Railways in Korea with Korea National Railway

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Director
Overseas Railway Project Team of Korea National Railway
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I. Railway Network in Korea
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I. Rail Network in Korea
Korea Railway History

- In 1905, Old Korea started to operate railway Seoul through Pyeong-yang connecting to Europe
- After the Korean War(1950), South Korea restores the railway system with its economic growth

<table>
<thead>
<tr>
<th>From beginning to decline</th>
<th>2004 Restructuring of Railway industry</th>
<th>New beginning and renaissance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1899 to 1950</td>
<td>1960 to 2003</td>
<td>2004 to 2010</td>
</tr>
<tr>
<td>Birth of railways in Korea</td>
<td>Railway industry on decline</td>
<td>Separation of Infrastructure &amp; Operation</td>
</tr>
<tr>
<td>1899 Opening of first railway (Gyeongin Line)</td>
<td>1969 Saemaeul train launched for commercial service</td>
<td>2004 Opening of First HSR (Gyeongbu HSR, 300km/h)</td>
</tr>
<tr>
<td>1950 Korean War breaks out</td>
<td>1974 Opening of first MRT (Seoul Metro 1)</td>
<td>2010 KTX-Sancheon launched for commercial service (100% Korean technology)</td>
</tr>
<tr>
<td></td>
<td>2004 to 2010</td>
<td>2011 to today</td>
</tr>
<tr>
<td></td>
<td>Separation of Infrastructure &amp; Operation</td>
<td>Traveling the future on eco-friendly railways</td>
</tr>
<tr>
<td></td>
<td>2015 Honam HSR opened</td>
<td>2016 Suseo HSR opened</td>
</tr>
<tr>
<td></td>
<td>2021 KTX-Eum launched for commercial service (EMU, 260km/h)</td>
<td></td>
</tr>
</tbody>
</table>
- Korea Railway Organization

✓ KNR (Korea National Railway) under MOLIT deals with railway policies, budget and safety
✓ KNR is fully government-owned and established by the railway industry development acts
MOLIT and KR in charge of railway facility management entrust maintenance works to KORAIL by the law.

* KR was the short name of Korea Rail Network Authority and now renamed it to Korea National Railway in Sep. 2020.
About KNR

- Korea National Railway is a fully state-owned rail infrastructure manager launched in 2004.
- KNR changed its name From Korea Rail Network Authority (Jan 2004~Sep. 2020), Korea High Speed Rail Construction Authority (Mar 1992~Dec 2003)

<table>
<thead>
<tr>
<th>Name</th>
<th>Korea National Railway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Founded</td>
<td>1 January 2004</td>
</tr>
<tr>
<td>Organization Type</td>
<td>State-owned agency</td>
</tr>
<tr>
<td>Annul budget</td>
<td>USD 8 billion</td>
</tr>
<tr>
<td>Railway Asset Mgt.</td>
<td>USD 100 billion (National 50Bil, KNR 50Bil)</td>
</tr>
<tr>
<td>Credit rating</td>
<td>Domestic AAA</td>
</tr>
<tr>
<td></td>
<td>Moody’s Aa2</td>
</tr>
<tr>
<td></td>
<td>S&amp;P AA</td>
</tr>
<tr>
<td>Employees</td>
<td>2,194</td>
</tr>
</tbody>
</table>

Head Office in Daejeon, Republic of Korea
KNR Investment Plan

- KNR is increasingly implementing its construction projects and infrastructure upgrading and maintenance.
- However, KNR has also a burden to pay HSR loans.

### KNR Strategy Plan (MAY 2023)

![Graph showing budget breakdown over years]

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Budget</th>
<th>CAPEX</th>
<th>High-Speed</th>
<th>Conventional</th>
<th>Inter-City</th>
<th>Upgrading &amp; Maintenance</th>
<th>The others</th>
<th>OPEX</th>
<th>Debt payment</th>
<th>Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td>9,198.8</td>
<td>6,347.1</td>
<td>448.6</td>
<td>2,225.1</td>
<td>855.1</td>
<td>2,670.3</td>
<td>148.1</td>
<td>293.3</td>
<td>2,554.6</td>
<td>3.8</td>
</tr>
<tr>
<td>2024</td>
<td>10,688.2</td>
<td>7,708.2</td>
<td>786.5</td>
<td>2,095.1</td>
<td>1,639.8</td>
<td>2,951.9</td>
<td>234.9</td>
<td>276.7</td>
<td>2,699.4</td>
<td>3.9</td>
</tr>
<tr>
<td>2025</td>
<td>13,567.4</td>
<td>10,675.1</td>
<td>1,820.5</td>
<td>4,232.4</td>
<td>1,385.6</td>
<td>3,073.7</td>
<td>163.0</td>
<td>281.1</td>
<td>2,607.2</td>
<td>4.0</td>
</tr>
<tr>
<td>2026</td>
<td>16,224.1</td>
<td>13,164.7</td>
<td>1,999.0</td>
<td>6,504.9</td>
<td>1,348.1</td>
<td>3,208.1</td>
<td>104.6</td>
<td>263.4</td>
<td>2,791.9</td>
<td>4.1</td>
</tr>
<tr>
<td>2027</td>
<td>15,665.9</td>
<td>12,493.2</td>
<td>1,244.4</td>
<td>6,564.9</td>
<td>1,439.2</td>
<td>3,198.9</td>
<td>45.8</td>
<td>276.6</td>
<td>2,891.9</td>
<td>4.2</td>
</tr>
</tbody>
</table>

In Billion Won
Ⅱ. KNR’s Performance
Construction Process

✓ Railways is a key national infrastructure and projects are implemented according to medium to long term policy plans.
✓ 4th National Rail Network Plan made by government policy goes together with KNR

<table>
<thead>
<tr>
<th>Process</th>
<th>Regulation and Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Transport Network Plan</td>
<td>National Transport System Efficiency Act</td>
</tr>
<tr>
<td>(2021~2040, 20years)</td>
<td>Ministry of Land, Infrastructure and Transport</td>
</tr>
<tr>
<td>4th National Rail Network Plan</td>
<td>Act on Construction and Management of Railways</td>
</tr>
<tr>
<td>(2021 – 2030)</td>
<td>Ministry of Land, Infrastructure and Transport</td>
</tr>
<tr>
<td>Preliminary feasibility study</td>
<td>National Finance Act</td>
</tr>
<tr>
<td></td>
<td>Ministry of Strategy and Finance</td>
</tr>
<tr>
<td>Master plan</td>
<td>Act on Construction and Management of Railways</td>
</tr>
<tr>
<td></td>
<td>Ministry of Land, Infrastructure and Transport</td>
</tr>
<tr>
<td>Design → Building → Evaluation</td>
<td>Act on Construction and Management of Railways</td>
</tr>
<tr>
<td></td>
<td>Korea National Railway</td>
</tr>
<tr>
<td>Railway operation</td>
<td>Railroad Service Act, etc.</td>
</tr>
<tr>
<td></td>
<td>Railway operating companies incl. Korail</td>
</tr>
</tbody>
</table>
✓ Performance goals by 2030 are total length 5,340km (from 4,304km) and modal share 16.5% (from 11.5%)
✓ Key activities are expansion of eco-friendly railways, speed upgrading and Alleviating traffic congestion by GTX

Key activities
- Expansion of Eco-friendly Railways
- Carbon Neutrality Link
- Upgrading Speed
- to Alleviate Traffic Congestion in the Capital Region
# Railways in Korea Today

- Today, there are 4,304 kilometers of railway and about 79.9% of it is electrified.
- We have 3 HSR lines, 34 main lines and 55 branch lines.

## Total length

<table>
<thead>
<tr>
<th>Electrified</th>
<th>3,442 km (79.9%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSR</td>
<td>8 lines : 2,119.7 km (49.2%)</td>
</tr>
<tr>
<td>HSR (over 300 km/h)</td>
<td>3 lines : 657.4 km</td>
</tr>
<tr>
<td>Upgraded HSR lines (200~250 km/h)</td>
<td>5 lines : 2,119.7 km</td>
</tr>
<tr>
<td>Conventional &amp; Inter-city lines</td>
<td>27 main lines, 687 Stations &amp; 15 main lines, 287 Stations</td>
</tr>
</tbody>
</table>

## Linking points

<table>
<thead>
<tr>
<th>Station-station distance</th>
<th>Financing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major cities</td>
<td>Central govt. 50%, KNR 50%</td>
</tr>
<tr>
<td>Major or midsized cities</td>
<td>Central govt. 100%</td>
</tr>
<tr>
<td>Downtown – suburbs</td>
<td>Central govt. 70%, local govt. 30%</td>
</tr>
</tbody>
</table>
High speed rail

✓ KNR constructed the three HSRs over 300 km/h and total 657 km in length in Korea as of today.

✓ KNR recently the third HSR Suseo line opened in 2016 to provide HSR services to southern districts of Seoul.

Honam HSR
Distance: 183.8km
Budget: USD 10 billion
Opened in Apr 2015

Gyeongbu HSR
Distance: 412.5km
Budget: USD 19 billion
Phase 1 opened in Apr. 2004
Phase 2 opened in Nov. 2010

Suseo HSR
Distance: 61.1km
Budget: USD 3.4 billion
Opened in Dec 2016
KNR have Conventional and Inter-city lines that total 3,413.6 km in length.

KNR recently have 22 ongoing Conventional rail projects and 7 Inter-city rail projects.

Completed projects:
- 673 stations
- 83 lines: 3,413.6 km
  - Electrified: 2,308 km

Ongoing projects:
including upgrading of existing railways:
- Conventional lines
  - 22 projects (1,361.5 km)
- Intercity lines
  - 7 projects (267.6 km)
  - Upgrading of existing railways
    - tracks, signaling and catenary
to increase speeds up to 250 km/h
Speed-up Projects

- KNR have 10 lines covering 1,462 km upgraded to 200-250km/h
- EMU-260 rolling stocks are operating on the Upgraded lines.

1. **Gyeonagbu Line** (Seoul – Busan)
   - Length (km): 444.5
   - Speed (km/h): 120 → 140

2. **Jeolla Line** (Ikisan – Yeosu)
   - Length (km): 180.4
   - Speed (km/h): 150 → 230

3. **Gyeongchun Line** (Seoul – Chuncheon)
   - Length (km): 80.4
   - Speed (km/h): 150 → 180

4. **Jungang Line** (Wonju – Jecheon section)
   - Length (km): 44.1
   - Speed (km/h): 120 → 250

5. **Jungang Line** (Dodam – Yeongcheon section)
   - Length (km): 148.1
   - Speed (km/h): 150 → 250

6. **Jungang Line** (Yeongcheon – Singyeongju section)
   - Length (km): 25.5
   - Speed (km/h): 130 → 250

7. **Donghae Line** (Singyeongju – Bujeon)
   - Length (km): 107.6
   - Speed (km/h): 120 → 200

8. **Seohae Line** (Hongseong – Daeya section)
   - Length (km): 86.6
   - Speed (km/h): 150 → 250

9. **Seohae Line** (Daeya – Iksan section)
   - Length (km): 14.3
   - Speed (km/h): 90 → 250

10. **Gyeongjeon Line** (Gwangyang – Jinju)
    - Length (km): 46.5
    - Speed (km/h): 150 → 200
Why Speed-up Projects

✓ Speed-up costs less than a new railway up to 62% in Korea

✓ Utilization of existing facilities and more eco-friendly.

Greater investment efficiency

Technology development and greater reliability

Practical use of resources

Less social and environmental impact

Speed up costs less than a new railway (32% for speeds 150 km/h & under and 62% for 200 km/h)

Less errors and lower costs with gradual speedup while developing highly reliable rail technologies and know-how

Utilization of existing facilities allows more practical and sound use of resources

More environment-friendly with much less impact on local residents & social activities and minimized impact on eco-system
Ⅲ. Korea High Speed Railway
Financing Sources of KNR

- KNR Shares HSR construction project cost with Government Contribution by KNR Bond Issuance
- In case of HSR, GyungBu 1st Phase (35%: KNR 65%), GyungBu 2nd & Honam (50:50) and Suseo Line (40: KNR 60)

<table>
<thead>
<tr>
<th>Type</th>
<th>Total Construction Project Cost</th>
<th>Facility Upgrading</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>GyungBu 1st Phase</td>
<td>KNR 65%</td>
<td>Gov. 100%</td>
<td>KNR 100%</td>
</tr>
<tr>
<td>GyungBu 2nd, Honam</td>
<td>KNR 50%</td>
<td>Gov. 100%</td>
<td></td>
</tr>
<tr>
<td>Suseo Line</td>
<td>KNR 60%</td>
<td>Gov. 100%</td>
<td></td>
</tr>
<tr>
<td>Gov. Contribution</td>
<td>35% ~ 50%</td>
<td>Gov. 100%</td>
<td>KNR 100%</td>
</tr>
<tr>
<td>Inter-City</td>
<td></td>
<td>Gov. 100%</td>
<td>Gov. 40%</td>
</tr>
<tr>
<td>Gov. 70%</td>
<td></td>
<td>Gov. 100%</td>
<td>KNR 60%</td>
</tr>
<tr>
<td>Local Gov. 30%</td>
<td></td>
<td>Gov. 100%</td>
<td></td>
</tr>
<tr>
<td>(Seoul City 50%)</td>
<td></td>
<td>Gov. 40%</td>
<td></td>
</tr>
</tbody>
</table>
Financing Sources of KNR

- KNR earns Track Access Charges from Railway operators (KORAIL/SR) in return for KNR investment.
- Instead of that, Railway operators (KORAIL/SR) have track access rights for safe operation of trains running on the same track.
**Track Access Charge**

- KNR repays principal & interest of KNR bond first by way of track access charge from railway operators.
- KNR also uses it to maintain railway infrastructure.

<table>
<thead>
<tr>
<th>Type</th>
<th>Facility Upgrading</th>
<th>Maintenance</th>
<th>Track Access Charge (KNR Revenue)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-Speed (300km/h)</td>
<td>Gov. 100%</td>
<td>KNR 100%</td>
<td>(KORAIL) 34% of Operating Revenue (SR) 50% of Operating Revenue</td>
</tr>
<tr>
<td>Conventional</td>
<td>Gov. 100%</td>
<td>Gov. 40%</td>
<td>(KORAIL) 60% of Maintenance Cost</td>
</tr>
<tr>
<td>Inter-City</td>
<td>Gov. 100%</td>
<td>KNR 60%</td>
<td>(KORAIL) 60% of Maintenance Cost</td>
</tr>
</tbody>
</table>
**Track Access Charge for HSR**

- KnR uses the track access charge for repayment of KnR bond and maintenance of HSR line.

- Government has contributed all of HSR upgrading costs

### HIGH-SPEED RAILWAY

**In Billion Won**

<table>
<thead>
<tr>
<th>Year</th>
<th>Track Access Charge</th>
<th>HSR Maintenance Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>835.9</td>
<td>205.6</td>
</tr>
<tr>
<td>2005</td>
<td>881.7</td>
<td>182.7</td>
</tr>
<tr>
<td>2006</td>
<td>828.8</td>
<td>204.0</td>
</tr>
<tr>
<td>2007</td>
<td>860.7</td>
<td>216.8</td>
</tr>
<tr>
<td>2008</td>
<td>880.0</td>
<td>227.0</td>
</tr>
<tr>
<td>2009</td>
<td>885.1</td>
<td>282.8</td>
</tr>
<tr>
<td>2010</td>
<td>947.1</td>
<td>300.2</td>
</tr>
<tr>
<td>2011</td>
<td>347.1</td>
<td>309.2</td>
</tr>
<tr>
<td>2012</td>
<td>375.0</td>
<td>347.1</td>
</tr>
<tr>
<td>2013</td>
<td>387.8</td>
<td>375.0</td>
</tr>
<tr>
<td>2014</td>
<td>540.2</td>
<td>387.8</td>
</tr>
<tr>
<td>2015</td>
<td>623.8</td>
<td>540.2</td>
</tr>
<tr>
<td>2016</td>
<td>809.0</td>
<td>623.8</td>
</tr>
<tr>
<td>2017</td>
<td>834.8</td>
<td>809.0</td>
</tr>
<tr>
<td>2018</td>
<td>854.3</td>
<td>834.8</td>
</tr>
<tr>
<td>2019</td>
<td>530.1</td>
<td>854.3</td>
</tr>
<tr>
<td>2020</td>
<td>504.3</td>
<td>530.1</td>
</tr>
<tr>
<td>2021</td>
<td>603.9</td>
<td>504.3</td>
</tr>
</tbody>
</table>

**High-Speed Railway Events**

- Apr. 1, 2004 Launching GyungBu 1st Phase
- Nov. 1, 2010 Launching GyungBu 2nd Phase
- Apr. 1, 2015 Launching Honam HSR
- Dec. 9, 2016 Launching Suseo SRT Line
- 2020~2021 COVID-19 Pandemic

* Korail from 31% to 34% of Operating Revenue
Railway demand declined until April 2004 when the Gyeongbu HSR was opened, leading to a notable upturn.

HSR passenger count exceeded over 50% in 2017 and reached 58% in 2019.
IV. Overseas Railway Cooperation
KNR Business Area

KNR's businesses into the 7 areas. KNR works together with the MOLIT on railway network planning.

KNR has comprehensive knowledge and experience in railway project management throughout all stages.

Business areas

① Railway network planning
② Project management
③ Railway construction
④ Railway facilities management
⑤ Training & consulting
⑥ Station area and railway land development
⑦ Overseas railway projects

PM capabilities

Planning stage management
Design control
Construction management (Supervision and Inspection)
Interface management
Verification, testing & commissioning

Economical,
Safe and
Efficient
Railway
Overseas Projects

✓ KNR has been participating in railway projects in other countries. Our first overseas project was in China in 2005.

✓ Project types range from technical consulting, to construction supervision, detail design, feasibility study, and training program.

- China HSR Project
  - Supervision (5 Projects)
  - Consulting (7 Projects)
- USA California HSR Project
  - Consulting: Fresno–Bakersfield
  - Length: 200 km
- India HSR Project
  - Consulting: Detail Design of HSR
  - Length: 527 km
- Indonesia Jakarta LRT 1st Phase Project
  - EPC Procurement: Systems & RS
  - Length: 5.8 km
- Paraguay Railway Project
  - F/S: Mbalam–Kribi
  - Length: 583.4 km
- Nepal Railway Project
  - F/S: Asuncion–Ypaccara
  - Length: 44 km
- Malaysia MRT Project
  - PMC for Communication System
  - Length: 51 km
- India Lucknow MRT Project
  - GC: General Consulting
  - Length: 23.8 km
- 2011 Nepal
  - Nepal Railway F/S Service
- 2012 Malaysia
  - MRT PM Consulting Service
- 2014 Paraguay
  - MRT F/S Service
- 2016 Indonesia
  - Jakarta LRT 1st Phase
- 2018 Egypt
  - Nag Hammady-Luxor Signal Modernization
- 2020 Thailand
  - 3 Airports linked HSR PMC
- 2022 Maroc
  - Nouaceur-Marrakesh HSR Design project
**Conclusion**

1. **Are you a State-owned enterprise (SOE) only for HSR?**
   - ✓ 300km/h technology need interface between superstructure (catenary, train control system, rolling stock) and infrastructure (trackwork)
   - ✓ Korea formed HSR construction authority (KHRC) in the early stage and we have lessons learned contemplated extensively for success

2. **How SOE itself can make a Project Financing and government support?**
   - ✓ Government can transfer its finance burden to SOE supported by contribution and debt guarantee
   - ✓ KNR bears the HSR project debt financed by supplier loan (2.3bil$) and issuance of HSR bond

3. **Additional costs for Technology Transfer for Localization?**
   - ✓ As a way of TT & T, KNR adopted 1:1 matching with overseas PM service, construction Supervision, CORE system suppliers.
   - ✓ KNR had set 50% of localization of core system and invested 300 million$ with Korea Railroad Research Institute launched in 1996.

4. **Enhancing Global Collaborating & Cooperating with International Partners?**
   - ✓ After opening HSR in 2004, KNR entered in the China HSR through HSR technology conference with Chinese railway ministry and SOEs.
   - ✓ Inland extensive technology experience and over 900 project management professionals are valuable assets for overseas project works.
   - ✓ KNR can form Korean one team as infrastructure manager, railway project manager including government, public, and private side.