's high-speed rails, which have a history of 20 years, has completely changed the paradigm of people's living and the national transportation system so far. If we can say that the opening of the Gyeongbu Expressway in July 1970 made it possible to access every corner of the country within a day, the opening of the high-speed rail in April 2004 can be described as the opening of the era in which it is possible to reach every corner of the country within half a day. As tourism and business industries gather along the high-speed rails, regional hubs have been formed, and major railway stations have been developed serving as social, economic, and cultural centers. Last year or in 2023, the cumulative number of passengers exceeded 1.17 billion and the annual number of passengers exceeded 100 million, and like this, the high-speed rails have been serving as the representative mode of transport in Korea.

The daily number of passengers was 72,000 at the time of opening the high-speed rail, and today, it is 240,000 or about 3.3 times up. The number of the passengers who use the KTX commuter tickets rose almost nine times from 460,000 in 2004 to 4.04 million in 2024.

As for the lines and the stations, there were 2 lines and 20 stations in 2004, and there are 8 lines and 69 stations in 2024. Beginning with the operation of the Gyeongbu Line and the Honam Line in 2004, the beneficiary area was enlarged as the Gyeongjeon Line (Seoul ~ Jinju) was opened in 2010; the Jeolla Line (Yongsan ~ Expo) in 2011; the Donghae Line (Seoul ~ Pohang) in 2015; the Gangneung Line (Seoul ~ Gangneung) in 2017; the Joongang Line (Cheongnyangni ~ Andong) in 2021; and the Joongbu Inland Line (Bubal ~ Choongju) in 2021.

Through this, the number of KTX passengers exceeded 100 million on 21 April 2007 and 1 billion on 31 August 2023, which is equal to every one of the 50 million population having used KTX 20 times each.

High-speed rails are also having a lot of impact on the socio-economic changes in Korea. As Korea is characterized by a relatively small land area and a high population density, the national transportation system centering on the high-speed rail network seems to have a greater influence on the people's living and the national economy than in Japan and in China.

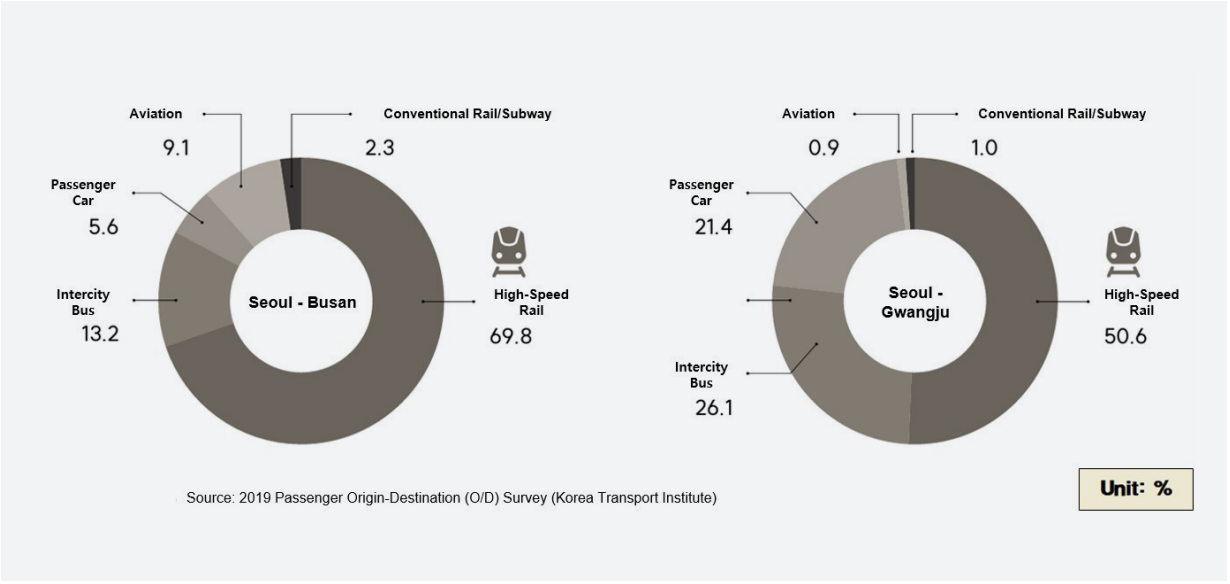
Actually, in Korea the influence is concentrated on the capital region, and in Gwangmyeong, Cheonan Asan, Daejeon, Daegu, and Busan, where there are stations, the influence zone reaches up to a range of 70 km from each station. Therefore, one can say that most of the nation's territory is under the influence of KTX.[6]

6 Lee, Y.S. (2024). The Future of Korea's High-speed Railway. 「20 Years of Korean High-Speed Rail History」, 137-163.

B. The Backbone Transport of the Country Changed

The high-speed rail transport system which has been continuously expanded since the opening of KTX has been positioned as the country's representative transportation services, making a significant contribution to the people's quality of living. The share of high-speed rails in the traffic volumes between major areas in the country is as shown in Figure-4. In the traffic between Seoul and Busan in 2019, high-speed rails accounted for 70%, which shows that high-speed rails had been positioned as a prevailing mode of transport.

Figure 4 Traffic Shares of Different Modes of Transport Between Seoul and Busan/Gwangju

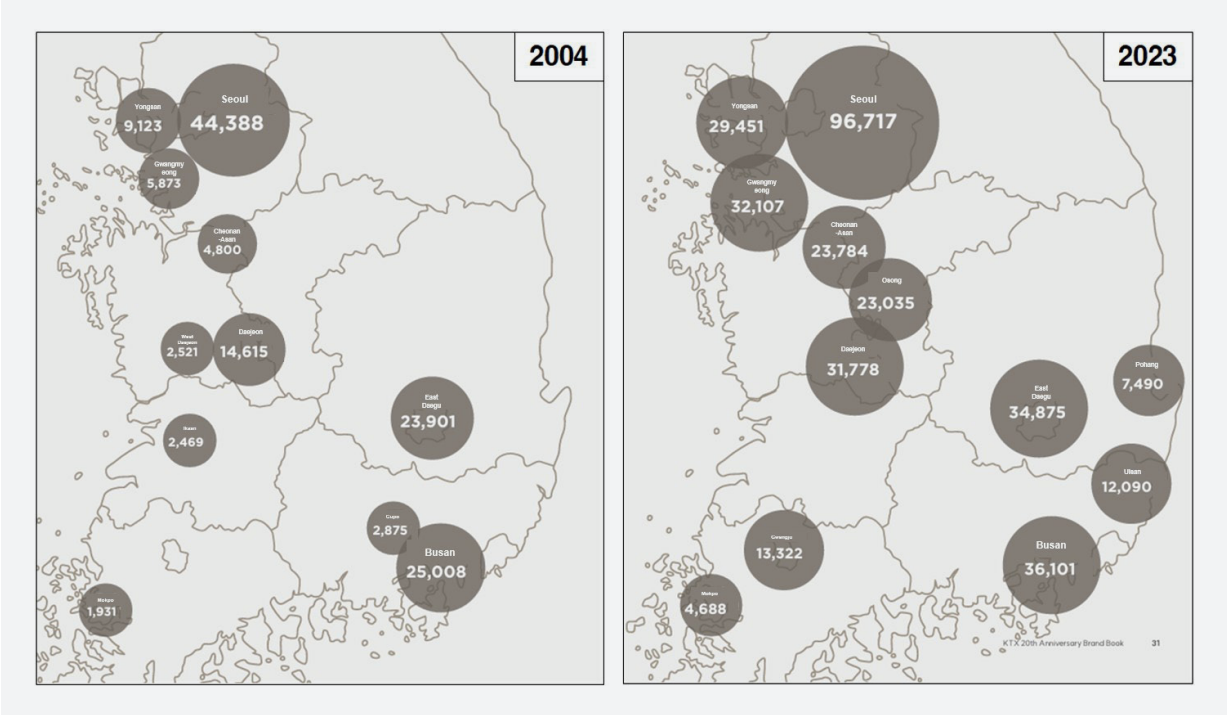


In the traffic between Seoul and Gwangju, high-speed rails accounted for 51%, which is over a half. The share of buses accounted for 26%, which stands relatively higher than in other long-distance sections. The reason why the share of high-speed rails in the traffic between Seoul and Gwangju is lower than between Seoul and Busan/Daegu is partly because the high-speed rail services in this section are being restrained by the track capacity restraints in the section between Pyeongtaek and Osong, which is a bottleneck in the current operation of high-speed rails.

Since the track capacities are being restrained as this section is shared by the high-speed trains along the Gyeongbu Line, the Honam Line, and the Suseo-Pyeongtaek Line, if the fleet of high-speed trains can be increased as the construction of the two double-track high-speed rails is completed by the end of 2028, the modal share of high-speed rails along the Gyeongbu Line corridor including Busan, Daegu, and Ulsan as well as along the Honam Line corridor including the Seoul – Gwangju section is prospected to further rise.

And compared with 2004 when the high-speed rail was opened, the changes in the ridership at each of the major high-speed rail stations over the two decades are as shown in Figure-5. At the time of opening the KTX, Seoul Station, which is the departure point of the Gyeongbu Line, saw a ridership of 44,388 passengers on the daily average, but in 2023, the daily ridership was 96,717 passengers or 2.2 times up, topping among the HSR stations.

Figure 5 Changes in the Daily Average Ridership at Major HSR Stations



Source: KORAIL(2024). 「The Brand Book Commemorating the 20th Anniversary of KTX Opening」.

Busan Station and East Daegu Station rank 2nd and 3rd places, respectively in the ridership, which have not been changed, but the ridership at Gwangmyeong Station, which has risen rapidly to the 4th place, rose as much as 5.5 times from in 2004, resulting in the current daily ridership of 32,107 passengers. The ridership at Yongsan Station, which is the departure station of the Honam Line, also has soared 3.2 times.

The increase in the ridership of Daejeon Station is remarkable, and Osong Station, which serves as the gateway to Sejong City, which is a junction station for the Gyeongbu high-speed line and a new administration town, besides Cheonan Asan Station, has emerged as a major HSR station.

C. Korean-style High-speed Train Vehicle Technology Development

The railway technology history of Korea shows an outstanding technological difference before and after the introduction of HSR. Such a technological change is an effect of introducing the HSR and the result of spurring the technological development of Korea itself.

At the time of opening the KTX in 2004, the high-speed trains were the rolling stock introduced to Korea for the first time with technology transfer from Alstom of France. The trains are of concentrated motive-power type. Two of 20 cars are motorized cars; 16 cars are passenger coaches; and 2 are motorized passenger coaches. Of the 46 trainsets introduced for the first time, 12 were manufactured in France, but 34 in Korea. The maximum operating speed is 305 kph, and the number of seats is 955.

Afterwards, Korea attempted to an independent technological development, succeeding in the technological development of HSR-350x trains, which are Korean-style high-speed metro models. It was a historic event which bore an important meaning in that Korea's railway technology stood shoulder to shoulder with countries with advanced railway technologies. Based on this technology, KTX-Sancheon high-speed trains were launched for commercial operation in March 2010. KTX-Sancheon, which is a commercial high-speed train of concentrated motive-power type which had been developed 4th in the world, had been designed and manufactured purely by domestic technologies. Unlike the existing KTX, the material of the vehicles of passenger coaches had been changed to aluminum, reducing the total weight of a trainset considerably, and by adopting a streamlined shape which could minimize the air resistance, it satisfied both the external beauty and the scientific functionality. For the development of HSR-350x, about 250 billion KRW was input from the government and the private sector. Looking at the value ordered so far, an import-substituting effect of over 2 trillion KRW has been achieved. The maximum operating speed is 305 kph, which is the same as of the existing KTX, and the trainset consists of 10 cars.

The attempt to develop the technology of Korean-style motive-power-distributed high-speed trains, which had been launched in parallel with that, aimed to secure the competitiveness in overseas markets while coping with the changes in the global railway technology environment. KTX-Eum high-speed trains, whose commercial operation was started in 2021, are high-speed vehicles with distributed motive-power designed by incorporating the topographical features of Korea's arterial railways that due to the short inter-station spacings, the trains have to repeat running and stopping.

As the power units are arranged distributed, a short time is required for the train to reach the top speed and it is free for the train to accelerate and to decelerate, making it possible to reduce the travel time. As the vehicle breadth is wide and all of the six cars can be utilized as passenger coaches, the vehicles are of good spatial use, and even in emergency situations such as a car breakdown, because the power units are distributed, the train can run flexibly. The maximum operating speed is 260 kph, and the trainset consists of 6 cars.

On top of that, KTX-Cheongryong (EMU-320) high-speed trains, which began to be operated in 2024 or the 20th anniversary of opening high-speed rails in Korea, can run at a maximum speed of 320 kph, which is the top speed in Korea, so they currently travel between Seoul and Busan in 2 hours 17 minutes. These trains are also of distributed motive-power and are high-speed trains of Korea's own technology upgraded from KTX-Eum whose maximum operating speed is 260 kph. As a trainset consists of 8 cars, the trains have a higher carrying capacity than of KTX-Eum, which consists of 6 cars in a trainset.

By this, Korea joined the ranks of advanced countries in the high-speed rail vehicle technology sector. Korea developed high-speed train models of concentrated motive power and of distributed motive power independently by its domestic technical team, and both of the models have been successfully commercialized.

Given the KTX was opened with a foreign technology introduced in 2004, it can be evaluated that Korea has made a quantum leap in developing local high-speed rail technologies in the 20-year history of high-speed rails in Korea. Besides, Korea has also secured export competitiveness for advancement into the global market.

D. Socio-economic Impact of HSR Operation

As Honam HSR and Suseo-Pyeongtaek HSR were opened following the opening of the Gyeongbu HSR in 2004, the travel time by rail along major transport corridors such as between Seoul and Busan was almost halved when compared with before the opening of high-speed rails. Through a relatively competitive fare policy in addition to such a speed competitiveness, high-speed rails have been positioned as a pivotal mode of transport in the medium and long-distance travels in the country.

As the modal share of high-speed rails rose, the air routes between Seoul and Daegu ceased to operate in 2007. The high-speed rail utilization demand rose about five times when compared with the initial stage of opening the high-speed rails, and the people's accessibility to high-speed rail services has been greatly improved. A review and an analysis on major studies and statistical data performed so far indicate that high-speed rails had had a positive impact on the regional economic, social, and cultural aspects overall. Professional baseball viewing goods and regional travel goods which utilize high-speed rails appeared. The delivery of local specialties by high-speed rail was vitalized. And an increasing number of various meetings were hosted at high-speed rail stations. Like this, high-speed rails have made a significant contribution to the promotion of human and goods exchanges.[7]

The number of high-speed rail season tickets in 2019 was about 9 times higher than in 2004 when the KTX was opened. Like this, long-distance commuting to work and to school has greatly increased due to the high-speed rail services. Also, it has turned out that high-speed rail users consider high-speed rails to have a positive impact on the improvement of the image and competitiveness of the stations such as the development of local tourism and leisure industries, of local industries, and of local culture and entertainment, and the vitalization of local wholesales and retails and goods distribution.

Through the construction of high-speed rails, commercial development around the station vicinity areas such as housing site development and industrial and commercial facilities development around major stations are being briskly pursued. Gwangmyeong Station and Cheonan Asan Station are success cases of developing the housing sites near the HSR stations, and around East Daegu Station, large-scale commercial facilities and a multi-modal transfer center have been built utilizing private capital. In addition, efforts are being made to build multi-modal transfer centers, business and commercial facilities, cultural facilities, and the like around HSR stations including Daejeon Station, New Gyeongju Station, Ulsan Station, Gimcheon Gumi Station, and Busan Station.

Also, high-speed rails are advantageous in the aspects of energy, environment, and traffic accidents when compared with its competing modes of transport, contributing to social cost savings and to improvement of railway operating agencies' management balance. And although the growth rates of some socio-economic indicators such as the population, the number of employees, and GRDP of HSR stations stand higher than in areas where the high-speed trains do not stop, the degree of interrelationship with the impact of HSR on the changes in those socio-economic indicators needs to be further identified in depth later. As we have

7 Mun, J.S., & Kim, K.T. (2024).

discussed so far, the 20 years of high-speed rail operation in Korea can be said to have no small impact on the economic activities of the state and local areas and on the people's daily life.

Together with the opening of KTX, there has been a lot of concern about the straw effect of the HSR operation likely resulting in the further recession of local areas, but it is being known that for the last two decades of HSR operation, high-speed rails have worked as a driving force for local development, too. Local areas in Korea need to devise strategies for more innovative local vitalization so that a fountain effect may be manifested rather than a simple, trickle-down effect of high-speed rails.[8]

From now on, in the strategic aspect of transportation, the arterial transport which connects the central area with local areas needs to be made speedier, and the transfer interface system within local areas needs to have a hub-and-spoke strategy which makes it more convenient. It is expected that by putting high-speed rails at the center of the national public transport network, Korea's national transportation vision will come true that the nation's territory will be linked just like a single urban zone, by completing the high-speed rail network in which one can reach any corner of the country within 90 minutes.

<References>

- Kang, K.D., & Roh, B.K. (2024). High-speed Rail Network Expansion. 「The 20-year History of HSR Construction in Korea」, 74-190.
- Kim, C.H. (2024). Completion of the First Stage of Gyeongbu High-Speed Railway Construction. 「20 Years of Korean High-Speed Rail History」, 14-39.
- KORAIL(2024).「The Brand Book Commemorating the 20th Anniversary of KTX Opening」.
- KORAIL(2024).「2023 Railway Statistics Yearbook」.
- Lee, C.W. (2003).「A Study on the National Transportation System for a HSR Transport Era」. KOTI.
- Lee, C.W. (2017). Transport Driving a Balanced Development. 「Local Areas and Development」 vol.29. Regional Development Committee.
- Lee, J.Y., Kim, K.T., & Song, H.S. (2021). 「HSR Utilization Characteristics and Railway Service Demand Survey」. KOTI.
- Lee, Y.S. (2024). The Future of Korea's High-speed Railway. 「20 Years of Korean High-Speed Rail History」, 137-163.
- MOLIT, Korea National Railway, KORAIL, SR, Korea Railway Association,& Korea Railway Foundation(2024), 「The 20 Years of Korea High-Speed Rail History」.
- Mun, J.S., & Kim, K.T. (2024). Socio-Economic Change Due to High-speed Rail. 「20 Years of Korean High-Speed Rail History」, 120-135.
- Oh, J.H., Kwon, Y.J., Choi, J.S., & Lee, J.Y. (2017). 「KTX Economic Revolution」, Trust Books.

8 Lee, C.W. (2017). Transport Driving a Balanced Development. 「Local Areas and Development」, Vol.29 Regional Development Committee.