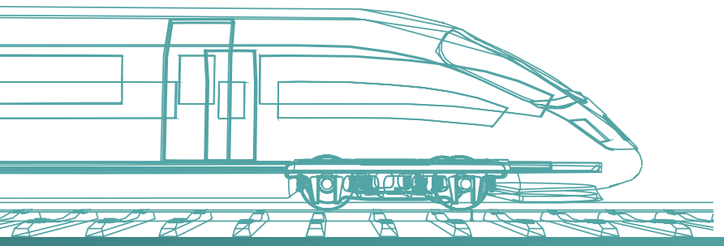

ATLAS

High-Speed Rail 2024

Data updated as of december 2023

Fundación de los FERROCARRILES Españoles

INTERNATIONAL UNION OF RAILWAYS

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CREDITS

High-Speed Rail Atlas

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A special mention goes to Michel Leboeuf (UIC) and Manuel Campos (FFE) for their cooperation in the development of this Atlas

Gratitude is also extended to the UIC Intercity & High-Speed Committee as well as to the people in charge of statistics and information processing of the railway companies and infrastructure managers of each country, for their collaboration

PRESENTATION

The key characteristics of high-speed rail remain its efficiency, safety, reliability, availability and environmental performance. Today more than ever, high-speed rail delivers on the “triple bottom line” of economic, social and environmental sustainability, a goal long sought by policymakers around the world.

In a context marked by post-Covid recovery, geopolitical disruptions, and the accelerating urgency of climate change, high-speed rail presents a unique and timely opportunity. It enables a shift toward sustainable mobility and should be regarded by both policymakers and the financial sector as a strategic investment for global connectivity and decarbonisation. The current momentum, shared across diverse national and regional contexts, is a clear signal: this is the right time to expand and modernize rail.

By saving time and shrinking distances, high-speed rail contributes to:

- Expanding and modernising mobility options
- Enhancing trade and intercity connectivity
- Reducing congestion on other transport infrastructure
- Advancing global sustainable development goals
- Strengthening regional integration and cohesion

The fight against climate change is now a defining political priority. Rail must respond by enabling a massive modal shift and positioning itself as the transport mode of choice. Wherever high-speed rail is being developed, it is increasingly integrated with upgraded or renovated conventional lines, extending the benefits of fast, reliable, and green mobility to broader territories.

UIC envisions railways as the backbone of tomorrow’s sustainable mobility system. This requires seamless interfaces with other public transport modes and soft mobility solutions. High-speed rail is no longer a standalone infrastructure; it is becoming the core of an interconnected, multimodal ecosystem designed to deliver value for passengers, economies and societies.

As a vector of innovation, high-speed rail is also at the forefront of the digital transformation of the transport sector. Technologies such as AI, IoT, big data and augmented intelligence are redefining operations, maintenance, safety (including cybersecurity) and customer experience. High-speed rail is not only adapting, it is leading.

UIC and its members are also deploying operational tools that support this transformation, including:

- Precise train location and real-time connectivity through telecoms technologies such as 5G and FRCMS (Future Rail Mobile Communication System), enabling new services and digitalised operations, and supporting ETCS
- Resilience tools for understanding and predicting the impacts of climate change on infrastructure and services
- Multimodal solutions for fully decarbonised end-to-end journeys, including standardised ticketing (e.g. via OSDM), enhanced accessibility of stations, and seamless connections with other transport modes

From the early pioneers like Japan, Italy, France, Germany and Spain, high-speed rail has now expanded to a truly global scale. In just a decade, China has built a network of 45,390 km, accounting for more than two-thirds of the global total of 64,698 km. Major developments are also underway in Türkiye, Morocco, the United States, India, Southeast Asia, and beyond.

Roughly 5,000 high-speed trainsets now operate daily, serving more than 2 billion passengers annually, with peak ridership reaching 2.8 billion in recent years. Wherever it has been implemented, high-speed rail has fostered industrial innovation, regional development, job creation and economic growth; contributing significantly to gross domestic product (GDP) by stimulating investment, supporting tourism, and improving business connectivity across regions.

As public and private stakeholders increasingly seek sustainable financing strategies, mechanisms such as carbon credits and public-private partnerships (PPPs) are emerging as valuable tools to support the deployment of high-speed rail infrastructure.

And why not imagine its future role in high-speed freight logistics, in line with the rise of e-commerce?

As the global association of the railway sector, UIC -working with its network of members, research institutes, and academic partners- is committed to:

- Promoting innovative thinking
- Supporting successful implementation
- Driving transformative developments in the rail industry

Now more than ever, UIC and its expert community stand ready to provide the data, knowledge, and best practices needed to support the global development of high-speed rail.

I trust that this 2024 edition of the UIC High-Speed Rail Atlas will provide you with a clear and detailed view of the world’s high-speed rail systems, from infrastructure and rolling stock to innovation and future outlooks.

François Davenne

UIC Director General

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ABBREVIATIONS AND SYMBOLS

AC	Alternating current
AEG	Allgemeine Elektricitäts-Gesellschaft
AGV	Automotrice à Grande Vitesse
ASFA	Anuncio de Señales y Frenado Automático
ATB	Automatische TreinBeïnvloeding
ATC	Automatic Train Control
ATP-EBICAB	Automatic Train Protection-Emergency Brake Intervention in Cab
AWS	Automatic Warning System
b.s.	Block station
BACC	Blocco Automatico a Correnti Codificate
BPL	Bretagne Pays de la Loire
BREL	British Rail Engineering Limited
CAF	Construcciones y Auxiliar de Ferrocarriles
CMK	Centralna Magistrala Kolejowa
CNM	Contoumement de Nimes-Montpellier
CNR	Canadian National Railways
CR	China State Railway Group Co., Ltd
CTC	Centralized Traffic Control
CTCS	Chinese Train Control System
DC	Direct current
DSB	Danish State Railways (Danske Statsbaner)
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
ETR	Elettro Treno Rapido
FFE	Spanish Railways Foundation
GDP	Gross Domestic Product
GPSO	Le Grand Projet du Sud-Ouest
HS	High-Speed
HSL	High-Speed Line
HT	Hull Trains
Hz	Hertz
ICE	InterCity Express
IRS	International Railway Solutions
JNR	Japanese National Railways
JRC	Central Japan Railway Company
JRE	East Japan Railway Company
JRK	Kyushu Japan Railway Company
JRW	West Japan Railway Company
km	Kilometre
Km/h	Kilometres per hour
KTX	Korea Train Express
kV	Kilovolt
KVB	Contrôle de Vitesse par Balises
kW	Kilowatt
kW/t	Kilowatts per ton
L	Locomotive
LGV	Ligne à Grande Vitesse
LHB	Linke Hofmann Busch
LNMP	Ligne Nouvelle Montpellier-Perpignan
LNPN	Ligne Nouvelle Paris-Normandie
LZB	Linienzugbeeinflussung
M	Motor coach
MB	Motor Bogie
mm	millimeter
NR	Northern Rail
NS	Dutch railways (Nederlandse Spoorwegen)
NTV	Nuovo Trasporto Viaggiatori (now "Italo")
ÖBB	Austrian Federal Railways (Österreichische Bundesbahnen)
ONCF	Moroccan National Railways (Office Nationale des Chemins de Fer)
PBKA	Paris-Brussels-Cologne-Amsterdam
PKP	Polish national Railways (Polskie Koleje Państwowe)
POCL	Paris-Orléans-Clermont-F.-Lyon
PZB	Punktförmige Zugbeeinflussung
RENFE	Red Nacional de los Ferrocarriles Españoles
RPS	Disruptive Radar Positioning System
S	Series (in rolling stock sections)
SBB	Swiss Federal Railways (Schweizerische Bundesbahnen)
SCMT	Sistema di Controllo della Marcia del Treno
SEA	Sud Europe Atlantique
SNCF	Societé Nationale des Chemins de fer Français
SR	Suseo High Speed Rail Corporation
T	Trailer coach
t	Ton
TALGO	Tren Articulado Ligero Goicoechea Oriol
TBL	Transmission Baliza-Locomotive
TCDD	Turkish National Railways (Türkiye Cumhuriyeti Devlet Demiryolları)
TGV	Train à Grande Vitesse
THSRC	Taiwan High Speed Rail Corporation
TPWS	Train Protection and Warning System
TVM	Transmission Voie-Machine
UIC	International Union Of Railways
⎓	Direct current
∿	Alternating current
‰	Per-mille

DEFINITIONS

Alternating current	An electric current that reverses its direction many times a second at regular intervals, typically used in power supplies
Block station	A place at which railroad manual block signals are displayed
Direct current	An electric current flowing in one direction only
Electrification	Type of electrification installed (3 kV, 15 kV, 25 kV)
High-Speed passenger	Passenger carried by a High-Speed train for a trip in totality, partly or not at all on a High-Speed line
High-Speed rail	It is a grounded, guided transport system and could also categorised as a railway subsystem. The most important difference, however, is the speed. As travel times had to be reduced for commercial purposes, speed emerged as a decisive factor with HSR providing the necessary improvement, which is why UIC considers a commercial speed of 250 km/h is the principal criterion for defining a line as high-speed. Nevertheless, average distance is a second criterion when a line does not have to compete with air travel, where it may not be as important to run at 250 km/h. A lower speed of above 200 km/h (any lower is within the capability of a conventional train) and more commonly 220 or 230 km/h, is enough to capture the highest possible market share for a collective mode of transport. This also applies to very long tunnels whose construction cost depends on the diameter linked to the square of the speed. For speeds above 200 km/h, the infrastructure can be categorised as "high-speed" if the system in operation complies with the necessary standards regarding track equipment, rolling stock (generalisation of trainsets), signalling systems (eliminating trackside signals), operations (long-range control centers), and the geographical or temporal separation of freight and passenger traffic. The High-Speed Railway Network can also include infrastructure sections that link high-speed lines without them needing to have all of these characteristics.
Line in operation	It is now operating on High-speed
Line long-term planning	It is not approved, just planned
Line planned	It is approved but not start constructing
Line under construction	It is now constructing on High-Speed
Line under study	Similar to "long-term planning" status
Maximum commercial speed	Maximum speed at which a train can operate on a track
Maximum train speed	Maximum speed that a train can reach, without any limitation in the infrastructure
Signalling	Type/s of signalling enabled (ERTMS / ETCS, TVM, LZB, ASFA…)

INTRODUCTION

High-Speed Rail is first and foremost about serving people: providing fast, reliable, comfortable and sustainable travel that meets evolving passenger expectations. As demand for smarter, greener mobility grows, high-speed rail must continue earning trust and loyalty by delivering a seamless, high-quality experience that makes the train the preferred choice.

Within the UIC Global Passenger Forum, managed by the UIC Passenger Department, high-speed rail remains a central focus of activity, coordinated by the UIC Intercity & High-Speed Committee (ICHSC). This sector brings together all railway companies and public authorities involved in the development and operation of high-speed rail systems.

The Committee covers a broad range of activities to support global high-speed rail development:

- Conducting international studies on key issues such as intelligent systems for high-speed operations, optimal speed and performance strategies, affordability and the impact of market liberalisation, multimodal connectivity with air transport, financial frameworks for infrastructure investment and comparative benchmarking of high-speed systems across regions. To date, over a dozen thematic studies have been produced and shared with members

- Partnering with universities worldwide to share knowledge, promote academic collaboration and attract top talent into the railway sector. The Alliance of Universities for High-Speed Rail (AUHSR) network now includes more than 40 universities and is celebrating its 10th anniversary this year

- Delivering international training sessions on high-speed rail planning, operations and management. The Committee has organized international training programmes and symposiums, supporting knowledge transfer and capacity building accross continents

- Maintaining and regularly updating the UIC high-speed rail database, the backbone of this Atlas, which provides authoritative data on global high-speed networks, services, rolling stock and more

- Contributing to the development of IRS (International Railway Solutions) standards for high-speed rail operations and systems. The Committee has coordinated the development of over a dozen IRS documents now published in the official catalogue

- Co-organising the UIC World Congress on High-Speed Rail, the leading global event on high-speed mobility, featuring more than 180 speakers and over 20 CEOs in its latest editions. The next edition will be held in Beijing, China, in July 2025, further showcasing the global reach and evolution of the sector

The UIC Intercity & High-Speed Committee (ICHSC) has committed to maintaining and enriching this Atlas as a unique and authoritative global reference. It offers a comprehensive system-level overview that includes infrastructure, rolling stock, operations and key technical features.

This publication begins with aggregated global data, structured by UIC regions to reflect the diversity and distribution of high-speed rail systems. It includes insights on:

- Countries operating or developing high-speed services

- Network lengths and top operating speeds

- Historical milestones and projected expansions

The second part of the Atlas presents country-specific details within each UIC region, including:

- Detailed maps

- Lines in commercial service, under construction and planned

- Long-term projects

- Rolling stock data (trainsets, depots, manufacturers)

- Technical characteristics (travel times, slopes, electrification systems, signalling, viaducts, tunnels, etc.)

The quality of this Atlas rests on the accuracy of the data, all of which has been provided and validated by UIC members and other sector stakeholders directly involved in high-speed rail implementation.

As such, this document serves as a trusted global reference for high-speed rail professionals, policymakers, academics and industry leaders.

All information presented in this edition is current as of 31 December 2023.

Bertrand Minary

UIC Passenger Director


INTERNATIONAL UNION
OF RAILWAYS

1. GLOBAL HIGH - SPEED DATA

2. EUROPE

3. ASIA - PACIFIC

4. AFRICA

5. NORTH AMERICA

6. MIDDLE EAST

7. LATIN AMERICA

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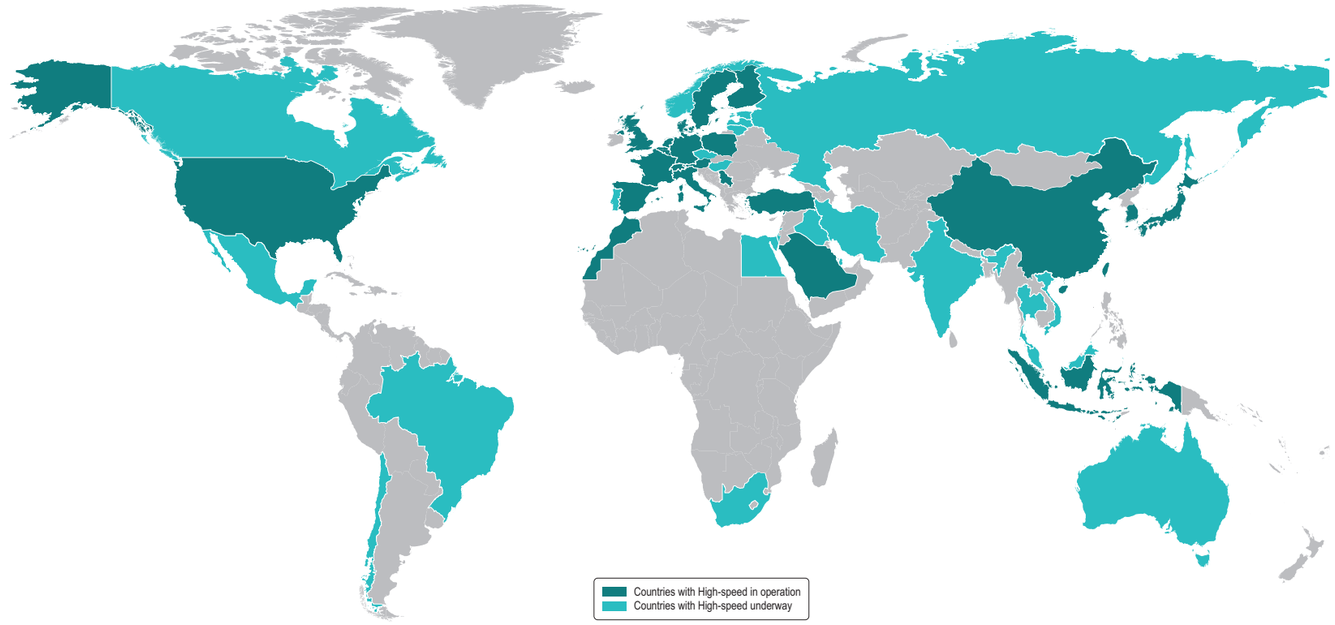
1.1 GLOBAL DATA

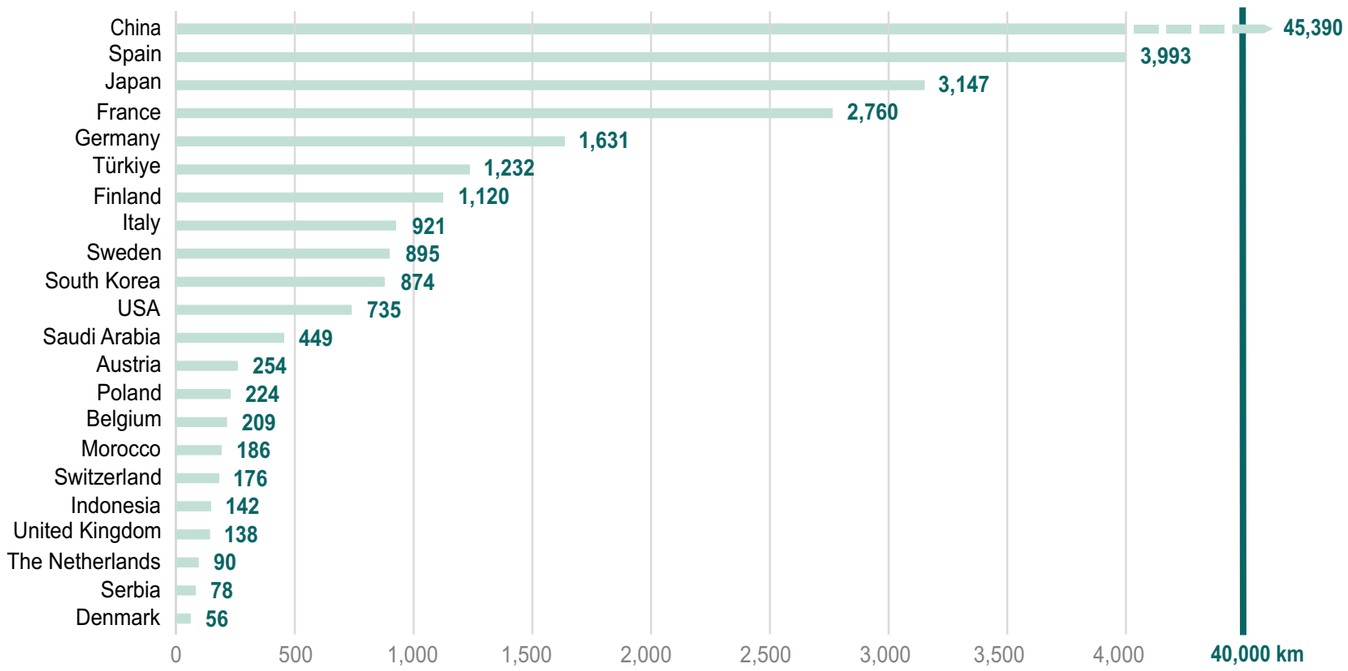
Countries with a high-speed rail network in commercial operation and underway



Note: Vast island territories in extreme latitudes are not considered for this map.

Source: compiled by authors based on International Union of Railways

Length of the high-speed network in commercial operation by country



Source: compiled by authors based on International Union of Railways

Length of the high-speed network in commercial operation by UIC Regions

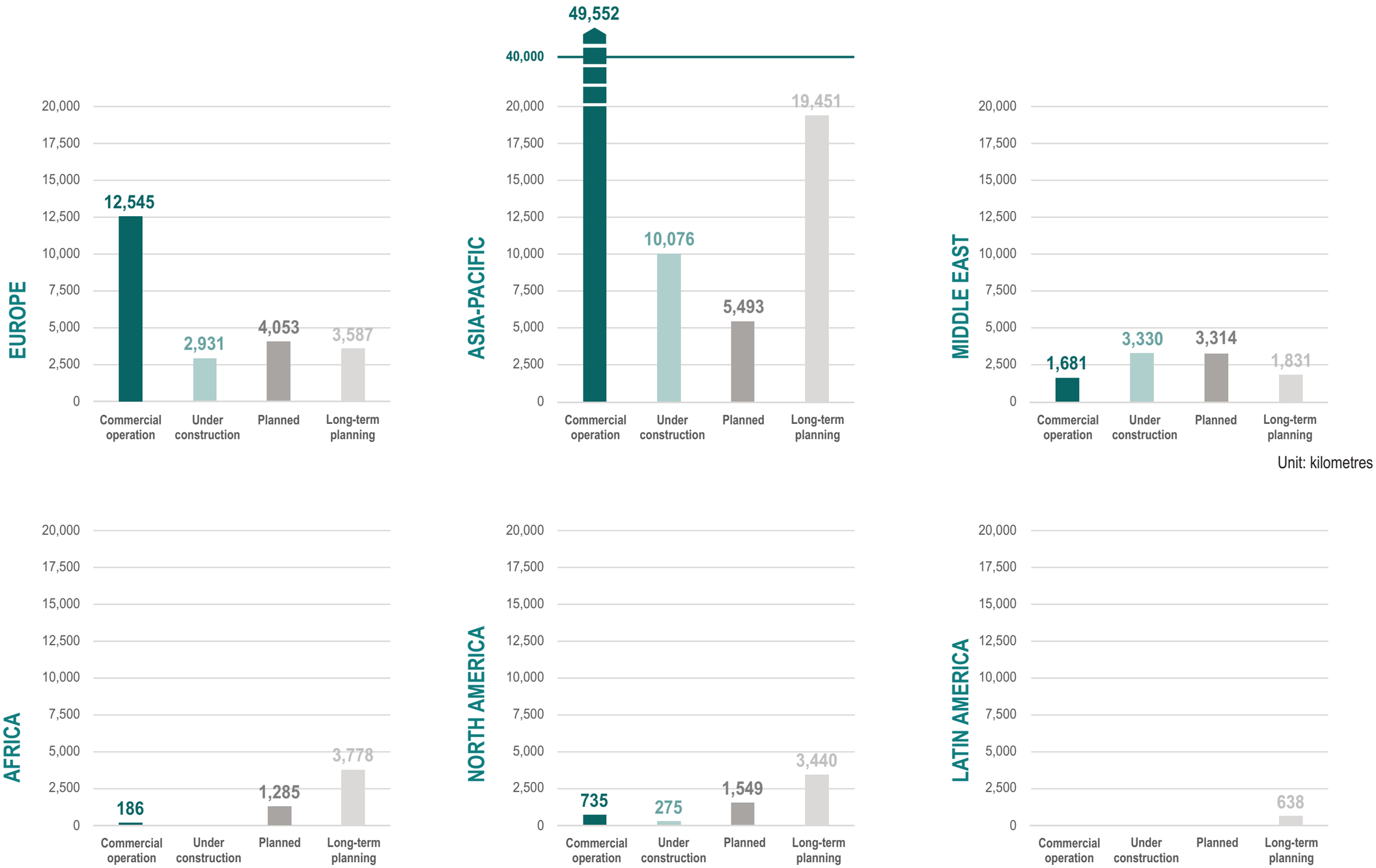
Source: compiled by authors based on International Union of Railways

Length of the high-speed network under construction by UIC Regions

Source: compiled by authors based on International Union of Railways

1.1 GLOBAL DATA

Length of the high-speed network by UIC Regions



Unit: kilometres

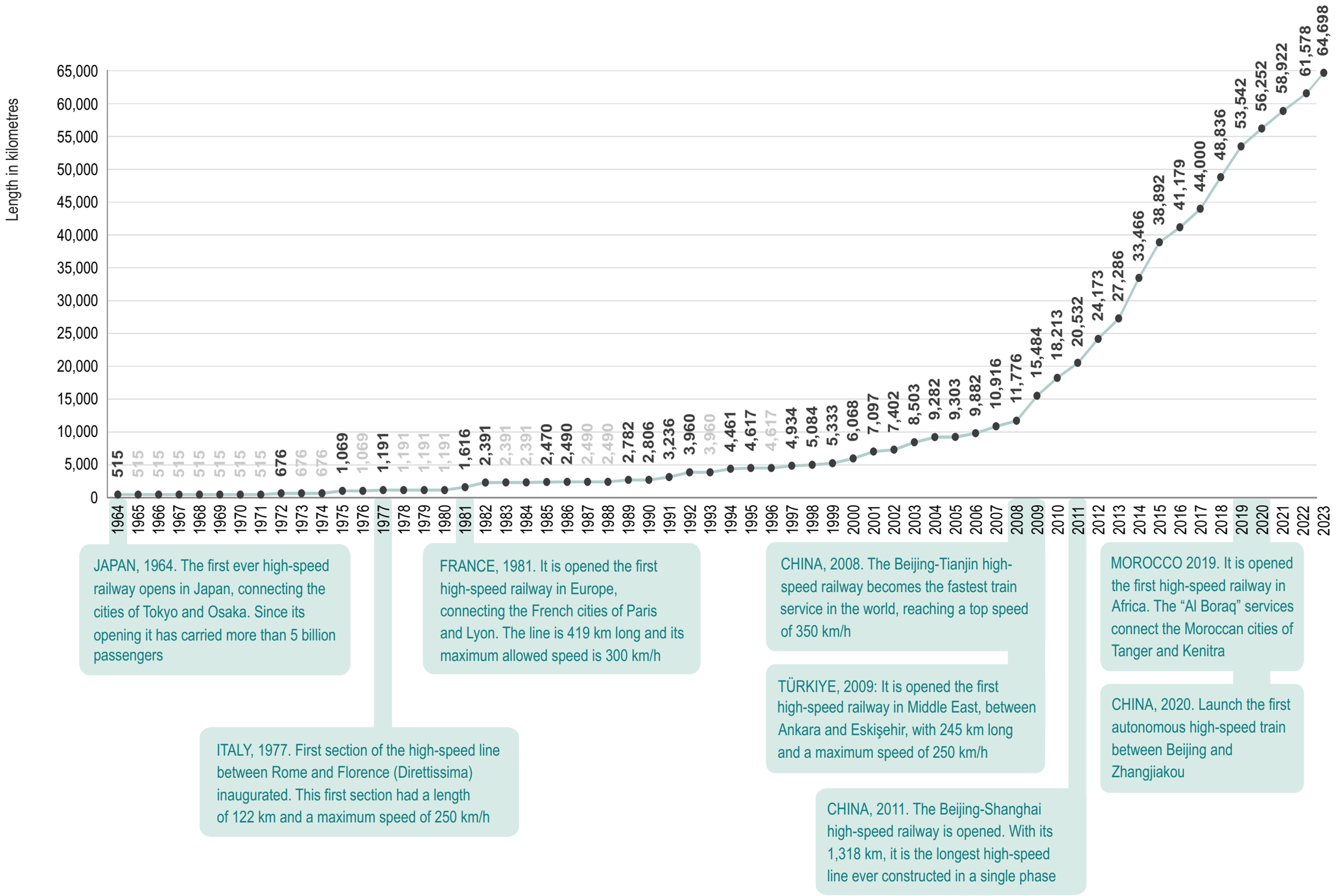
Unit: kilometres

Source: compiled by authors based on International Union of Railways

International Union of Railways

1.1 GLOBAL DATA

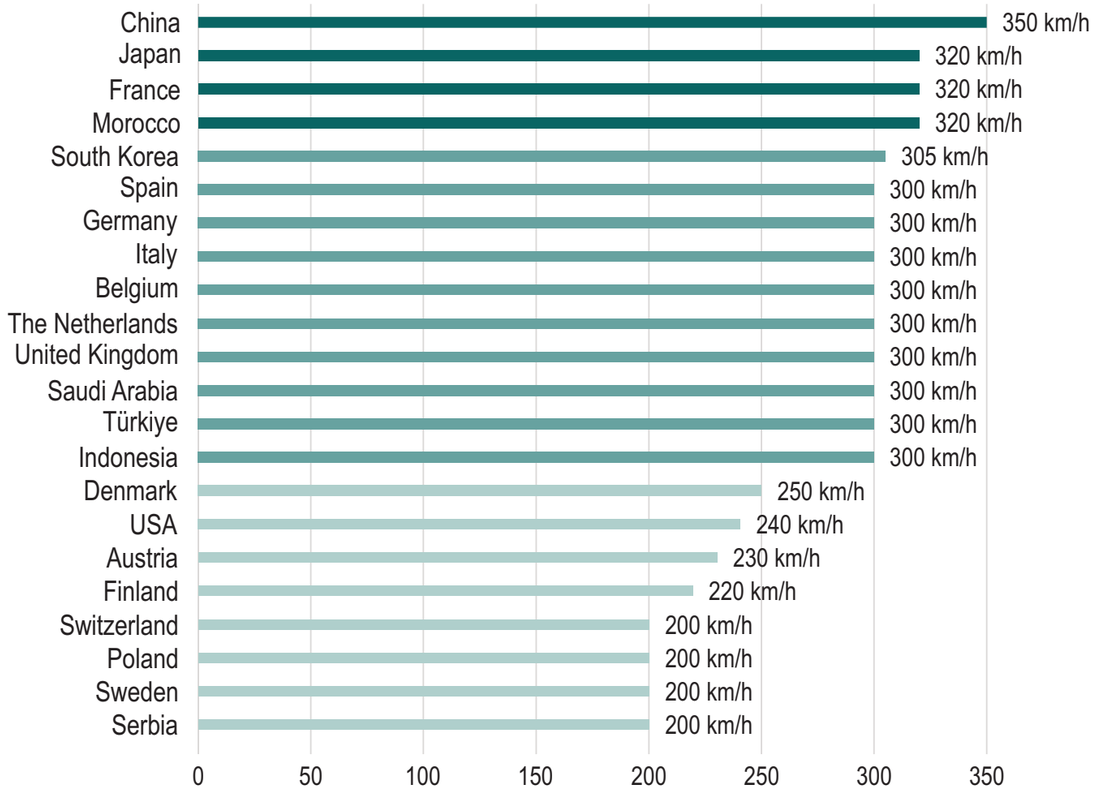
Length of the high-speed network in commercial operation worldwide (1964-2023)



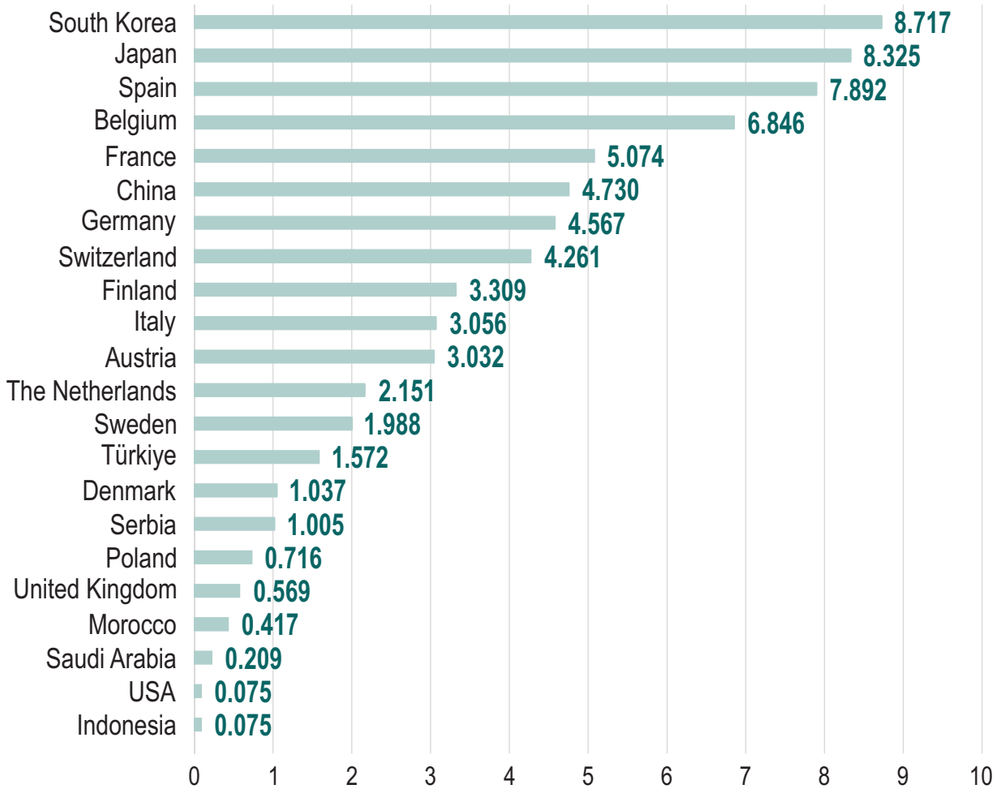
Source: compiled by authors based on International Union of Railways

1.1 GLOBAL DATA

Maximum speed of high-speed rail network by country (2023)



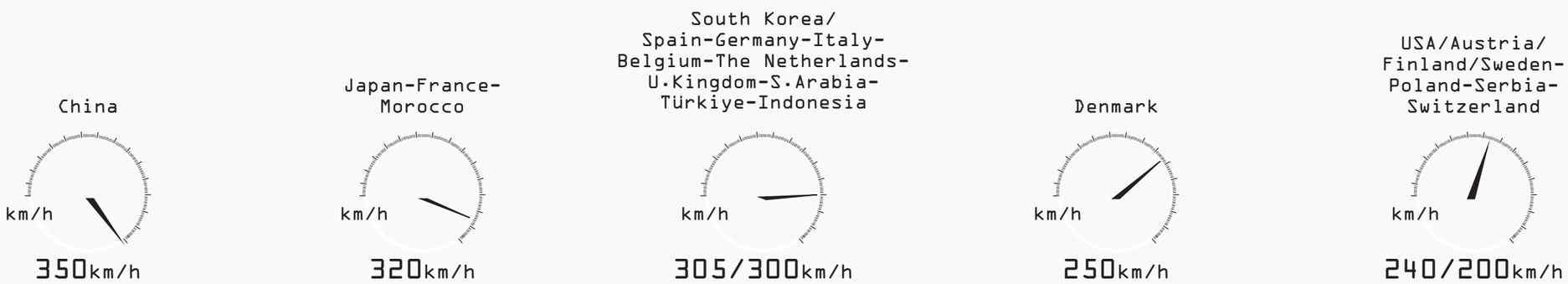
Density of high-speed network in 2023 (metres of high-speed lines / country area in km²)



Note: Density ratio for Denmark has been calculated excluding Greenland area

Source: compiled by authors based on International Union of Railways

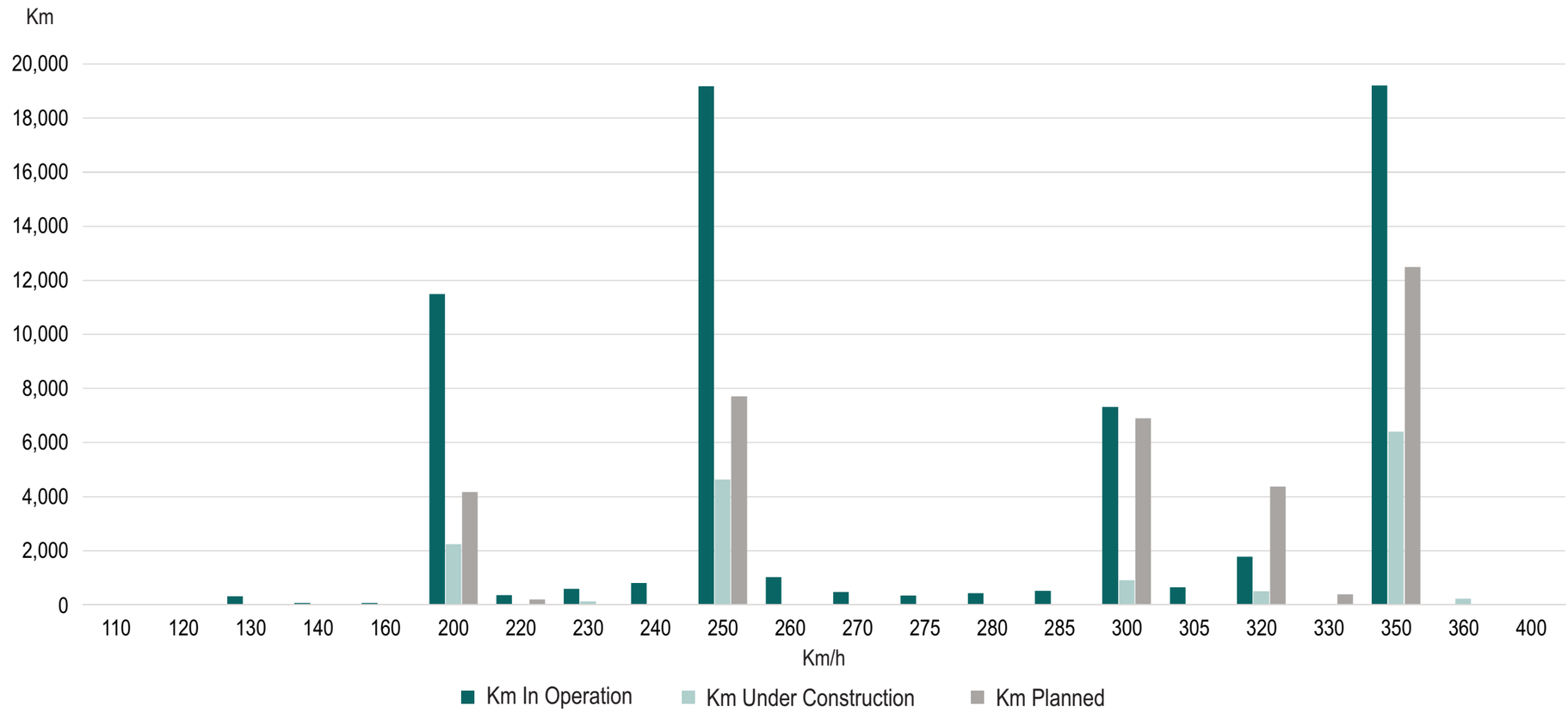
Maximum speed of high-speed rail network by country (2023)



Source: compiled by authors based on International Union of Railways

1.1 GLOBAL DATA

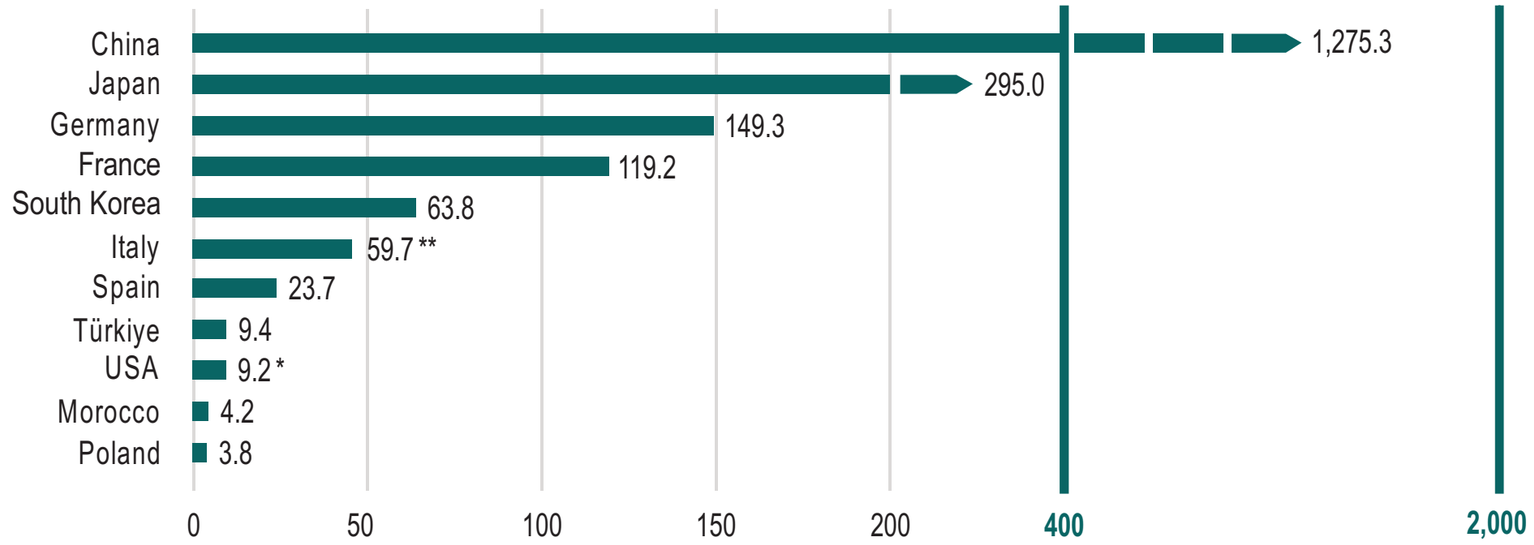
Length (km) of the high-speed network according to maximum speed and status of implementation (2023)



Source: compiled by authors based on International Union of Railways

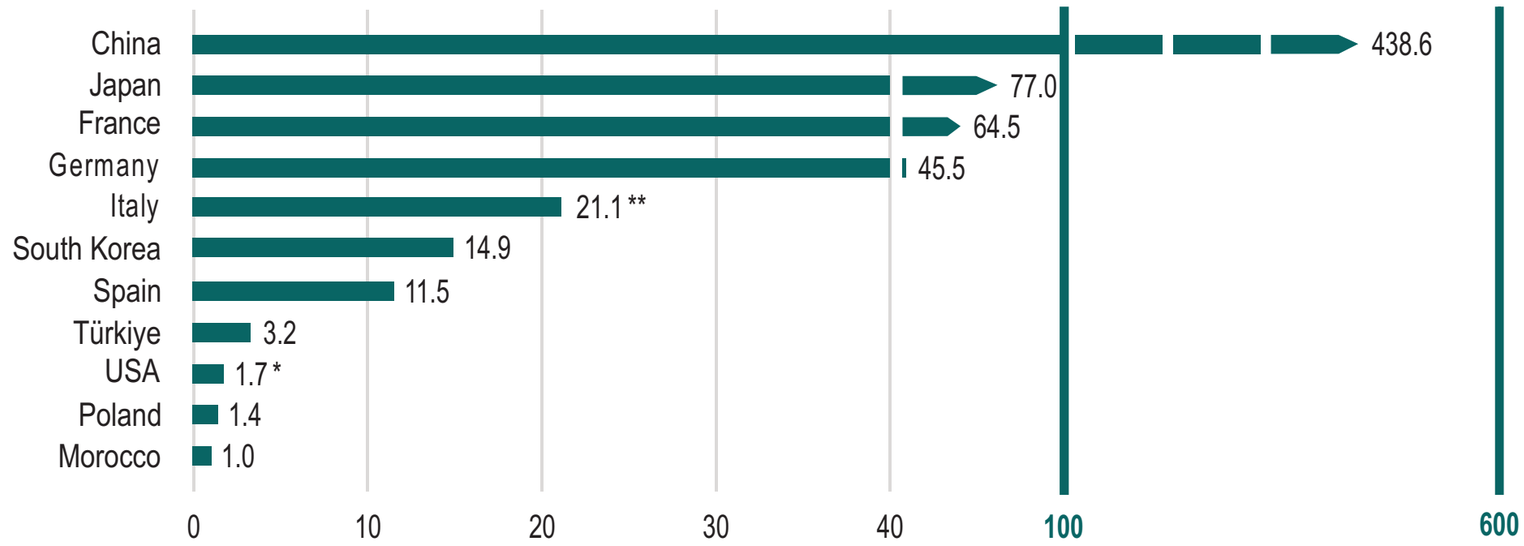
1.1 GLOBAL DATA

Number of passenger (millions) by countries (2022)



Source: compiled by authors based on International Union of Railways

Number of passenger.kilometre (billions) by countries (2022)



Notes:
(*) Figures referred to fiscal year Oct 2021-Sep 2022
(**) Figures referred to 2019

Source: compiled by authors based on International Union of Railways

1.2 HIGH-SPEED LINES IN COMMERCIAL OPERATION WORLDWIDE

High-speed lines in Europe (I)

LINE	COUNTRY	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Rome - Florence (First section)	ITALY	250	1977	122
LN1 LGV París Sud-Est	FRANCE	300	1981	425
Rome - Florence (Second section)	ITALY	250	1985	52
Rome - Florence (Third section)	ITALY	250	1986	20
LN2 - LGV Atlantique	FRANCE	300	1989	292
Linz - Wels	AUSTRIA	200	1990	24
Hannover - Würzburg	GERMANY	280	1991	327
Mannheim - Stuttgart	GERMANY	280	1991	99
Rome - Florence (Forth section)	ITALY	250	1992	44
Madrid - Sevilla	SPAIN	270	1992	471
LN4 - LGV Rhone-Alpes	FRANCE	300	1992	122
Calais - Folkstone (Channel Tunnel)	FRANCE / U. KINGDOM	160	1994	50
LN3 - LGV Nord - Europe	FRANCE	300	1994	346
LN3 - LGV Interconnexion EST IDF	FRANCE	300	1994	105
Helsinki - Turku	FINLAND	200	1995	156
Brussels - French border (L1)	BELGIUM	300	1997	72
Hannover - Berlin	GERMANY	250	1998	150
Stockholm - Örebro	SWEDEN	250	1999	187
St. Pölten - Ybbs	AUSTRIA	200	2001	44
Helsinki - Oulu	FINLAND	200	2001	673
Jämsänkoski - Jyväskylä	FINLAND	200	2001	53
LN5 - LGV Méditerranée	FRANCE	300	2001	259
Leuven - Liège (L2)	BELGIUM	300	2002	65
(Cologne) - Siegburg - Frankfurt	GERMANY	300	2002	144
Amstetten - St. Valentin	AUSTRIA	200	2003	37
Cologne - Düren	GERMANY	250	2003	39
Madrid - Lleida	SPAIN	300	2003	467
Zaragoza - Huesca	SPAIN	200	2003	79
Fawkham Junction - Tunnel	UNITED KINGDOM	300	2003	74
(Karlsruhe) - Raststatt Süd - Offenburg - (Basel)	GERMANY	250	2004	44
Hamburg - Berlin	GERMANY	230	2004	286
Mattstetten - Rothrist	SWITZERLAND	200	2004	42
Solothurn - Wanzwil	SWITZERLAND	200	2004	11
(Madrid -) La Sagra - Toledo	SPAIN	220	2005	21
Kinni - Otava	FINLAND	200	2006	44
Kerava - Lahti	FINLAND	220	2006	63
Nuremberg - Ingolstadt	GERMANY	300	2006	89

Source: compiled by authors based on International Union of Railways

1.2 HIGH-SPEED LINES IN COMMERCIAL OPERATION WORLDWIDE

High-speed lines in Europe (II)

LINE	COUNTRY	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Turin - Novara	ITALY	300	2006	86
Córdoba - Antequera-Santa Ana	SPAIN	300	2006	111
Lleida - Camp de Tarragona	SPAIN	300	2006	96
Hoofddorp - Rotterdam West	THE NETHERLANDS	300	2006	44
Rotterdam Lombardijen - Belgian border	THE NETHERLANDS	300	2006	46
St. Valentin - Asten-St Florian	AUSTRIA	230	2007	16
LN6 - LGV Est Europe (First phase)	FRANCE	320	2007	335
Madrid - Olmedo - Valladolid	SPAIN	300	2007	178
Antequera Santa Ana - Málaga	SPAIN	300	2007	58
Frutigen - Visp (Lötschberg base tunnel)	SWITZERLAND	250	2007	38
London - Southfleet Junction	UNITED KINGDOM	300	2007	39
Padova - Venice	ITALY	220	2007	25
Milan - Bologna	ITALY	300	2008	182
Naples - Salerno	ITALY	250	2008	29
Camp de Tarragona - Barcelona	SPAIN	300	2008	100
Gothenburg - Lund	SWEDEN	200	2008	283
Liège - German border (L3)	BELGIUM	260	2009	36
Antwerp - Dutch border (L4)	BELGIUM	300	2009	36
Lahti - Luumäki	FINLAND	200	2009	131
Rome - Naples	ITALY	300	2009	205
Novara - Milan	ITALY	300	2009	38
Florence - Bologna	ITALY	300	2009	78
Bypass Madrid	SPAIN	200	2009	5
Santiago - A Coruña	SPAIN	200	2009	61
Nyland - Umeå	SWEDEN	200	2009	180
(Figueres -) Spanish border - Perpignan	FRANCE	300	2010	24
Madrid - Albacete Junction - Valencia	SPAIN	300	2010	362
Albacete Junction - Albacete	SPAIN	300	2010	73
Figueres - French border (- Perpignan)	SPAIN	300	2010	20
Sundsvall - Nyland	SWEDEN	200	2010	30
LN7 LGV Rhin-Rhône Branche Est	FRANCE	320	2011	146
Munich - Augsburg	GERMANY	230	2011	62
Ourense - Santiago	SPAIN	300	2011	85
Vienna Knoten Hadersdorf - St. Pölten	AUSTRIA	230	2012	50
Knoten Radfeld - Knoten Baumkirchen	AUSTRIA	220	2012	36
Wels - Attnang-Puchheim	AUSTRIA	230	2012	30

Source: compiled by authors based on International Union of Railways

1.2 HIGH-SPEED LINES IN COMMERCIAL OPERATION WORLDWIDE

High-speed lines in Europe (III)

LINE	COUNTRY	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
(Karlsruhe) - Katzenberg tunnel - (Basel)	GERMANY	250	2012	18
Bypass Yeles	SPAIN	200	2012	6
Gothenburg - Kornsjø	SWEDEN	200	2012	180
Barcelona - Figueres	SPAIN	290	2013	131
Albacete - Alicante/Alacant	SPAIN	300	2013	165
Erfurt - Leipzig/Halle	GERMANY	300	2015	123
Grodzisk Mazowiecki - Opoczno	POLAND	200	2015	224
Santiago - Vigo	SPAIN	200	2015	95
Valladolid - León	SPAIN	200	2015	166
Olmedo - Zamora	SPAIN	200	2015	99
Sevilla - Cádiz	SPAIN	200	2015	153
Ybbs - Amstetten	AUSTRIA	230	2016	17
LN6 - LGV Est Europe (Second phase)	FRANCE	320	2016	122
Milan - Brescia	ITALY	250	2016	40
Erstfeld - Biasca (Gothard base tunnel)	SWITZERLAND	200	2016	67
LGV Bretagne Pays de la Loire	FRANCE	320	2017	219
LGV Sud Europe Atlantique (Tours-Bordeaux)	FRANCE	320	2017	340
Ebensfeld - Erfurt	GERMANY	300	2017	107
Nuremberg - Ebensfeld	GERMANY	230	2017	83
Copenhagen - Ringsted	DENMARK	250	2019	56
Valencia - Vandellós	SPAIN	220	2019	219
Antequera-Santa Ana - Granada	SPAIN	250	2019	109
Vandellós - Tarragona	SPAIN	200	2020	47
Giubiasco/S. Ant. - Vezia (Ceneri base tunnel)	SWITZERLAND	250	2020	18
Zamora - Pedralba	SPAIN	300	2020	110
Murcia Junction - Orihuela - Beniel	SPAIN	240	2021	54
Pedralba - Ourense	SPAIN	300	2021	119
Wendlingen - Ulm	GERMANY	250	2022	60
Beniel - Murcia	SPAIN	240	2022	16
Venta de Baños - Burgos	SPAIN	300	2022	91
Plasencia - Badajoz	SPAIN	200	2022	142
Chamartín - Atocha new tunnel	SPAIN	120	2022	7
Belgrade - Novi Sad	SERBIA	200	2022	78
León - Pola de Lena (Pajares New pass)	SPAIN	250	2023	76
Lund - Arlöv	SWEDEN	200	2023	11
Ängelholm - Maria	SWEDEN	200	2023	24

Source: compiled by authors based on International Union of Railways

1.2 HIGH-SPEED LINES IN COMMERCIAL OPERATION WORLDWIDE

High-speed lines in Asia - Pacific (I)

LINE	COUNTRY	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Tokyo - Shin Osaka (Tokaido)	JAPAN	285	1964	515
Shin Osaka - Okayama (San-yo)	JAPAN	300	1972	161
Okayama - Hakata (San-yo)	JAPAN	300	1975	393
Omiya - Niigata (Joetsu)	JAPAN	275	1982	270
Omiya - Utsunomiya (Tohoku)	JAPAN	275	1982	79
Utsunomiya - Morioka (Tohoku)	JAPAN	320	1982	426
Ueno - Omiya (Tohoku)	JAPAN	130	1985	28
Tokyo - Ueno (Tohoku)	JAPAN	110	1991	4
Fukushima - Yamagata (Yamagata)	JAPAN	130	1992	87
Takasaki - Nagano (Hokuriku)	JAPAN	260	1997	117
Morioka - Akita (Akita)	JAPAN	130	1997	127
Yamagata - Shinjo (Yamagata)	JAPAN	130	1999	62
Morioka - Hachinohe (Tohoku)	JAPAN	260	2002	97
Qinhuangdao - Shenyang North	CHINA	250	2003	405
Shin Yatsuhiro - Kagoshima Chuo (Kyushu)	JAPAN	260	2004	127
Geumcheon-gu (Seoul) - Dongdaegu	SOUTH KOREA	305	2004	269
Taipei - Kaohsiung	CHINA-CHINESE TAIPEI	300	2007	345
Nanjing South - Hefei	CHINA	250	2008	148
Beijing South - Tianjin	CHINA	350	2008	118
Qingdao - Jinan	CHINA	200	2009	393
Hefei East - Hankou	CHINA	250	2009	380
Shijiazhuang North - Taiyuan	CHINA	250	2009	228
Ningbo - Cangnan	CHINA	250	2009	351
Wuhan - Guangzhou South	CHINA	350	2009	1,079
Chongqing North - Liangwu	CHINA	200	2009	263
Zhengzhou East - Xi'an North	CHINA	350	2010	553
Hachinohe - Shin Aomori (Tohoku)	JAPAN	260	2010	82
Dongdaegu - Busan	SOUTH KOREA	305	2010	131
Cangnan - Fuzhou	CHINA	250	2010	211
Fuzhou - Xiamen North	CHINA	250	2010	234
Chengdu - Qingchengshan	CHINA	200	2010	65
Shanghai - Nanjing	CHINA	350	2010	323
Jiujiang - Nanchang West	CHINA	250	2010	138
Shanghai Hongqiao - Hangzhou South	CHINA	350	2010	174
Haikou - Sanya	CHINA	250	2010	308
Guangzhou South - Zhuhai	CHINA	200	2011	143

Source: compiled by authors based on International Union of Railways

1.2 HIGH-SPEED LINES IN COMMERCIAL OPERATION WORLDWIDE

High-speed lines in Asia - Pacific (II)

LINE	COUNTRY	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Changchun - Jilin	CHINA	250	2011	111
Hakata - Shin Yatsushiro (Kyushu)	JAPAN	260	2011	130
Beijing South - Shanghai Hongqiao	CHINA	350	2011	1,318
Guangzhou South - Shenzhen North	CHINA	250	2011	111
Longyan - Beixitou (block station)	CHINA	200	2012	119
Hankou - Yichang East	CHINA	200	2012	292
Zhengzhou East - Wuhan	CHINA	350	2012	526
Bengbu South - Hefei	CHINA	350	2012	131
Dalian North - Shenyang North	CHINA	350	2012	383
Shenyang North - Harbin	CHINA	350	2012	546
Suining - Chengdu East	CHINA	200	2012	151
Beijing West - Zhengzhou East	CHINA	350	2012	676
Taishansuo (b.s.) - Liuzhou	CHINA	200	2012	498
Taigemu - Baotou	CHINA	200	2013	146
Nanjing South - Hangzhou East	CHINA	350	2013	254
Hangzhou South - Ningbo	CHINA	350	2013	157
Panjin North - Yingxiajiahe (block station)	CHINA	350	2013	90
Nanchang West - Fuzhou	CHINA	200	2013	547
Yongtai - Putian	CHINA	200	2013	59
Jinhu (b.s.) - Longjiaying (b.s.)	CHINA	350	2013	288
Xi'an North - Baoji South	CHINA	350	2013	184
Xiamen North - Shenzhen North	CHINA	250	2013	513
Nanhu East - Xianning South	CHINA	250	2013	76
Liuzhou - Nanning	CHINA	250	2013	223
Qinzhou North - Fangchenggang	CHINA	250	2013	62
Nanning East - Beihai	CHINA	250	2013	197
Pixian West - Pengzhou	CHINA	200	2013	21
Nanning - Guangzhou South	CHINA	250	2014	574
Xiaomayang (b.s.) - Daye North	CHINA	250	2014	91
Gedian South - Huanggangdong	CHINA	250	2014	36
Changfengjie (b.s.) - Xi'an North	CHINA	250	2014	574
Hangzhou South - Changsha South	CHINA	350	2014	911
Changsha South - Xinhuang West	CHINA	350	2014	420
Jiangyou - Chengdu East	CHINA	250	2014	153
Chengdu East - Leshan	CHINA	250	2014	135
Leshan - Emeishan	CHINA	250	2014	27

Source: compiled by authors based on International Union of Railways

1.2 HIGH-SPEED LINES IN COMMERCIAL OPERATION WORLDWIDE

High-speed lines in Asia - Pacific (III)

LINE	COUNTRY	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Lanzhou West - Ürümqi South	CHINA	250	2014	1,785
Jiayuguan South - Jiayuguan	CHINA	200	2014	7
Guizhou East - Guangzhou South	CHINA	250	2014	860
Qingdao - Rongcheng	CHINA	250	2014	301
Zhengzhou East - Songchenglu	CHINA	200	2014	50
Ximotang - Yantai	CHINA	250	2015	19
Nanyangzhai - Jiaozuo	CHINA	200	2015	70
Xinhuang West - Guiyang North	CHINA	350	2015	286
Hefei North City - Fuzhou	CHINA	350	2015	850
Harbin North - Qiqihar South	CHINA	250	2015	264
Shenyang South - Dandong	CHINA	250	2015	208
Osong - Gwangju	SOUTH KOREA	305	2015	182
Tianjin - Haibin	CHINA	350	2015	43
Jilin - Hunchun	CHINA	250	2015	361
Nanjing East - Anqing	CHINA	250	2015	257
Nagano - Kanazawa (Hokuriku)	JAPAN	260	2015	228
Nanning - Yangxu	CHINA	250	2015	257
Dandong - Dalian North	CHINA	200	2015	293
Chengdu East - Shapingba	CHINA	250	2015	300
Tangyasuo (block station) - Wenzhou South	CHINA	200	2015	190
Ganxian - Longyan	CHINA	200	2015	248
Tianjin West - Bazhou West	CHINA	250	2015	72
Bazhou West - Xushui	CHINA	200	2015	65
Hainan West Circle (Haikou-Sanya)	CHINA	200	2015	345
Zhengzhou East - Xinzheng Airport	CHINA	200	2015	28
Taipei - Nangang	CHINA-CHINESE TAIPEI	130	2016	9
Foshan West - Zhaoqing	CHINA	200	2016	81
Changping East - Xiaojinkou	CHINA	200	2016	53
Suseo - Pyoengtaek	SOUTH KOREA	305	2016	61
Zhengzhou East - Xuzhou East	CHINA	350	2016	362
Chongqing North - Wanzhou North	CHINA	250	2016	246
Shin Aomori - Shin Hakodate (Hokkaido)	JAPAN	260	2016	149
Hankou - Xiaogan East	CHINA	200	2016	61
Changsha - Zhuzhou South	CHINA	200	2016	58
Muyun - Xiangtan	CHINA	200	2016	24
Guiyang North - Kunming South	CHINA	250	2016	463

Source: compiled by authors based on International Union of Railways

1.2 HIGH-SPEED LINES IN COMMERCIAL OPERATION WORLDWIDE

High-speed lines in Asia - Pacific (IV)

LINE	COUNTRY	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Yangxu - Kunming East	CHINA	250	2016	452
Daye North - Yangxin	CHINA	250	2017	37
Baoji South - Lanzhou West	CHINA	250	2017	353
Wulanchabu - Hohhot East	CHINA	250	2017	128
Yangxin - K23 block station	CHINA	250	2017	82
Xi'an North - Jiangyou	CHINA	250	2017	505
Huaibei North - Xiaoxian North	CHINA	250	2017	25
Seoul - Gangneung	SOUTH KOREA	250	2017	230
Shijiazhuang - Jinan West	CHINA	250	2017	308
Quzhou - Jiujiang	CHINA	200	2017	334
Dongguan - Changping East	CHINA	200	2017	48
Changsha West - Changsha	CHINA	200	2017	22
Tongjiaxi (block station) - Guiyang	CHINA	200	2018	380
Jiangmen - Zhanjiang West	CHINA	200	2018	355
Harbin - Jiamusi	CHINA	200	2018	343
Fanjiazhuang (b.s.) - Changfengjie (b.s.)	CHINA	200	2018	122
Guangtong North - Dali	CHINA	200	2018	175
Xinhui - Jiangmen	CHINA	200	2018	3
Shenzhen North - Futian	CHINA	200	2018	4
Harbin - Harbin North	CHINA	200	2018	18
Hangzhou South - Huangshan North	CHINA	250	2018	272
Harbin - Mudanjiang	CHINA	250	2018	300
Qingdao North - Ganyu North	CHINA	200	2018	197
Ganyu North - Weiyang (block station)	CHINA	200	2018	234
Huaihua South - Hengyang East	CHINA	200	2018	319
Mayuan - Yanjialong	CHINA	200	2018	5
Changtang (block station) - Hengyang North	CHINA	200	2018	5
Changtang (block station) - Chashan'ao	CHINA	200	2018	5
Qihe - Jinan West	CHINA	200	2018	21
Dazhengzhuang (b.s.) - Damoliu (b.s.)	CHINA	200	2018	3
Beixindian (b.s.) - Wulitang (block station)	CHINA	200	2018	21
Jinan East - Hongdao	CHINA	350	2018	305
Tongren - Dazongping	CHINA	200	2018	46
Chengdu West - Chaoyang Lake	CHINA	200	2018	100
Yanping - Longyan	CHINA	200	2018	247
Houling (b.s.) - Hongxing (b.s.)	CHINA	200	2018	8

Source: compiled by authors based on International Union of Railways

1.2 HIGH-SPEED LINES IN COMMERCIAL OPERATION WORLDWIDE

High-speed lines in Asia - Pacific (V)

LINE	COUNTRY	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Huyi (block station) - Aibei (block station)	CHINA	200	2018	2
Chengde South - Pingquan North	CHINA	350	2018	67
Pingquan North - Shenyang North	CHINA	350	2018	435
Dingxiang Lake 2 (b.s.) - Da'erhuan 1 (b.s.)	CHINA	200	2018	2
Dingxiang Lake 1 (b.s.) - Da'erhuan 2 (b.s.)	CHINA	200	2018	2
Xinmin North - Tongliao	CHINA	250	2018	197
Yaojiawopu (b.s.) - Tianjiawopu (b.s.)	CHINA	200	2018	6
Tuancun (block station) - Daguhe (block station)	CHINA	350	2018	4
Leshan - Yibin West	CHINA	350	2019	145
Liying - Daxing Airport	CHINA	200	2019	32
Meizhou West - Chaoshan	CHINA	200	2019	121
Rizhao West - Dawangzhuang (b. s.)	CHINA	350	2019	226
Qufu East - Dawangzhuang (b. s.)	CHINA	200	2019	10
Qufu East - Nanxiasong (b. s.)	CHINA	200	2019	4
Xiaogan East - Yunmeng East	CHINA	250	2019	21
Yunmeng East - Shiyan East	CHINA	350	2019	377
Shangqiu - Hefei North City	CHINA	350	2019	378
Zhengzhou East - Xiangyang East	CHINA	350	2019	389
Zhengzhou South - Fuyang West	CHINA	350	2019	280
Yinchuan - Zhongwei South	CHINA	250	2019	207
Xintang South - Shenzhen Airport	CHINA	140	2019	73
Xintang South - Xintang	CHINA	140	2019	3
Xuzhou East (Xulan b.s.) - Yancheng (Xuyan b.s.)	CHINA	250	2019	313
Dongji - Huai'an East	CHINA	250	2019	105
Yibin West - Guiyang East	CHINA	250	2019	368
Jianpo (block station) - Guiyang North	CHINA	250	2019	9
Hejia (b.s.) - Yangtaishan (b.s.)	CHINA	350	2019	385
Henggang - Hejia (block station)	CHINA	200	2019	11
Dongcun (block station) - Pushu (block station)	CHINA	200	2019	5
Fanjia (block station) - Nanjie (block station)	CHINA	200	2019	2
Ganxian North - Pingjiang (block station)	CHINA	200	2019	3
Qianjiang - Changde	CHINA	200	2019	333
Beijing North - Zhangjiakou	CHINA	350	2019	174
Zhangjiakou - Wulanchabu	CHINA	350	2019	159
Xiahuayuan - Taizicheng (Chongli Railway)	CHINA	250	2019	52
Huai'an - Taishancun (block station)	CHINA	250	2019	136

Source: compiled by authors based on International Union of Railways

1.2 HIGH-SPEED LINES IN COMMERCIAL OPERATION WORLDWIDE

High-speed lines in Asia - Pacific (VI)

LINE	COUNTRY	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Kazuo - Chifeng	CHINA	250	2020	156
Sunjiagou (b.s.) - Zhengzhangzi (b.s.)	CHINA	200	2020	5
Feidong - Huzhou	CHINA	350	2020	309
Zhaodian - Huangdu	CHINA	200	2020	143
Pingdong (b.s.) - Nantong West	CHINA	200	2020	5
Anshun West - Shuicheng	CHINA	250	2020	120
Guangzhou North - Qingyuan	CHINA	200	2020	38
Weifang North - Laixi East	CHINA	350	2020	124
Langjiazhuang (b.s.) - Pangjiatun (b.s.)	CHINA	200	2020	3
Huai'an East - Dantu	CHINA	250	2020	199
Shaobo (b.s.) - Jiangdu	CHINA	200	2020	4
Shaobo (b.s.) - Tai'anzhen	CHINA	200	2020	5
Hengshan (b.s.) - Zhenjiang (Intercity o.s.)	CHINA	200	2020	12
Jiaozuo - Changfengjie (b.s.)	CHINA	250	2020	362
Feixi Jinggang (b.s.) - Shuangling (b.s.)	CHINA	350	2020	134
Shuangling (b.s.) - Longshan (b.s.)	CHINA	200	2020	4
Longshan (b.s.) - Anqing	CHINA	200	2020	22
Fuzhou - Pingtan	CHINA	200	2020	88
Xi'an North - Wuzhong	CHINA	250	2020	545
Huwang (b.s.) - Liquan South	CHINA	200	2020	6
Daxing Airport - Xiong'an	CHINA	350	2020	59
Yancheng (Xuyan o.s.) - Nantong West	CHINA	350	2020	158
Guodaocun (b.s.) - Chenqiao (b.s.)	CHINA	200	2020	6
Jixianlu (b.s) - Feixi Jinggang o.s.	CHINA	200	2020	10
Dafu - Xiantao	CHINA	200	2020	17
Beijing Chaoyang - Chengde South	CHINA	350	2021	192
Xuzhou East - Houmazhuang	CHINA	350	2021	185
Shenxu (b.s.) - Lianyungang (Xuzhou o.s.)	CHINA	200	2021	5
Neijiang North - Luzhou	CHINA	250	2021	129
Liaoning Chaoyang - Linghai South	CHINA	350	2021	107
Zhangjiajie West - Huaihua South	CHINA	350	2021	245
Zhangjiajie West - Shadi (b.s.)	CHINA	200	2021	3
Longxingcun (b.s.) - Huaihua South	CHINA	200	2021	4
Mudanjiang - Jiamusi	CHINA	250	2021	372
Changbaishan - Dunhua South	CHINA	250	2021	99
Dunhua South - Dunhua	CHINA	200	2021	12

Source: compiled by authors based on International Union of Railways

1.2 HIGH-SPEED LINES IN COMMERCIAL OPERATION WORLDWIDE

High-speed lines in Asia - Pacific (VII)

LINE	COUNTRY	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Hejia (b.s.) - Yangtaishan (b.s.)	CHINA	350	2021	431
Shuangling (b.s.) - Lushan	CHINA	350	2021	176
Tangxia (b.s.) - Dongguan South	CHINA	200	2021	3
Dongguan South - Tangxia (b.s.)	CHINA	200	2021	2
Yangtaishan (b.s.) - Shenzhen North	CHINA	200	2021	8
Anqing West - Longshan (b.s.)	CHINA	200	2021	7
Dawangzhuang - Zhuangzhai	CHINA	350	2021	199
Xiaobeishan (b.s.) - Nanxiasong (b.s.)	CHINA	200	2021	5
Takeo Onsen - Nagasaki (Nishi Kyushu)	JAPAN	260	2022	66
Shaoxing North - Wenling	CHINA	350	2022	223
Shaoxing North - Jinghu (b.s.)	CHINA	350	2022	3
Webling North (b.s.) - Wenling	CHINA	350	2022	4
Bahe (b.s.) - Huangmei East	CHINA	350	2022	116
Huanggang East - Bahe (b.s.)	CHINA	250	2022	9
Puyang East - Zhengzhou East	CHINA	350	2022	195
Yangzhuang (b.s.) - Hongbao (b.s.)	CHINA	250	2022	3
Beijing Fengtai - Dujiakan (b.s.)	CHINA	350	2022	9
Xiangyang East - Wanzhou North	CHINA	350	2022	450
Huanglou (b.s.) - Gongxing (b.s.)	CHINA	250	2022	6
Yiyang South - Huangjinyuan (b.s.)	CHINA	350	2022	60
Huangjinyuan (b.s.) - Changsha West	CHINA	350	2022	3
Huzhou - Tonglu East	CHINA	350	2022	129
Tonglu East - Tonglu	CHINA	350	2022	9
Nanning South - Chongzuo	CHINA	250	2022	121
Mile - Honghe	CHINA	250	2022	106
Changde - Yiyang South	CHINA	350	2022	97
Zhongwei South - Shuping	CHINA	250	2022	221
Dingjiagou (b.s.) - Lanzhou New Area	CHINA	250	2022	7
Baodi - Beichen	CHINA	250	2022	54
Beiliugezhuang (b.s.) - Tangshan	CHINA	350	2022	141
Gaoxinzhuang - Beiliugezhuang (b.s.)	CHINA	250	2022	2
Tangshan West - Laozhuangzi (b.s.)	CHINA	250	2022	10
Jinan - Laiwu	CHINA	350	2022	116
Jakarta - Bandung	INDONESIA	300	2023	142
Longli North - Libo	CHINA	350	2023	176
Libo - Nanning East	CHINA	350	2023	305

Source: compiled by authors based on International Union of Railways

1.2 HIGH-SPEED LINES IN COMMERCIAL OPERATION WORLDWIDE

High-speed lines in Asia - Pacific (VIII)

LINE	COUNTRY	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Fengling North (b.s.) - Xiangzhu (b.s.)	CHINA	250	2023	3
Shanwei - Xintang	CHINA	350	2023	200
Huizhou North - Xiangzhu (b.s.)	CHINA	250	2023	14
Madiling (b.s.) - Zhongkai	CHINA	250	2023	11
Fuzhou Nanyong Square - Beixitou (b.s.)	CHINA	350	2023	267
Zhanglan (b.s.) - Fuzhou Nanyong Square	CHINA	250	2023	2
Heshan (b.s.) - Xiamen North (Hangshen o.s.)	CHINA	250	2023	4
Nanjing South Ning'an o.s. - Taicang Riverside o.s.	CHINA	350	2023	275
Jiangning - Gaoxinyuan (b.s.)	CHINA	250	2023	3
Taicang Riverside o.s. - Ludu (b.s.)	CHINA	250	2023	5
Qingbaijiang - Zhenjiangguan	CHINA	200	2023	207
Qingbaijiang East - Sanxingdui	CHINA	200	2023	5
Jinan West - Puyang East	CHINA	350	2023	212
Damiaotun (b.s.) - Yufuhe (b.s.)	CHINA	250	2023	4
Laixi - Rongcheng	CHINA	350	2023	193
Laixi - Laixi East (b.s.)	CHINA	250	2023	3
Gu'an East - Shengfang	CHINA	250	2023	49
Shantou South - Shanwei	CHINA	350	2023	142
Chengdu East - Yibin East	CHINA	350	2023	246
Yibin East - Yibin	CHINA	350	2023	17
Huaxingcun (b.s.) - Jinrui (b.s.)	CHINA	250	2023	2
Yibin - Yibin West	CHINA	250	2023	2
Yibin - Zaojuebang (b.s.)	CHINA	250	2023	2
Fangchenggang North - Dongxing City	CHINA	200	2023	47
Longyan - Wuping	CHINA	250	2023	64
Huangshan North - Nanchang South	CHINA	350	2023	304
Guangzhou North - Guangzhou Baiyun	CHINA	250	2023	22

Source: compiled by authors based on International Union of Railways

1.2 HIGH-SPEED LINES IN COMMERCIAL OPERATION WORLDWIDE

High-speed lines in Africa

LINE	COUNTRY	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Tanger - Kenitra	MOROCCO	320	2018	186

High-speed lines in North America

LINE	COUNTRY	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
NE Corridor (Boston - New York - Washington)	USA	240	2000	735

High-speed lines in Middle East

LINE	COUNTRY	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Ankara - Eskisehir	TÜRKIYE	250	2009	245
(Ankara) Polatli - Konya	TÜRKIYE	250	2011	212
Eskisehir - İzmit - Pendik (Istanbul)	TÜRKIYE	250	2014	257
Kayseri North Passage	TÜRKIYE	160	2016	23
Medina - Jeddah - Mecca	SAUDI ARABIA	300	2018	449
Balışeyh (Kırıkkale) - Sivas	TÜRKIYE	300	2021	315
Konya - Karaman	TÜRKIYE	200	2022	102
(Ankara) Kayaş - Balışeyh (Kırıkkale)	TÜRKIYE	300	2023	78

Source: compiled by authors based on International Union of Railways


INTERNATIONAL UNION
OF RAILWAYS

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INDEX OF COUNTRIES

2.1 HIGH-SPEED RAIL NETWORK

AUSTRIA
SWITZERLAND

High-speed lines in commercial operation in Austria

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Linz - Wels	200	1990	24
St. Pölten - Ybbs	200	2001	44
Amstetten - St. Valentin	200	2003	37
St. Valentin - Asten-St. Florian	230	2007	16
Vienna Knot Hadersdorf - St. Pölten	230	2012	50
Radfeld Knot - Baumkirchen Knot	220	2012	36
Wels - Attnang-Puchheim	230	2012	30
Ybbs - Amstetten	230	2016	17
			Total km = 254

High-speed lines under construction in Austria

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Vienna Stadlau - Slovakian border	200	2023	38
Vienna Inzersdorf Ort - Wr. Neustadt	200	2023	47
Graz - Klagenfurt	250	2025	122
Gloggnitz - Mürzzuschlag	230	2026	28
Volders-Baumkirchen - Italian border	250	2027	46
			Total km = 281

High-speed lines planned in Austria

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Linz - Wels	230	2026	24
Gänserndorf - Czech border	200	2028	47
			Total km = 71

High-speed lines in commercial operation in Switzerland

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Mattstetten - Rothrist	200	2004	41.7
Solothurn - Wanzwil	200	2004	10.6
Frutigen - Visp (Lötschberg base tunnel)	200	2007	38.4
Erstfeld - Biasca (Gotthard base tunnel)	200	2016	67.1
Giubiasco/S. Antonino - Vezia (Ceneri base tunnel)	200	2020	18.1
			Total km = 176

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Austria and Switzerland

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

BELGIUM
THE NETHERLANDS

High-speed lines in commercial operation in Belgium

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Brussels - French border	300	1997	72
Leuven - Liège	300	2002	65
Liège - German border	260	2009	36
Antwerp - Dutch border	300	2009	36
			Total km = 209

High-speed lines in commercial operation in The Netherlands

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Hoofddorp - Rotterdam West	300	2006	44.3
Rotterdam Lombardijen - Belgian border	300	2006	45.4
			Total km = 90

Note: There are several TSR's (temporary speed restriction) on north section, so that maximum speed has been reduced to 80-120 km/h until end of 2025/beginning of 2026
Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Belgium and The Netherlands

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

CZECH REPUBLIC

High-speed lines planned in Czech Republic

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Modřice - Rakvice	320	2029	40
Rakvice - Břeclav	200	2029	15
Přerov - Ostrava	320	2029	73
Plzeň - Domažlice - German border	200	2030	58
Prague - Poříčany (- Brno)	320	2031	22
Prague - Poříčany (- Hradec Králové)	320	2031	29
Prague - Litoměřice	320	2031	58
Poříčany - Světlá nad Sázavou	320	2031	71
Velká Bíteš - Brno	320	2032	32
Brno - Přerov	200	2032	80
Světlá nad Sázavou - Velká Bíteš	320	2032	81
Prague - Beroun	200	2040	25
Poříčany - Hradec Králové / Pardubice	320	2040	67
Litoměřice - Ústí nad Labem	250	>2040	23
Ústí nad Labem - Dresden	200	-	56
Ostrava - Bohumín - Polish border	200	-	21
			Total km = 751

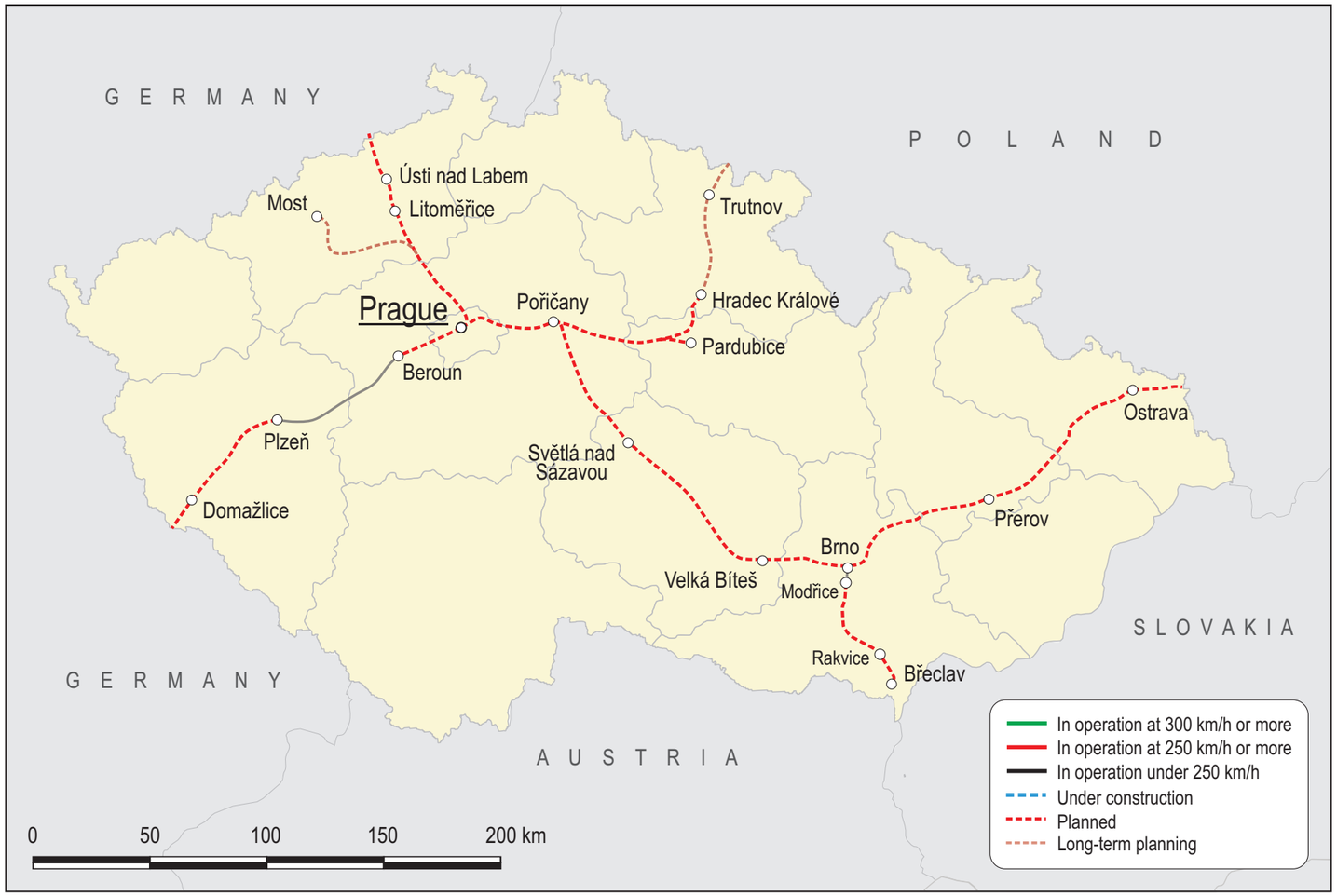
High-speed lines with long-term planning in Czech Republic

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Odb. Veltrusy - Most	250	>2040	85
Brno - Přerov	320	>2040	74
Rakvice - Břeclav	320	>2040	15
Hradec Králové - Trutnov - Polish border	250	>2040	69
			Total km = 243

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines planned and long-term planning in Czech Republic



Note:
Beroun-Plzen is not a high-speed line but a modernization of existing line up to 160 km/h
Source: compiled by authors based on International Union of Railways

International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

DENMARK
ESTONIA
FINLAND
LATVIA
LITHUANIA
NORWAY
SWEDEN

High-speed lines in commercial operation in Denmark

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Copenhagen - Ringsted	250	2019	56
			Total km = 56

High-speed lines under construction in Estonia

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Tallinn - Latvian border	249	2030	213
			Total km = 213

High-speed lines in commercial operation in Finland

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Helsinki - Turku	200	1995	156
Helsinki - Oulu	200	2001	673
Jämsänkoski - Jyväskylä	200	2001	53
Kinni - Otava	200	2006	44
Kerava - Lahti	220	2006	63
Lahti - Luumäki	200	2009	131
			Total km = 1,120

High-speed lines planned in Finland

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Helsinki - Porvoo - Kouvola - Vainikkala	-	2030	238
Helsinki - Turku	300	2031	156
			Total km = 394

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines under construction in Latvia

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Estonian border - Lithuanian border	249	2030	265
			Total km = 265

High-speed lines under construction in Lithuania

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Latvian border - Polish Border	249	2030	252
Kaunas - Vilnius	249	2032	109
			Total km = 361

High-speed lines with long-term planning in Norway

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Sandbukta - Fredrikstad	250	-	34
Gardermoen - Hamar	250	-	74
Drammen - Tønsberg	250	-	60
Fredrikstad - Halden	250	-	39
Hamar - Lillehammer	250	-	54
Tønsberg - Skien	250	-	72
			Total km = 333

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines in commercial operation in Sweden

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Stockholm - Örebro	200	1999	187
Gothenburg - Lund	200	2008	283
Nyland - Umeå	200	2009	180
Sundsvall - Nyland	200	2010	30
Gothenburg - Kornsjø	200	2012	180
Lund - Arlöv	200	2023	11
Ängelholm - Maria	200	2023	24
			Total km = 895

High-speed lines under construction in Sweden

Umeå - Dåvå	250	2024	12
Varberg - Hamra (Varbergtunnel)	200	2025	7
			Total km = 19

High-speed lines planned in Sweden

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Dingersjö - Sundsvall	250	2028	14
Myrbacken - Uppsala	200	2029	30
Gävle - Kringlan	200	2032	40
Dåvå - Skellefteå	250	2033	120
Maria - Helsingborg	200	2035	4
			Total km = 208

High-speed lines long-term planning in Sweden

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Järna - Linköping (East Link)	250	2035	160
Gothenburg - Borås	250	-	60
			Total km = 220

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Denmark, Estonia, Finland, Latvia, Lithuania, Norway and Sweden

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

FRANCE

High-speed lines in commercial operation in France

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
LGV Paris Sud-Est	300	1981 / 1983	425
LGV Atlantique	300	1989 / 1990	292
LGV Rhône - Alpes (rail bypass of Lyon)	300	1992 / 1994	122
Calais - Folkstone (Channel Tunnel French section)	160	1994	25
LGV Nord (inc. London - Brussels link)	300	1994 / 1996	346
LGV Interconnexion Est IDF	300	1994 / 1996	105
LGV Méditerranée	300	2001	259
LGV Est Europe (first phase)	320	2007	335
Perpignan - Spanish border (Figueres)	300	2010	24
LGV Rhin-Rhône Branche Est (first phase)	320	2011	146
LGV Est Europe (second phase)	320	2016	122
LGV Bretagne Pays de la Loire (BPL)	320	2017	219
LGV Tours - Bordeaux (SEA)	320	2017	340
			Total km = 2,760

High-speed lines under construction in France

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Lyon - Italian Border - (Turin)	300	2032	189
			Total km = 189

High-speed lines under study in France

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Modernisation of HSL Paris-Lyon and Lyon bypass	300	2025	483
Modernisation of HSL Paris-Lille (LGV Nord)	300	-	346
Modernisation of HSL Paris-Bordeaux (LGV Atlantique)	300	-	292
Paris - Normandie (LNPN) (first phase)	250	-	59
LGV Bordeaux - Toulouse / Dax (GPSO)	320	-	327
Interconnexion des LGV au sud de l'IDF	320	-	31
Paris - Orléans - Clermont-F. - Lyon (POCL)	320	-	540
Montpellier - Perpignan (LNMP)	320	-	155
Ligne nouvelle Rennes-Redon	300	-	80
LGV Rhin-Rhône Branche Est (second phase)	320	-	50
			Total km = 1,242

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines in France

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

GERMANY

High-speed lines in commercial operation in Germany

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Hannover - Würzburg	280	1991	327
Mannheim - Stuttgart	280	1991	99
(Hannover) - Oebisfelde - Berlin	250	1998	150
(Cologne) - Siegburg - Frankfurt	300	2002	144
Cologne - Düren	250	2003	39
Hamburg - Berlin	230	2004	286
(Karlsruhe) - Rastatt Süd - Offenburg - (Basel)	250	2004	44
Nuremberg - Ingolstadt	300	2006	89
Munich - Augsburg	230	2011	62
(Karlsruhe) - Katzenberg Tunnel - (Basel)	250	2012	18
Erfurt - Leipzig/Halle	300	2015	123
Ebensfeld - Erfurt	300	2017	107
Nuremberg - Ebensfeld	230	2017	83
Wendlingen - Ulm	250	2022	60
			Total km = 1,631

High-speed lines under construction in Germany

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Karlsruhe - Rastatt - (Basel)	250	2024	17
Stuttgart - Wendlingen	250	2025	25
Buggingen - Katzenberg Tunnel - (Basel)	250	2025	32
(Karlsruhe) - Katzenberg Tunnel - Basel	250	2025	13
			Total km = 87

High-speed lines planned in Germany

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
(Karlsruhe) - Riegel - Buggingen - (Basel)	200	2031	41
(Karlsruhe) - Offenburg - Riegel - (Basel)	250	2035	40
			Total km = 81

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Germany

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

HUNGARY
SERBIA

High-speed lines planned in Hungary

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Budapest - Serbian border	200	-	164
			Total km = 164

High-speed lines in operation in Serbia

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Belgrade - Stara Pazova - Novi Sad	200	2022	78
			Total km = 78

High-speed lines under construction in Serbia

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Novi Sad - Subotica - Hungarian border	200	-	108
			Total km = 108

High-speed lines planned in Serbia

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Belgrade - Niš	200	-	204
			Total km = 204

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Hungary and Serbia

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

ITALY

High-speed lines in commercial operation in Italy

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Rome - Florence (First section)	250	1977	122
Rome - Florence (Second section)	250	1985	52
Rome - Florence (Third section)	250	1986	20
Rome - Florence (Forth section)	250	1992	44
Turin - Novara	300	2006	86
Padova - Venice	220	2007	25
Milan - Bologna	300	2008	182
Naples - Salerno	250	2008	29
Rome - Naples	300	2009	205
Novara - Milan	300	2009	38
Florence - Bologna	300	2009	78
Milan (Treviglio) - Brescia	300	2016	40
			Total km = 921

High-speed lines under construction in Italy

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Turin - French Border - (Lyon)	300	2032	81
Genoa - Milan (Tortona)	250	-	53
Brescia - Verona	300	-	45
Naples - Bari	250	-	150
Verona - Padova	300	-	79
			Total km = 408

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Italy

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

POLAND

High-speed lines in commercial operation in Poland

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Grodzisk Mazowiecki - Zawiercie	200	2015	224
			Total km = 224

High-speed lines planned in Poland

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Warsaw - Poznan / Wroclaw	350	2030	448
Warsaw - Bialystok - Ełk	200	2030	277
Ełk - Lithuanian border (Rail Baltica)	250	2030	80
			Total km = 805

High-speed lines with long-term planning in Poland

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Knapówka - Katowice / Kraków	300	>2030	138
Wroclaw - Czech border	350	>2030	148
Poznan - German border	350	>2030	171
Katowice - Czech border	300	>2030	61
Warsaw - Toruń - Gdańsk	350	>2030	357
			Total km = 875

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Poland

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

PORTUGAL
SPAIN

High-speed lines under construction in Portugal

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Évora - Caia	250	2025	79.5
			Total km = 79.5

High-speed lines planned in Portugal

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Lisbon - Porto	300	2030	306
Porto - Valença AV	250	2030	112
			Total km = 418

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines in commercial operation in Spain

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Madrid - Sevilla	270	1992	471
Madrid - Lleida	300	2003	467
Zaragoza - Huesca	200	2003	79
(Madrid -) La Sagra - Toledo	220	2005	21
Córdoba - Antequera-Santa Ana	300	2006	111
Lleida - Camp de Tarragona	300	2006	96
Madrid - Segovia - Olmedo - Valladolid	300	2007	178
Antequera-Santa Ana - Málaga	300	2007	58
Camp de Tarragona - Barcelona	300	2008	100
Bypass Madrid	200	2009	5
Santiago - A Coruña	250	2009	61
(Madrid -) Torrejón de Velasco - Valencia	300	2010	362
Bif. Albacete - Albacete	300	2010	73
Figueres - French border (- Perpignan)	300	2010	20
Ourense - Santiago	300	2011	85
Bypass Yeles	200	2012	6
Barcelona - Figueres	300	2013	131
Albacete - Alicante/Alacant	300	2013	165
Santiago - Vigo	200	2015	95
Sevilla - Cádiz	250	2015	153
Valladolid - León	300	2015	166
Olmedo - Zamora	300	2015	99
Valencia - Vandellós	220	2019	219
Antequera-Santa Ana - Granada	250	2019	109
Vandellós - Tarragona	200	2020	47
Zamora - Pedralba	300	2020	110
Bif. Murcia - Orihuela - Beniel	240	2021	54
Pedralba - Ourense	300	2021	119
Beniel - Murcia	240	2022	16
Venta de Baños - Burgos	300	2022	91
Plasencia - Badajoz	200	2022	142
Chamartín - Atocha new tunnel	120	2022	7
León - Pola de Lena (Pajares New pass)	250	2023	76
			Total km = 3,993

Source: compiled by authors based on International Union of Railways and Spanish Ministry of Transport

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines under construction in Spain

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Talayuela - Navalmoral - Plasencia	300	2025	69
Vitoria Gasteiz - Bilbao / San Sebastián	250	2028	175
Murcia - Almería	300	-	188
Castejón - Pamplona	300	-	75
La Encina - Valencia	300	-	107
Palencia - Alar del Rey	300	-	82
			Total km = 696

High-speed lines planned in Spain

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Burgos - Vitoria	300	-	110
Madrid - Talayuela	300	-	223
Alar del Rey - Reinosa	300	-	44
Sevilla - Huelva	300	-	102
Teruel - Zaragoza	250	-	166
Castejón - Logroño	220	-	76
Valencia - Castellón	300	-	68
			Total km = 789

Source: compiled by authors based on International Union of Railways and Spanish Ministry of Transport

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Portugal and Spain

Source: compiled by authors based on International Union of Railways and Spanish Ministry of Transport

2.1 HIGH-SPEED RAIL NETWORK

RUSSIA

High-speed lines under study in Russia

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Moscow - St. Petersburg	350	2027-2028	674
			Total km = 674

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Russia

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

UNITED KINGDOM

High-speed lines in commercial operation in the United Kingdom

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Calais - Folkstone (Channel Tunnel British section)	160	1994	25
Fawkham Junction - Channel Tunnel	300	2003	74
London - Southfleet Junction	230	2007	39
			Total km = 138

High-speed lines under construction in the United Kingdom

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
London - Birmingham	360	2026	225
			Total km = 225

High-speed lines planned in the United Kingdom

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Birmingham - Crewe	300	2029	60
Crewe - Manchester	300	2035	43
Birmingham - East Midland parkway	-	2040	65
			Total km = 168

Source: compiled by authors based on International Union of Railways

2.1 HIGH-SPEED RAIL NETWORK

High-speed lines in the United Kingdom

Source: compiled by authors based on International Union of Railways and HS2 railway website (www.hs2.org.uk)

Note:
(1) HS2 is expected to be extended to the North (Scotland, via Crewe) and East (Leeds and Nottingham), but there is no further information up to now

2.2 GROWTH OF THE HIGH-SPEED NETWORK

High-speed network development in Europe (2023)

Source: compiled by authors based on International Union of Railways

2.2 GROWTH OF THE HIGH-SPEED NETWORK

Detailed zoom of Paris

PARIS

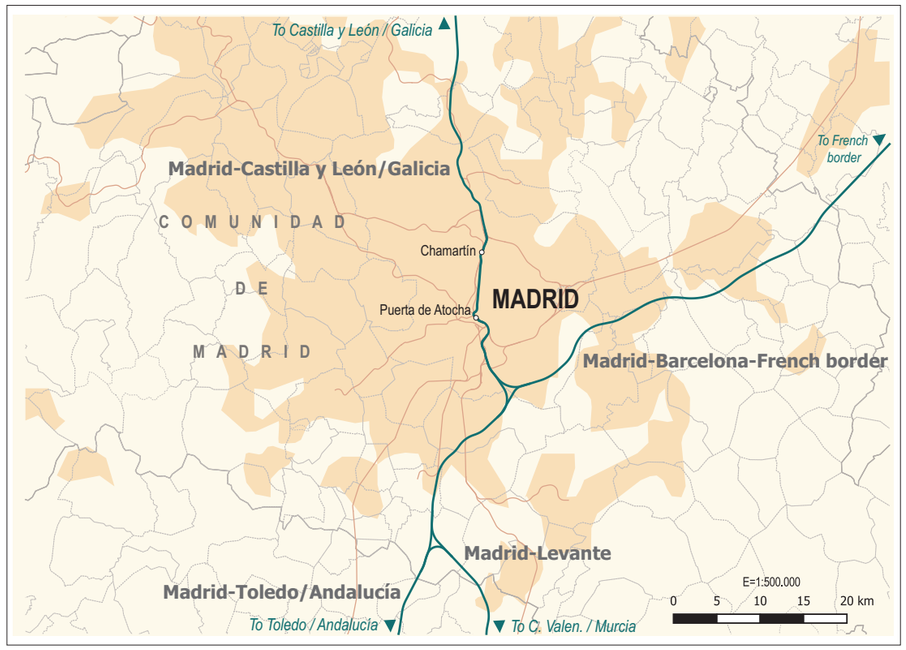
Source: compiled by authors based on International Union of Railways

Detailed zoom of Berlin

BERLIN

Source: compiled by authors based on International Union of Railways

Detailed zoom of Madrid



MADRID

Source: compiled by authors based on International Union of Railways

Detailed zoom of Rome

ROME

Source: compiled by authors based on International Union of Railways

2.2 GROWTH OF THE HIGH-SPEED NETWORK

Growth of the high-speed network in Europe: 1993, 2006, 2010 and 2023

Source: compiled by authors based on International Union of Railways

Countries with high-speed:

Italy, France, Austria, Germany, and Spain

1,998 kilometres

Source: compiled by authors based on International Union of Railways

Countries with high-speed:

Italy, France, Austria, Germany, Spain, Finland, Belgium, Sweden, United Kingdom, Switzerland and The Netherlands

5,980 kilometres

2.2 GROWTH OF THE HIGH-SPEED NETWORK

Growth of the high-speed network in Europe: 1993, 2006, 2010 and 2023

Source: compiled by authors based on International Union of Railways

Countries with high-speed:

Italy, France, Austria, Germany, Spain, Finland, Belgium, Sweden, United Kingdom, Switzerland and The Netherlands

8,543 kilometres

Source: compiled by authors based on International Union of Railways

Countries with high-speed:

Italy, France, Austria, Germany, Spain, Finland, Belgium, Sweden, United Kingdom, Switzerland, The Netherlands, Poland, Denmark and Serbia

12,545 kilometres

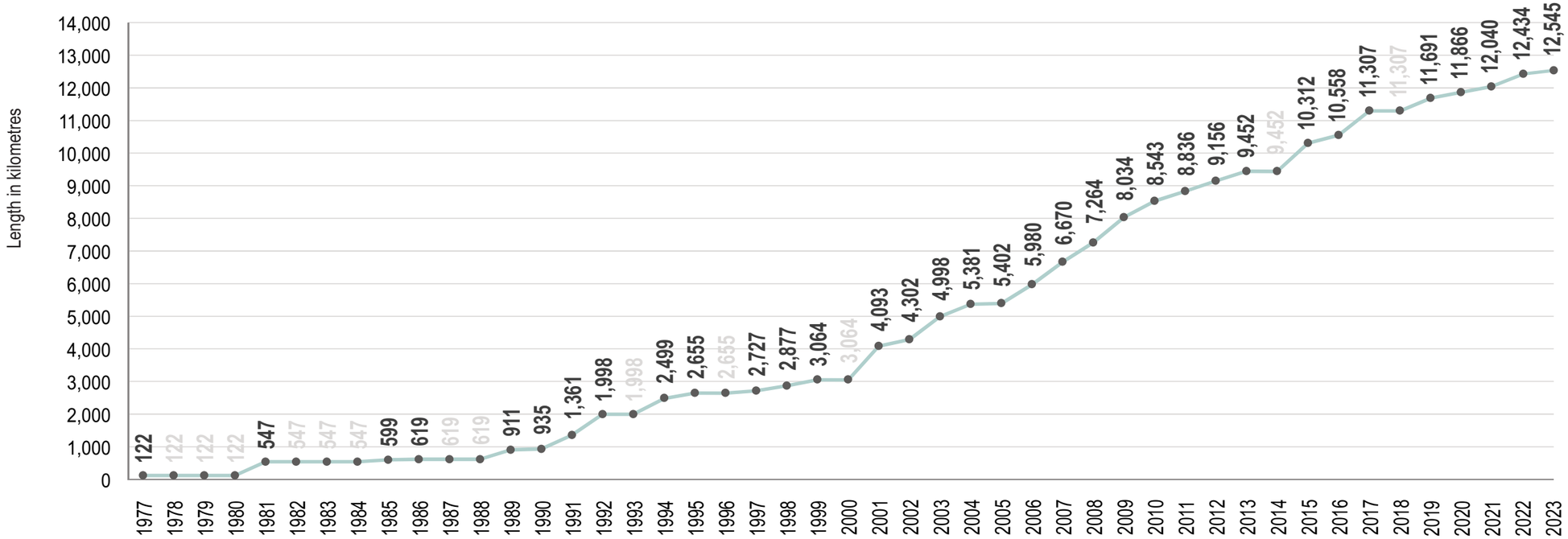
2.2 GROWTH OF THE HIGH-SPEED NETWORK

Chronological map of the high-speed rail network in Europe

Source: compiled by authors based on International Union of Railways

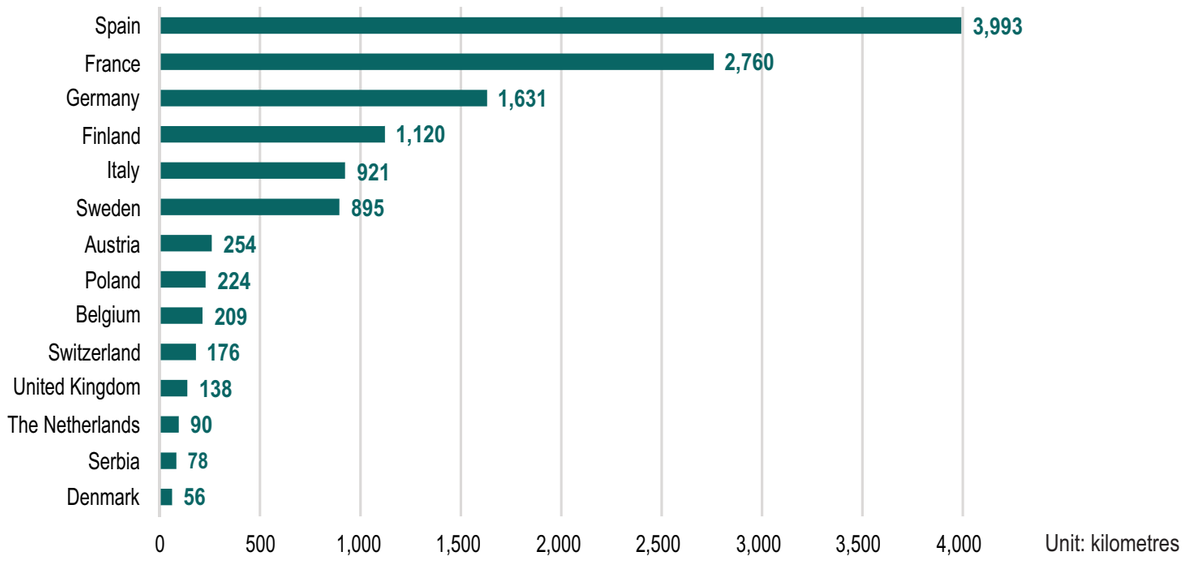
2.2 GROWTH OF THE HIGH-SPEED NETWORK

Length of the high-speed network in commercial operation in Europe (1977-2023)



Source: compiled by authors based on International Union of Railways

Length of the high-speed network in commercial operation in Europe by country (2023)



Source: compiled by authors based on International Union of Railways

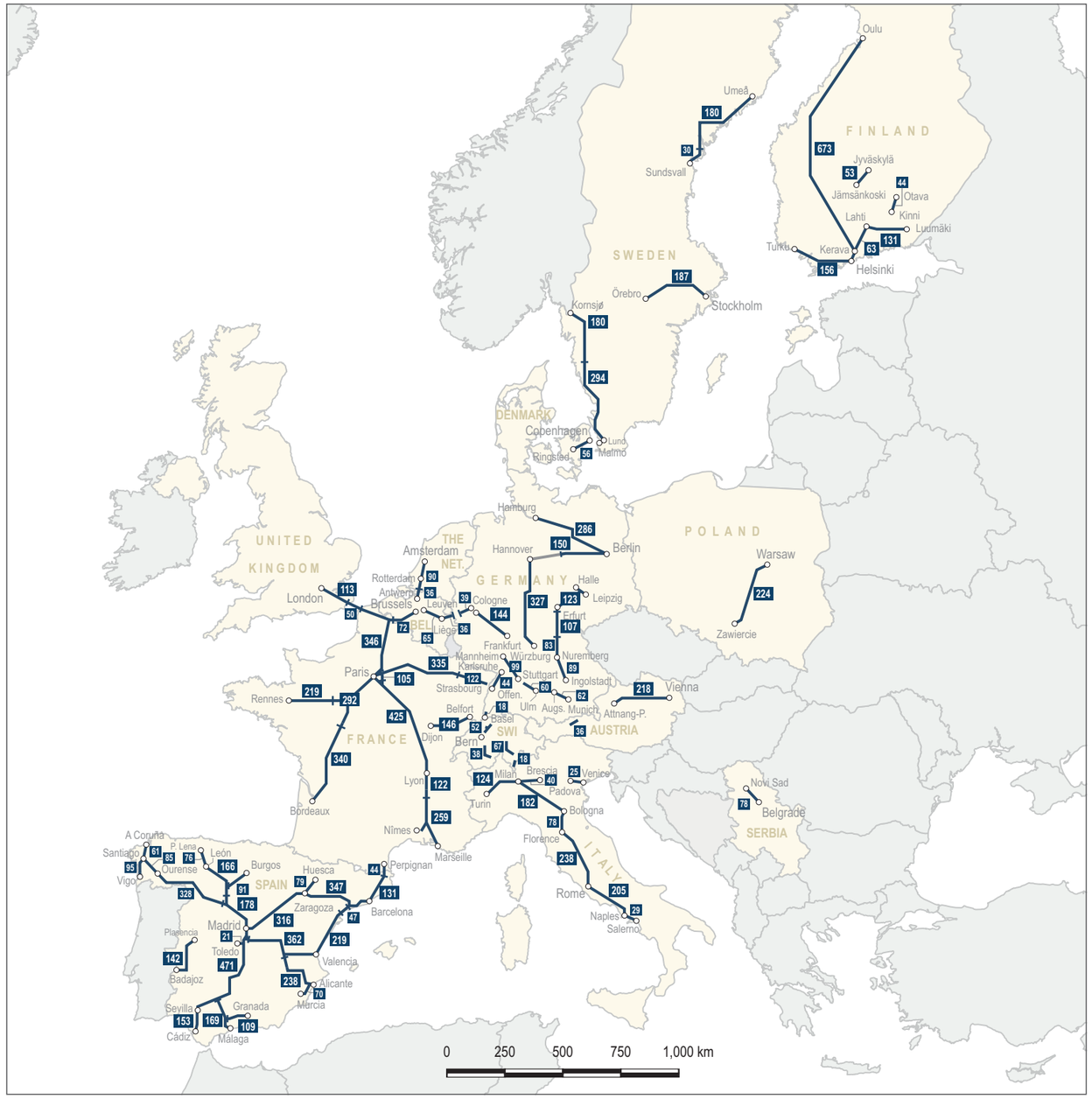
2.3 CHARACTERISTICS AND EQUIPMENT

Maximum commercial speed

Source: compiled by authors based on International Union of Railways

2.3 CHARACTERISTICS AND EQUIPMENT

Distance (kilometres)



Source: compiled by authors based on International Union of Railways

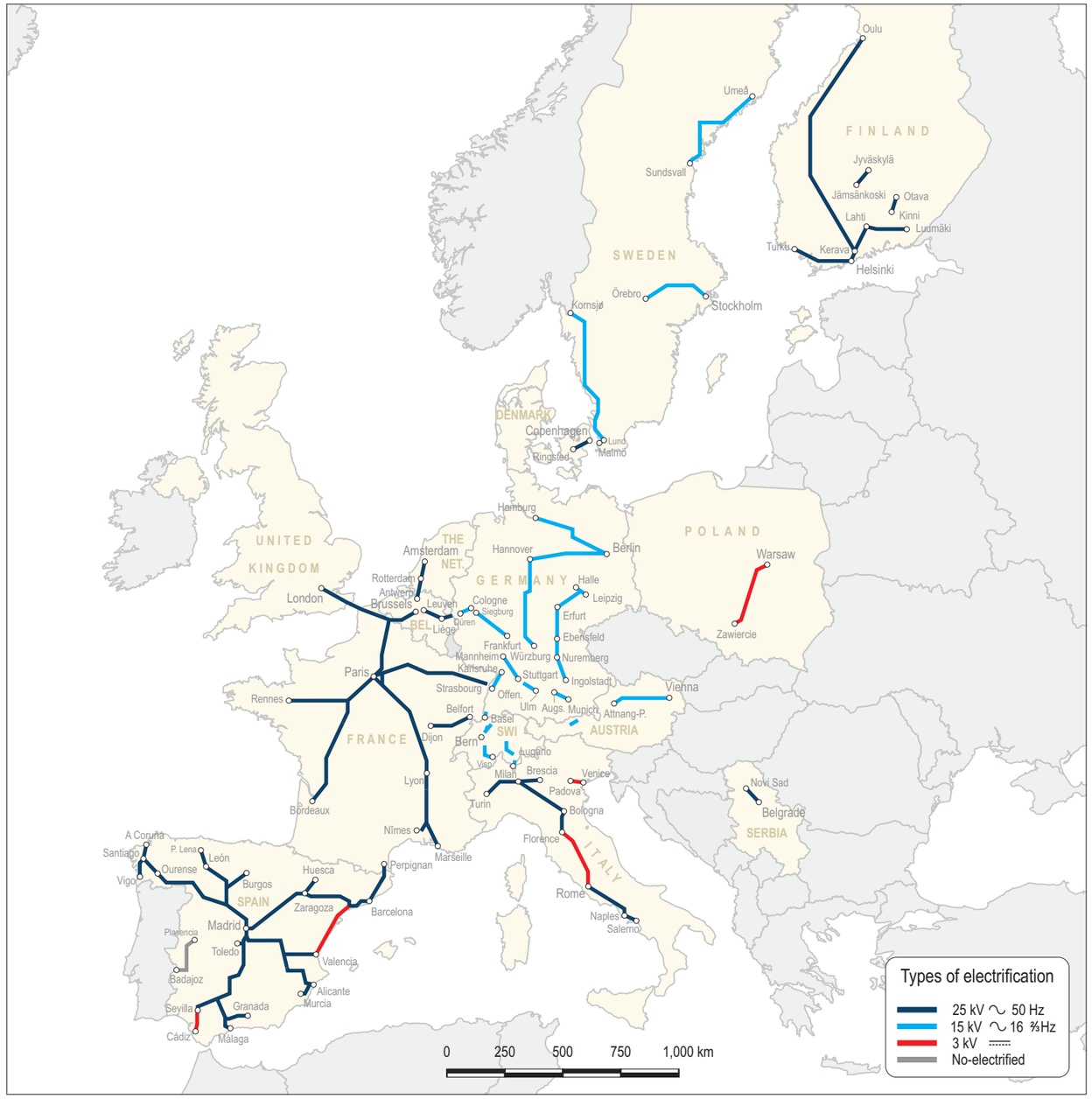
2.3 CHARACTERISTICS AND EQUIPMENT

Maximum slope (‰)

Source: compiled by authors based on International Union of Railways

2.3 CHARACTERISTICS AND EQUIPMENT

Electrification



Source: compiled by authors based on International Union of Railways

2.3 CHARACTERISTICS AND EQUIPMENT

Signalling

Source: compiled by authors based on International Union of Railways

2.3 CHARACTERISTICS AND EQUIPMENT

Centralized Traffic Control (CTC)

Source: International Union of Railways. For United Kingdom, Austria and Denmark, miscellaneous data sources
Note: In Poland, CMK line does not have a centralized control traffic system. Traffic is controlled by local centers located in the frame existing stations.

2.3 CHARACTERISTICS AND EQUIPMENT

High-speed rolling stock workshops

Source: International Union of Railways. For United Kingdom, Belgium and Austria, miscellaneous data sources

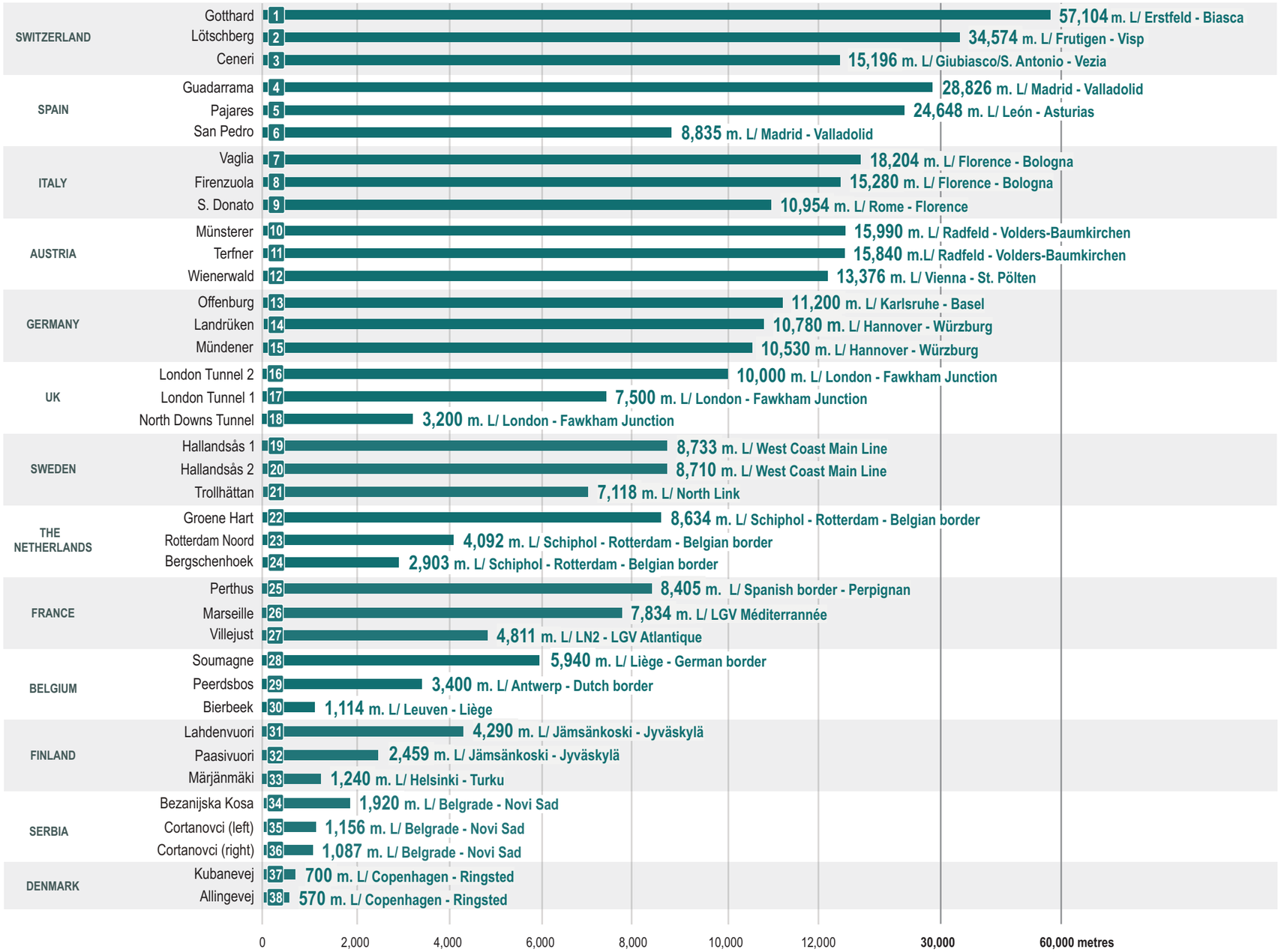
2.3 CHARACTERISTICS AND EQUIPMENT

High-speed rolling stock main factories

Source: International Union of Railways

2.3 CHARACTERISTICS AND EQUIPMENT

Longest tunnels of the high-speed rail network in Europe



Source: International Union of Railways. For United Kingdom and Belgium, miscellaneous data sources
Note: Apart from domestic high-speed tunnels, Channel Tunnel Calais-Folkestone (50.450 km) is included in the map on page 77

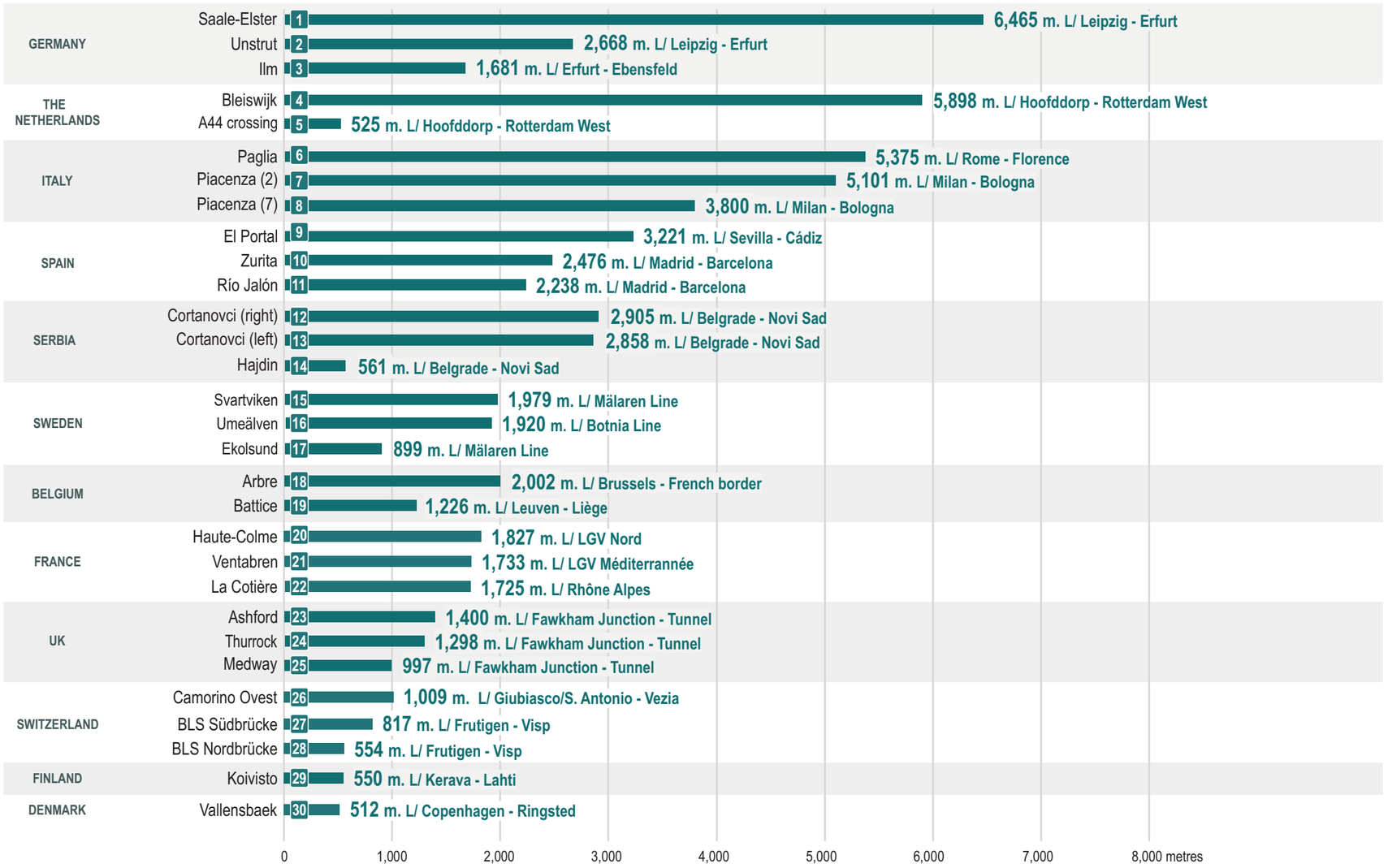
2.3 CHARACTERISTICS AND EQUIPMENT

Longest tunnels of the high-speed rail network in Europe

Source: International Union of Railways. For United Kingdom and Belgium, miscellaneous data sources

2.3 CHARACTERISTICS AND EQUIPMENT

Longest viaducts of the high-speed rail network in Europe



Note: There is another viaduct in Sweden to be considered: Igelsta (2,038 m; Södertälje,West Line, not currently identified as HSL)
Source: International Union of Railways. For United Kingdom and Belgium, miscellaneous data sources

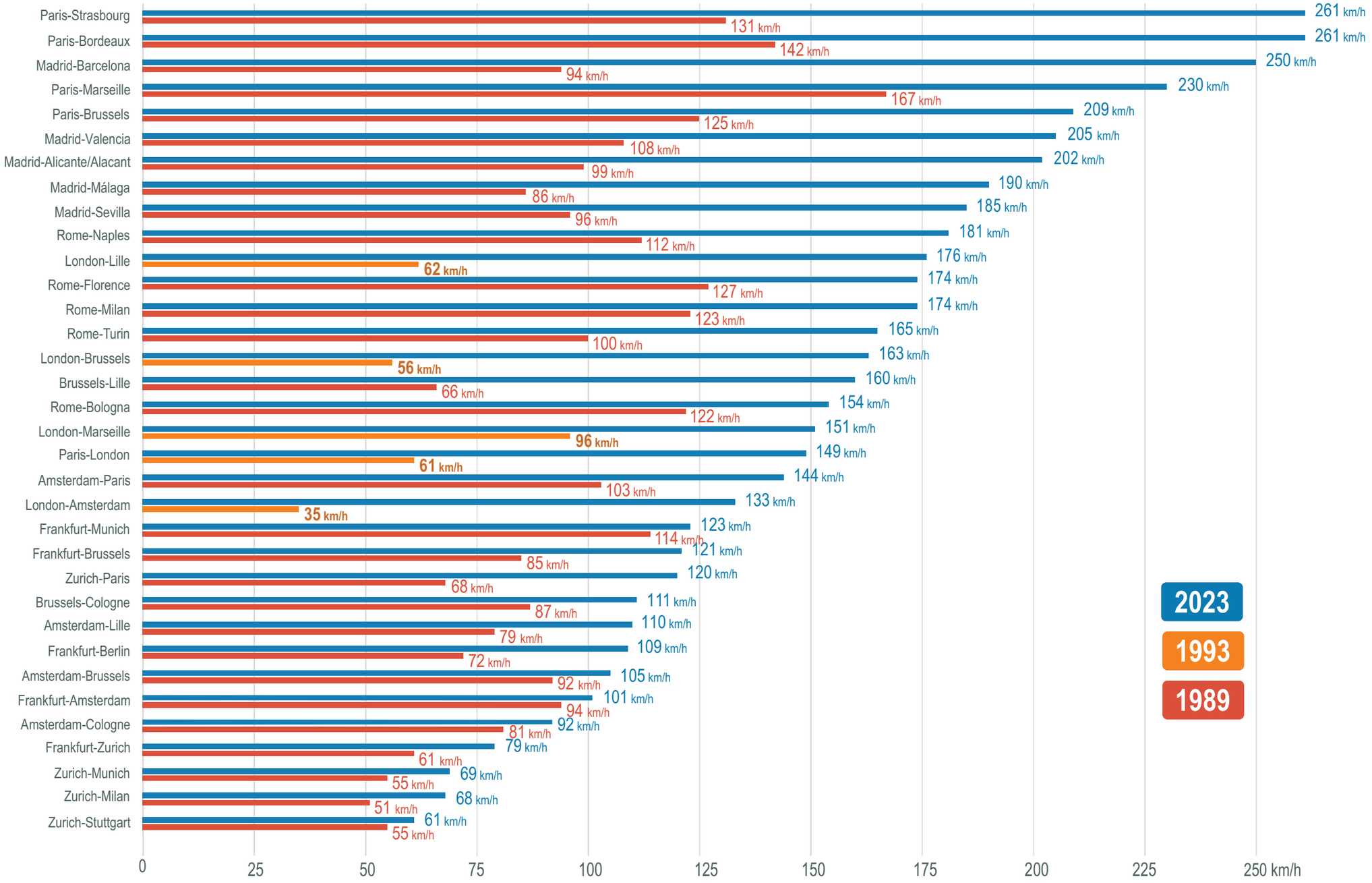
2.3 CHARACTERISTICS AND EQUIPMENT

Longest viaducts of the high-speed rail network in Europe

Source: International Union of Railways. For United Kingdom and Belgium, miscellaneous data sources

2.4 SPEED AND TRAVEL TIMES

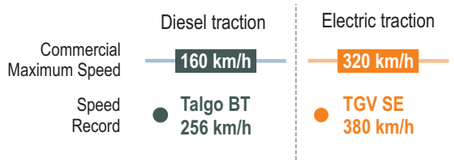
Evolution of average speed on European high-speed lines

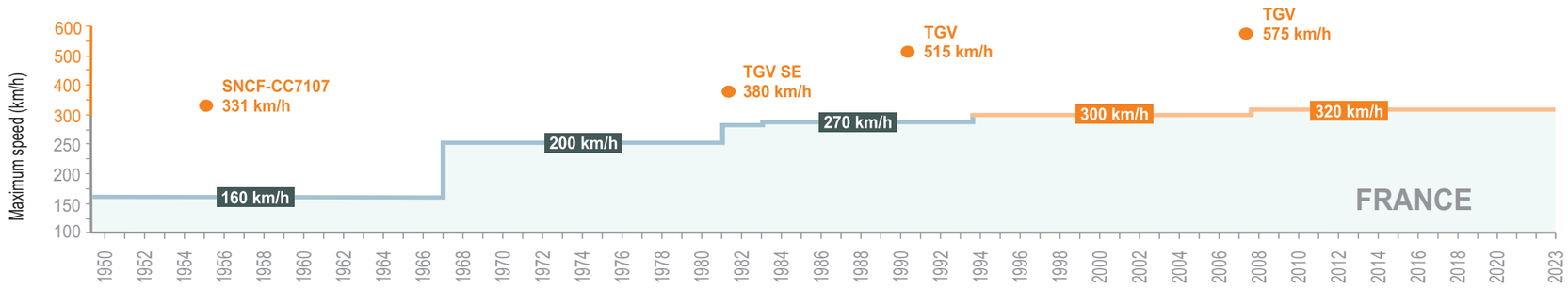


Source: compiled by authors based on "European Timetable" Thomas Cook Travel Guides 1989, Railway Operators websites, British Rail Timetable 1993 and Indicateur Horaires Ville à Ville SNCF 1993
Note: before 1994, travel between London and France was carried out by Ferry or Hoverspeed with their corresponding journey times

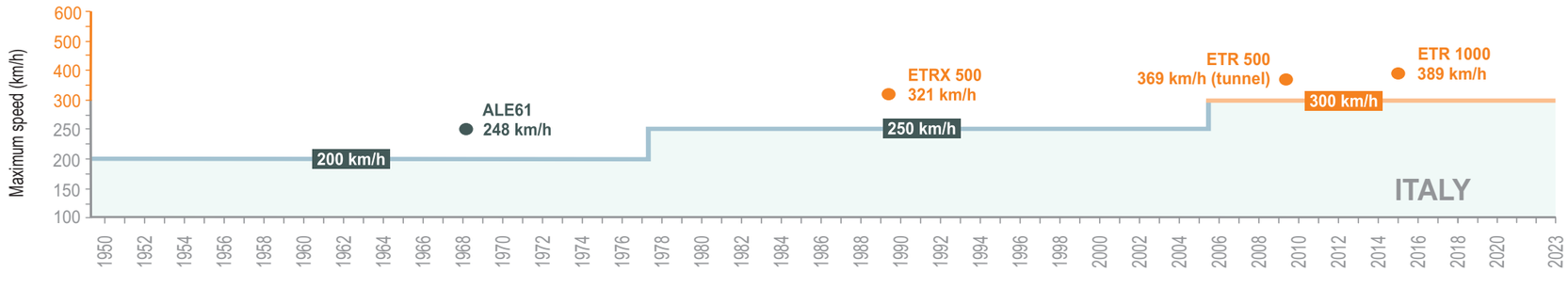
2.4 SPEED AND TRAVEL TIMES

Evolution of maximum speed in commercial services in France

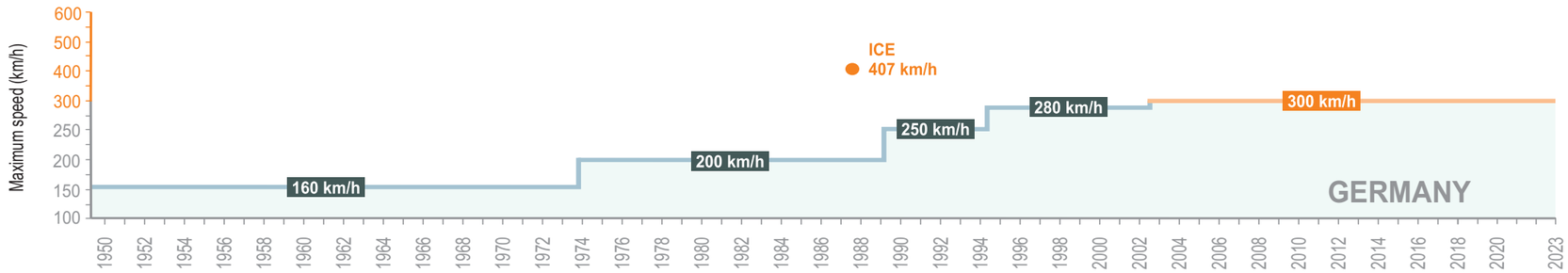




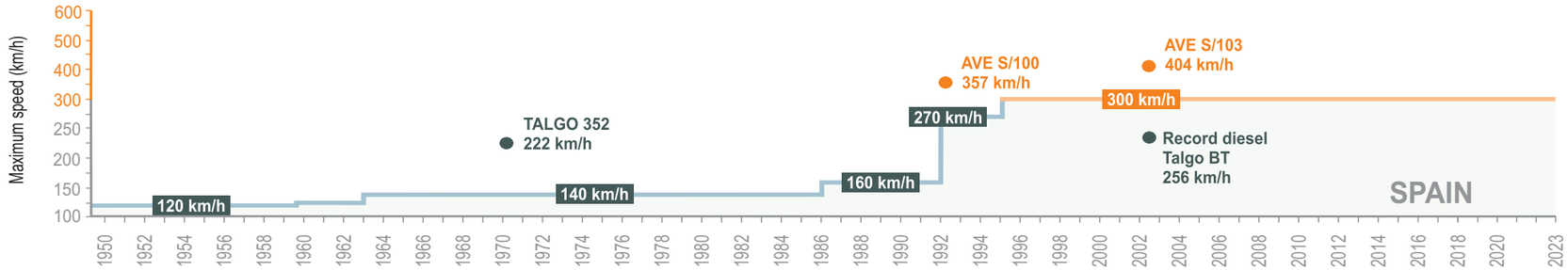
Evolution of maximum speed in commercial services in Italy



Evolution of maximum speed in commercial services in Germany



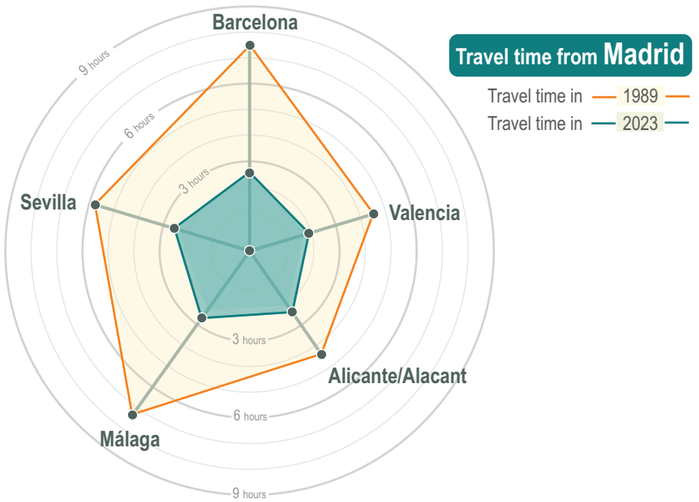
Evolution of maximum speed in commercial services in Spain

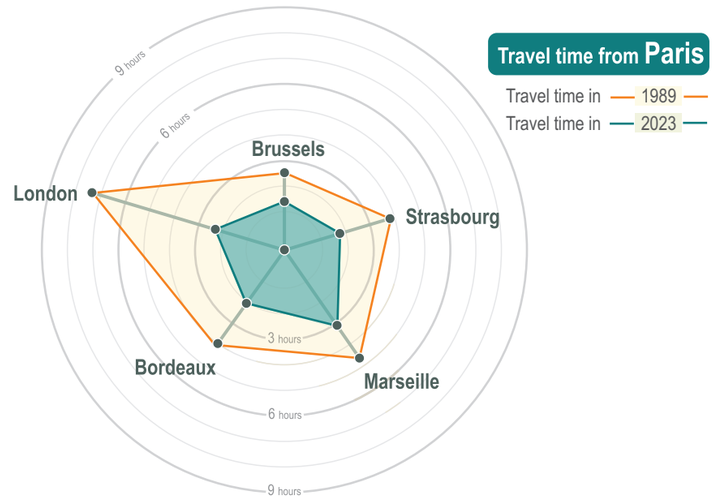


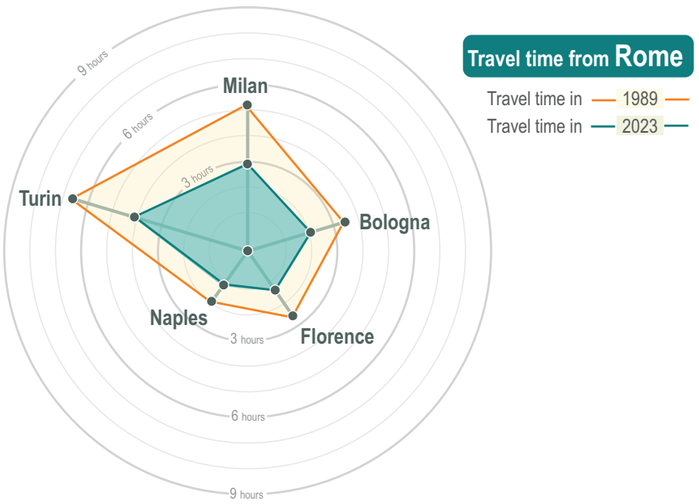
Source: miscellaneous data sources
Note: speed records, signaled by dots in the graphics, were set in non-commercial operations. Representation of available data (non-exhaustive)

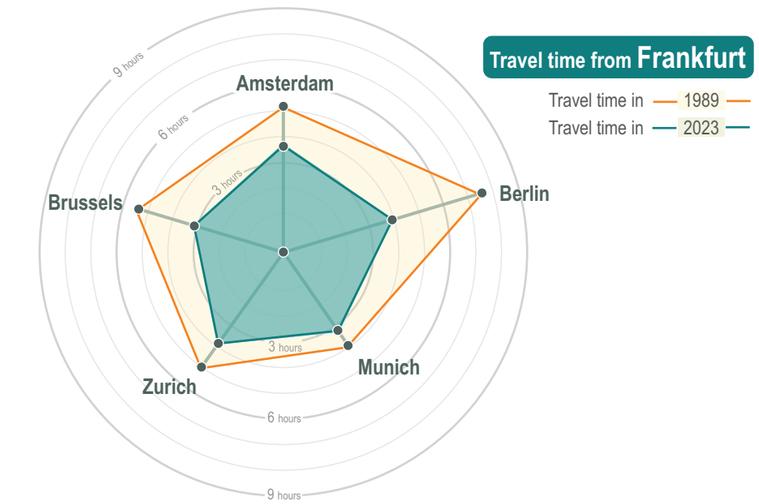
2.4 SPEED AND TRAVEL TIMES

Evolution of travel time from the main European cities





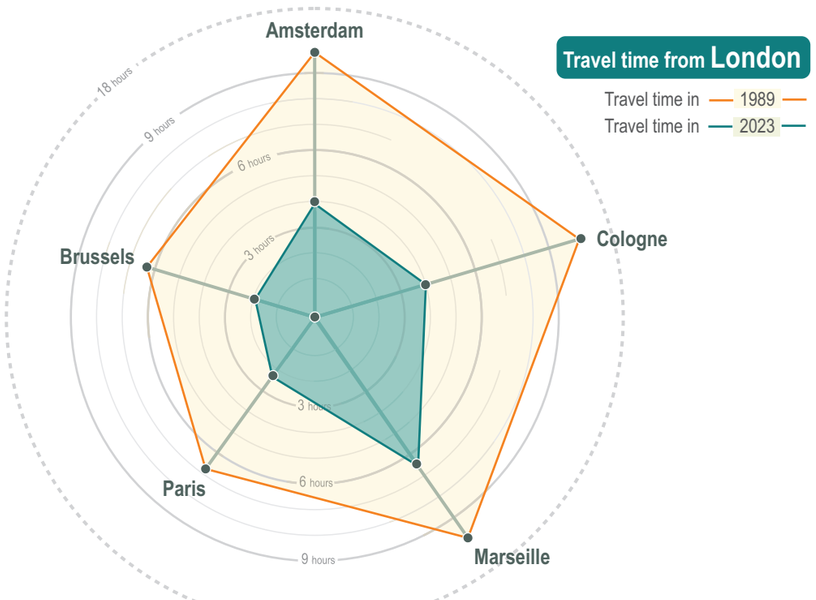


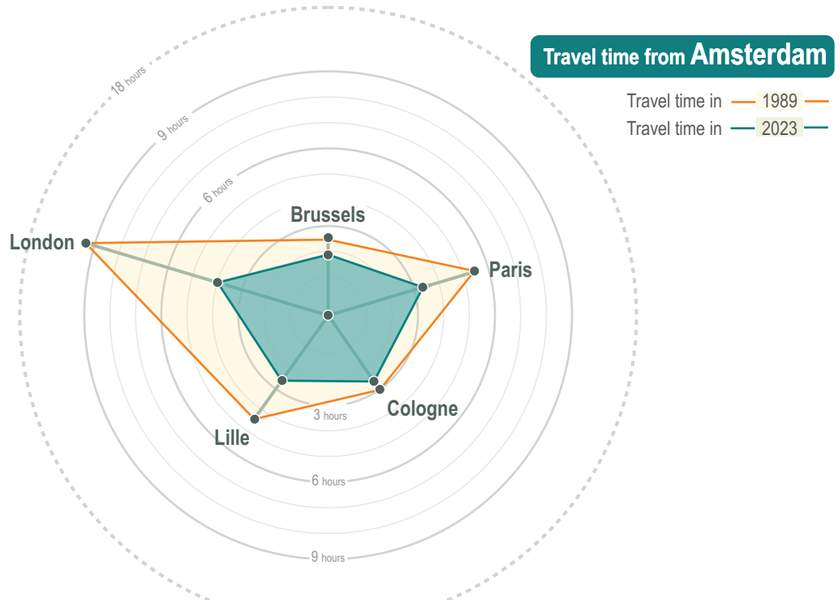


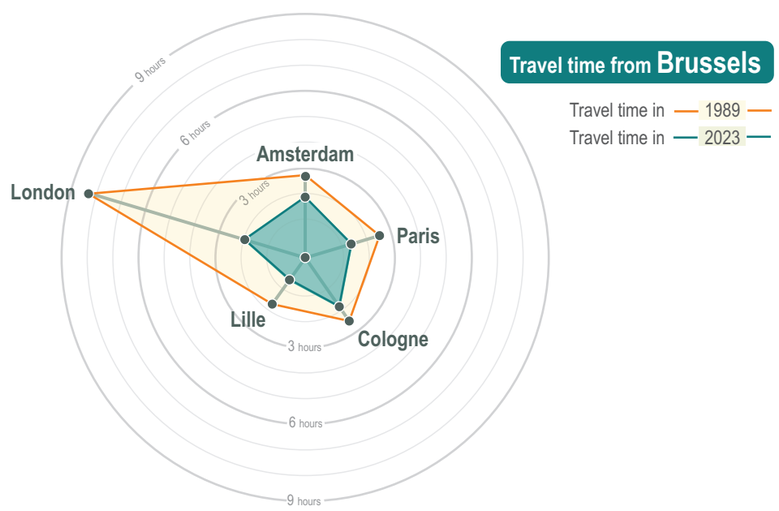
Source: compiled by authors based on "European Timetable" Thomas Cook Travel Guides 1989 and Railway Operators websites
Note: before 1994, travel between London and France was carried out by Ferry or Hoverspeed with their corresponding journey times

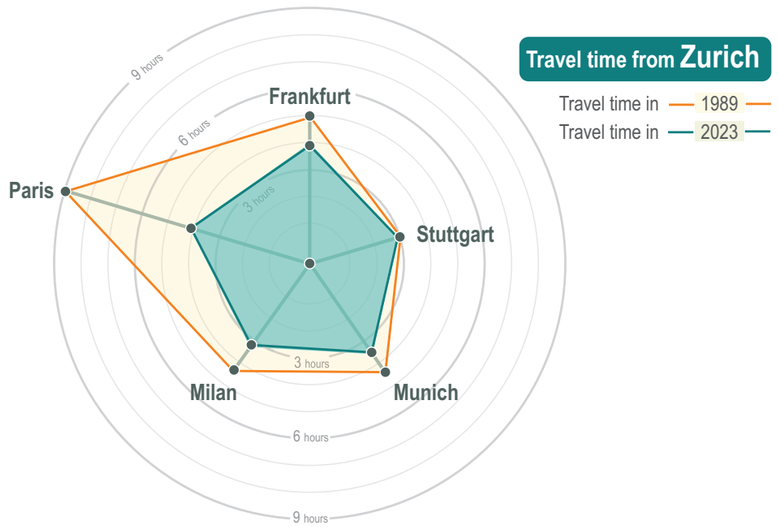
2.4 SPEED AND TRAVEL TIMES

Evolution of travel time from the main European cities









Source: compiled by authors based on "European Timetable" Thomas Cook Travel Guides 1989, Railway Operators websites, British Rail Timetable 1993 and Indicateur Horaires Ville à Ville SNCF 1993
Note: before 1994, travel between London and France was carried out by Ferry or Hoverspeed with their corresponding journey times

2.5 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	"Railjet" Siemens Taurus (OBB 1216) + Siemens Viaggio *(Austria)*	4010 *(Austria)*	SM3 "Pendolino" *(Finland)*
(1) Composition	L+7T	M+4T+M	T+4M+T
Suppliers	Siemens	Stadler	Alstom
Owners or operators	ÖBB	WestBahn	VR
Year in service	2008	2011	1995
Articulated	No	No	No+Tilting
Track gauge (mm)	1,435	1,435	1,524
Electrification voltage (kV)	25 kV 50 Hz AC / 15 kV 16.7 Hz AC / 3 kV DC (partially)	15 kV 16.7 Hz AC	25 kV 50 Hz AC
Maximum train speed / operation speed (km/h)	230 / 230	200 / 200	220 / 220
Power (kW)	6,400	6,000	4,000
Traction	Concentrated traction	Distributed traction	Distributed traction
Signalling	LZB / PZB, ZUB, ETCS	LZB / PZB, ZUB	EBICAB900
Train sets currently used / planned	60	7	18
Weight and dimensions			
Unladen weight in running order (t)	446	296	328
Maximum axle load (t)	22.5	12.3	14.3
Power weight ratio (kW/t)	13.4	17.9	11.5
Train length (m)	206	150	159
Train width (m)	2.825	2.800	3.200
Seats			
1st class seats*	16+76 / 6+42 (partially)	60	47
2nd class seats	316, 394 (partially)	441	238 (+2 hp)
Total seats	408, 442 (partially)	501	285 (+2 hp)
Observations			
	Locomotive: Class 1116, partially 1216		Broad gauge (1,524)

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

SM6 "Allegro" *(Finland, Russia)*	TGV Atlantique *(France)*	Thalys PBA *(France / Belgium / The Netherlands)*	General characteristics
M+T+M+T+M+T+M	L+10T+L	L+8T+L	(1) Composition
Alstom	Alstom	Alstom	Suppliers
Karelian Railways	SNCF	Thalys	Owners or operators
2010	1989	1996	Year in service
No+Tilting	Yes (except for ends)	Yes (except for ends)	Articulated
1,520 / 1,522	1,435	1,435	Track gauge (mm)
25 kV 50 Hz AC / 3 kV DC	25 kV 50 Hz AC / 1.5 kV DC	25 kV 50 Hz AC / 3 kV DC / 1.5 kV DC	Electrification voltage (kV)
220 / 220	300 / 300	320 / 300	Maximum train speed / operation speed (km/h)
5,500	8,800	8,800	Power (kW)
Distributed traction	Concentrated traction	Concentrated traction	Traction
EBICAB900	TVM / KVB	TVM / KVB, TBL, ATB, ETCS	Signalling
4	28	9	Train sets currently used / planned
			Weight and dimensions
409 (loaded)	435	385	Unladen weight in running order (t)
17	17	17	Maximum axle load (t)
13.4	18.6	21.2	Power weight ratio (kW/t)
184.8	237	200	Train length (m)
3.200	2.904	2.904	Train width (m)
			Seats
48	105	120	1st class seats*
304 (+2 hp)	354	257	2nd class seats
352 (+2 hp)	459	377	Total seats
			Observations
Broad gauge (1,522 and 1,520) Operated by RZD and VR	No. 301-405 Renovated to Lacroix 455 places (105+350) TVM430 is installed from No. 386 to No. 405	No. 4531-4540, owned by SNCF Same series as TGV Réseau (tric.) 4531 (now 4551) is used for SNCF	

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	Thalys PBKA *(France / Belgium / The Netherlands)*	TGV Réseau (bicourant) *(France)*	TGV Réseau (tricourant) *(France)*
(1) Composition	L+8T+L	L+8T+L	L+8T+L
Suppliers	Alstom	Alstom	Alstom
Owners or operators	Thalys	SNCF	SNCF
Year in service	1996	1993	1993
Articulated	Yes (except for ends)	Yes (except for ends)	Yes (except for ends)
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC / 15 kV 16.7 Hz AC / 3 kV DC / 1.5 kV DC	25 kV 50 Hz AC / 1.5 kV DC	25 kV 50 Hz AC / 3 kV DC / 1.5 kV DC
Maximum train speed / operation speed (km/h)	320 / 300	320 / 320	320 / 320
Power (kW)	8,800	8,800	8,800
Traction	Concentrated traction	Concentrated traction	Concentrated traction
Signalling	TVM/KVB, TBL, TBL2, ATB, PZB/LZB, ETCS	TVM / KVB	TVM / KVB, TBL, SCMT
Train sets currently used / planned	17	29	27
Weight and dimensions			
Unladen weight in running order (t)	385	383	383
Maximum axle load (t)	17	17	17
Power weight ratio (kW/t)	21.2	21.3	21.3
Train length (m)	200	200	200
Train width (m)	2.904	2.904	2.904
Seats			
1st class seats*	120	111	111
2nd class seats	257	250	242
Total seats	377	361	353
Observations			
	No. 4301-4346 SNCF 6 (No. 4341-4346) NS 4 (No. 4321-4322,4331-4332) SNCB 7 (No. 4301-4307) No. 4321-4322 → DB → NS		No. 4551 is ex-Thalys

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

	TGV Duplex *(France)*	TGV Réseau Duplex *(France)*	TGV POS *(France)*
	L+8T+L	L+8T+L	L+8T+L
	Alstom	Alstom	Alstom
	SNCF	SNCF	SNCF, SBB
	1996	2006	2006
	Yes (except for ends) + Double Decker	Yes (except for ends) + Double Decker	Yes (except for ends) + Double Decker
	1,435	1,435	1,435
	25 kV 50 Hz AC / 1.5 kV DC	25 kV 50 Hz AC / 15 kV 16.7 Hz AC / 1.5 kV DC	25 kV 50 Hz AC / 15 kV 16.7 Hz AC / 1.5 kV DC
	320 / 320	320 / 320	320 / 320
	8,800	8,800	9,280
	Concentrated traction	Concentrated traction	Concentrated traction
	TVM / KVB	TVM / KVB	TVM / KVB, PZB / LZB, SUB, ETCS
	88	16	14
	390	380	423
	17	17	17
	20.4	20.9	20.6
	200	200	200
	2.896	2.896	2.904
	181	181	111
	328	328	250
	509	509	361
	No. 201-289	No. 601-619 613-615: tri-voltage (15 kV 16.7 Hz)	No. 4401-4419

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics
(1) Composition
Suppliers
Owners or operators
Year in service
Articulated
Track gauge (mm)
Electrification voltage (kV)
Maximum train speed / operation speed (km/h)
Power (kW)
Traction
Signalling
Train sets currently used / planned
Weight and dimensions
Unladen weight in running order (t)
Maximum axle load (t)
Power weight ratio (kW/t)
Train length (m)
Train width (m)
Seats
1st class seats*
2nd class seats
Total seats
Observations

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	TGV Dasye (France)	TGV Euroduplex 3UA (France)	TGV Euroduplex 3UF / 3UH (France)
(1) Composition	L+8T+L	L+8T+L	L+8T+L
Suppliers	Alstom	Alstom	Alstom
Owners or operators	SNCF	SNCF	SNCF
Year in service	2009	2011	2013
Articulated	Yes (except for ends) + Double Decker	Yes (except for ends) + Double Decker	Yes (except for ends) + Double Decker
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC / 1.5 kV DC	25 kV 50 Hz AC / 15 kV 16.7 Hz AC / 1.5 kV DC	25 kV 50 Hz AC / 1.5 kV DC
Maximum train speed / operation speed (km/h)	320 / 320	320 / 320	320 / 320
Power (kW)	9,280	9,280	9,280
Traction	Concentrated traction	Concentrated traction	Concentrated traction
Signalling	TVM / KVB, ETCS	TVM / KVB, PZB / LZB, ETCS	TVM / KVB, ETCS
Train sets currently used / planned	11	30	9
Weight and dimensions			
Unladen weight in running order (t)	390	390	390
Maximum axle load (t)	17	17	17
Power weight ratio (kW/t)	21.5	21.5	21.5
Train length (m)	200	200	200
Train width (m)	2.896	2.896	2.896
Seats			
1st class seats*	181	181	181
2nd class seats	328	328	328
Total seats	509	509	509
Observations			
	Initially No. 701-749 Now 710-720	No. 4701-4730 Used for Lyria and Alleo	No. 801-825 for first 25 sets

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

TGV Euroduplex 3UFC Océane *(France)*	TGV Duplex renov Océane *(France)*	TGV P-Duplex *(France)*
L+8T+L	L+8T+L	L+8T+L
Alstom	Alstom	Alstom
SNCF	SNCF	SNCF
2016	1996	2006
Yes (except for ends) + Double Decker	Yes (except for ends) + Double Decker	Yes (except for ends) + Double Decker
1,435	1,435	1,435
25 kV 50 Hz AC / 1.5 kV DC	25 kV 50 Hz AC / 1.5 kV DC	25 kV 50 Hz AC / 1.5 kV DC
320 / 320	320 / 320	320 / 320
9,280	8,800	9,280
Concentrated traction	Concentrated traction	Concentrated traction
TVM, KVB, ETCS	TVM, KVB, ETCS	TVM, KVB, ETCS
67	26	3
390	390	390
17	17	17
21.4	20.4	20.4
200	200	200
2.896	2.896	2.896
158	158	158
398	398	398
556	556	556

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics
(1) Composition
Suppliers
Owners or operators
Year in service
Articulated
Track gauge (mm)
Electrification voltage (kV)
Maximum train speed / operation speed (km/h)
Power (kW)
Traction
Signalling
Train sets currently used / planned
Weight and dimensions
Unladen weight in running order (t)
Maximum axle load (t)
Power weight ratio (kW/t)
Train length (m)
Train width (m)
Seats
1st class seats*
2nd class seats
Total seats
Observations

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	TGV Ouigo *(France)*	TGV-TMST 373 e300 *(France / UK / Belgium)*	401 (ICE 1) *(Germany)*
(1) Composition	L+8T+L	L+18T+L (+2MB)	L+12T+L
Suppliers	Alstom	Alstom	Siemens
Owners or operators	SNCF	Eurostar	DB AG
Year in service	2009	1993	1991
Articulated	Yes (except for ends) + Double Decker	Yes (except for ends)	No
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC / 1.5 kV DC	25 kV 50 Hz AC / 3 kV DC / 1.5 kV DC	15 kV 16.7 Hz AC
Maximum train speed / operation speed (km/h)	320 / 320	300 / 300	280 / 280
Power (kW)	9,280	12,200	9,600
Traction	Concentrated traction	Concentrated traction	Concentrated traction
Signalling	TVM, KVB, ETCS	TVM / KVB, TBL 1+, AWS / TPWS	ETCS, LZB / PZB, ZUB
Train sets currently used / planned	38	8	59
Weight and dimensions			
Unladen weight in running order (t)	390	752	782
Maximum axle load (t)	17	17	19.5
Power weight ratio (kW/t)	21.5	15	11.5
Train length (m)	200	394	358
Train width (m)	2.896	2.814	3.020
Seats			
1st class seats*	-	206	197
2nd class seats	-	540	506
Total seats	634	746	703
Observations			
			Sets have 197/506 seats after modernisation (which is completed now) 1 was abandoned by Eschede accident 19 sets also suited for traffic to Switzerland (ZUB installed)

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

402 (ICE 2) *(Germany)*	403 (ICE 3) *(Germany)*	406 (ICE 3M) *(Germany / The Netherlands)*	General characteristics
L+7T	M+T+M+T+T+M+T+M	M+T+M+T+T+M+T+M	(1) Composition
Siemens	Siemens	Siemens	Suppliers
DB AG	DB AG	DB AG, NS (46 ICE3M)	Owners or operators
1996	2000	2000	Year in service
No	No	No	Articulated
1,435	1,435	1,435	Track gauge (mm)
15 kV 16.7 Hz AC	15 kV 16.7 Hz AC	25 kV 50 Hz AC / 15 kV 16.7 Hz AC / 3 kV DC / 1.5 kV DC	Electrification voltage (kV)
280 / 280	330 / 300	330-220 (DC) / 300	Maximum train speed / operation speed (km/h)
4,800	8,000	8,000	Power (kW)
Concentrated traction	Distributed traction	Distributed traction	Traction
LZB / PZB	ETCS, LZB / PZB	ETCS, LZB / PZB, ATB, TBL	Signalling
44	50	16 / 5	Train sets currently used / planned
			Weight and dimensions
418	409	435	Unladen weight in running order (t)
19.5	16	16	Maximum axle load (t)
10.7	18	17.1	Power weight ratio (kW/t)
205	200	200	Train length (m)
3.020	2.950	2.950	Train width (m)
			Seats
106	101	93	1st class seats*
275	349	326	2nd class seats
381	450	419	Total seats
			Observations
Passenger car consists of 6 coaches and driving trailer	Last 13 delivered since 2005 (with 98/344 seats)	4 sets belong to NS, 4 sets belong to NS for Frankfurt-Brussels/Amsterdam and Basel-Amsterdam 3,500 kW and 220 km/h under DC	

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	407 (ICE 3) *(Germany)*	408 (ICE 3neo) *(Germany)*	411 (ICE-T) *(Germany)*
(1) Composition	M+T+M+T+T+M+T+M	M+T+M+T+T+M+T+M	M+T+M+T+M+T+M
Suppliers	Siemens	Siemens	Siemens-Alstom
Owners or operators	DB AG	DB AG	DB AG
Year in service	2013	2022	2000
Articulated	No	No	No + Tilting
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC / 15 kV 16.7 Hz AC / 3 kV DC / 1.5 kV DC	1.5 kV,3 kV, 15 kV 16.7 Hz AC 25kV/50Hz	15 kV 16.7 Hz AC
Maximum train speed / operation speed (km/h)	320 / 320	320 / 320	230 / 230
Power (kW)	8,000	8,000	4,000
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	LZB / PZB, TVM / KVB, ETCS	LZB/PZB, ATB, TBL, ETCS	LZB / PZB, ETCS
Train sets currently used / planned	17	4/73	31
Weight and dimensions			
Unladen weight in running order (t)	454	454	350
Maximum axle load (t)	14.2	14.2	15
Power weight ratio (kW/t)	16.3	16.3	10.6
Train length (m)	201	200	185
Train width (m)	2.950	2.950	2.850
Seats			
1st class seats*	111	99	55
2nd class seats	333	340	304
Total seats	444	439	359
Observations			
	Several trainsets for Frankfurt-Paris (2015)		3 were sold from DB to ÖBB (class 4011) 5 sets with ZUB are suited for operation in Switzerland

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

	411 (ICE-T2) *(Germany)*	415 (ICE-T) *(Germany)*	412 (ICE 4 - 7 car) *(Germany)*
(1) Composition	M+T+M+T+M+T+M	T+M+M+M+T	T+M+T+2M+2T
Suppliers	Siemens-Alstom	Siemens-Alstom	Siemens-Alstom
Owners or operators	DB AG	DB AG	DB AG
Year in service	2004	1999	2017
Articulated	No + Tilting	No + Tilting	No
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	15 kV 16.7 Hz AC	15 kV 16.7 Hz AC	25 kV 50 Hz AC / 15 kV 16.7 Hz AC / 3 kV DC / 1.5 kV DC
Maximum train speed / operation speed (km/h)	230 / 230	230 / 230	250 / 250
Power (kW)	4,000	3,000	4,950
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	LZB / PZB, ETCS	LZB / PZB, ETCS	LZB / PZB, ETCS
Train sets currently used / planned	28	11	37
Weight and dimensions			
Unladen weight in running order (t)	350	273	455
Maximum axle load (t)	15	15	<18
Power weight ratio (kW/t)	10.5	10.2	10.1
Train length (m)	185	133	200
Train width (m)	2.850	2.850	2.852
Seats			
1st class seats*	55	41	77
2nd class seats	321	209	379
Total seats	376	250	456
Observations	Additional ICE-T trainsets (named ICE-T2) with more seating capacity	Similar to class 411 5 are suited for operation in Switzerland	ICE 4

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	412 (ICE 4 - 12 car) *(Germany)*	605 (ICE TD) *(Germany)*	ETR 450 *(Italy)*
(1) Composition	T+2M+T+2M+T+M+T+M+2T	4M	4M+T+4M
Suppliers	Siemens-Alstom	Siemens-Alstom	Alstom
Owners or operators	DB AG	DB AG	Trenitalia
Year in service	2017	2001	1988-2015
Articulated	No	No + Tilting	No + Tilting
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	15 kV 16.7 Hz AC	Diesel	3 kV DC
Maximum train speed / operation speed (km/h)	265 / 250	200 / 200	250 / 250
Power (kW)	9,900	2,240	5,000
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	LZB / PZB, ETCS	LZB / PZB, ZUB	SCMT / BACC
Train sets currently used / planned	50	2	0
Weight and dimensions			
Unladen weight in running order (t)	659	216	435
Maximum axle load (t)	<18	14.5	12.5 (unloaded)
Power weight ratio (kW/t)	13.6	9.7	10.7
Train length (m)	346	106	233.9
Train width (m)	2.852	2.850	2.750
Seats			
1st class seats*	205	41	170
2nd class seats	625	154	220
Total seats	830	195	390
Observations			
		6 were transferred from DB to DSB and are equipped with Danish signalling system and radio for international services. 14 is out of service Tilting system is not used All trainsets decommissioned except for 2 trainsets	15 trainsets were produced

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

	ETR 460 *(Italy)*	ETR 470 *(Italy / Switzerland)*	ETR 480 *(Italy)*
(1) Composition	2M+2T+2M+T+2M	2M+2T+2M+T+2M	2M+2T+2M+T+2M
Suppliers	Alstom	Alstom	Alstom
Owners or operators	Trenitalia	Trenitalia, SBB	Trenitalia
Year in service	1995	1996-2017	1997
Articulated	No + Tilting	No + Tilting	No + Tilting
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	3 kV DC	15 kV 16.7 Hz AC / 3 kV DC	25 kV 50 Hz AC / 3 kV DC
Maximum train speed / operation speed (km/h)	250 / 250	200 / 200	280 / 250
Power (kW)	5,880	5,880	5,880
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	SCMT / BACC	SCMT / BACC, ZUB	SCMT / BACC
Train sets currently used / planned	6	0	14
Weight and dimensions			
Unladen weight in running order (t)	445	460	422
Maximum axle load (t)	13.5 (unloaded)	15.1	13.5 (unloaded)
Power weight ratio (kW/t)	12.2	11.8	12.8
Train length (m)	237	236.6	237
Train width (m)	2.800	2.800	2.800
Seats			
1st class seats*	139	151	139
2nd class seats	341	324	341
Total seats	480	475	480
Observations			
	10 trainsets were produced	Trenitalia: 5 sets SBB: 0 sets Out of service in both countries from 2017, but 5 trainsets operate in Greece from 2022	AC electric equipment was installed to ETR 480 and renumbered as ETR 485

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	ETR 500 *(Italy)*	ETR 600 *(Italy)*	ETR 610 *(Italy / Switzerland)*
(1) Composition	L+11T+L	M+T+M+T+M+T+M	M+T+M+T+M+T+M
Suppliers	Ansaldobreda-Alstom	Alstom	Alstom
Owners or operators	Trenitalia	Trenitalia	Trenitalia, SBB
Year in service	1995	2008	2009
Articulated	No	No + Tilting	No + Tilting
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC / 3 kV DC	25 kV 50 Hz AC / 3 kV DC	25 kV 50 Hz AC / 15 kV 16.7 Hz AC 3 kV DC
Maximum train speed / operation speed (km/h)	360 / 300	280 / 250	250 / 250
Power (kW)	8,800	5,600	5,500
Traction	Concentrated traction	Distributed traction	Distributed traction
Signalling	SCMT / BACC, ETCS	SCMT / BACC, ETCS	SCMT / BACC, LZB / PZB, ZUB, ETCS
Train sets currently used / planned	58	12	26
Weight and dimensions			
Unladen weight in running order (t)	640 (loaded)	443 (loaded)	466
Maximum axle load (t)	17	17	17
Power weight ratio (kW/t)	13.8	12.6	12.2
Train length (m)	354	187.4	187.4
Train width (m)	2.860	2.830	2.830
Seats			
1st class seats*	-	126	108+18
2nd class seats	-	306	304 (Trenitalia), 296 (SBB)
Total seats	574	432	430 (Trenitalia), 422 (SBB)
Observations			
	Figures are for 3-class 4-class are introduced since 2012		Trenitalia: 7 sets SBB: 19 sets

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

ETR 700 *(Italy)*	ETR 1000 *(Italy-France)*	AGV 575 *(Italy)*	General characteristics
M+T+M+T+T+M+T+M	M+T+M+2T+M+T+M	EMU-11 (5MB+7TB)	(1) Composition
Ansaldobreda	Alstom-Hitachi	Alstom	Suppliers
Trenitalia	Trenitalia	NTV	Owners or operators
2019	2015	2012	Year in service
No	No	Yes	Articulated
1,435	1,435	1,435	Track gauge (mm)
25 kV 50 Hz AC / 3 kV DC / 1.5 kV DC	25 kV 50 Hz AC / 15 kV 16.7 Hz AC 3 kV DC / 1.5 kV DC	25 kV 50 Hz AC / 3 kV DC	Electrification voltage (kV)
250 / 250	400 / 300	300 / 300	Maximum train speed / operation speed (km/h)
5,500	9,800	7,500	Power (kW)
Distributed traction	Distributed traction	Distributed traction	Traction
ATB, TBL, LZB, ETCS	ETCS	SCMT / BACC, ETCS	Signalling
16	57	25	Train sets currently used / planned
			Weight and dimensions
423	500 (loaded)	398	Unladen weight in running order (t)
17	17	17	Maximum axle load (t)
11.8	19.6	15	Power weight ratio (kW/t)
200.9	202	201	Train length (m)
2.870	2.924	3.000	Train width (m)
			Seats
52+148	10+71+76	19+143	1st class seats*
300	300	288	2nd class seats
500	457	450	Total seats
			Observations
Trenitalia: 17 sets since jun. 2019 Former V250 series (NS)	Operation since 2015 in 300 km/h 9 trainsets modified for service in France	3-class	

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	"Evo Pendolino" *(Italy)*	ED250 *(Poland)*	S100 (bicourant) *(Spain)*
(1) Composition	M+T+M+T+M+T+M	2M+3T+2M	L+8T+L
Suppliers	Alstom	Alstom	Alstom
Owners or operators	NTV	PKP Intercity	Renfe Operadora
Year in service	2018	2014	1992
Articulated	Yes	No	Yes (except for ends)
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC / 3 kV DC	25 kV 50 Hz AC / 15 kV 16.7 Hz AC 3 kV DC	25 kV 50 Hz AC / 3 kV DC
Maximum train speed / operation speed (km/h)	250 / 250	250 / 250	300 / 300
Power (kW)	5,500	5,500	8,800
Traction	Distributed traction	Distributed traction	Concentrated traction
Signalling	SCMT / BACC, ETCS	SHP, Mirel, LZB / PZB, ETCS	ASFA / LZB, ETCS
Train sets currently used / planned	26	20	14
Weight and dimensions			
Unladen weight in running order (t)	407	395.5	392
Maximum axle load (t)	25	17	17.2
Power weight ratio (kW/t)	13.5	14.2	21
Train length (m)	187.3	187.4	200.15
Train width (m)	2.950	2.830	2.904
Seats			
1st class seats*	-	57	80 (1)
2nd class seats	-	345	265 (+2 hp)
Total seats	472	402	345 (+2 hp)
Observations			
	Pendolino Design		AVE "3 classes" (1) Includes 8 places in club room

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

S100 F (bicourant) *(Spain)*	S102 R *(Spain)*	S103 R *(Spain)*	General characteristics
L+8T+L	L+12T+L	M+T+M+2T+M+T+M	(1) Composition
Alstom	Talgo-Alstom	Siemens	Suppliers
Renfe Operadora	Renfe Operadora	Renfe Operadora	Owners or operators
1992	2005	2007	Year in service
Yes (except for ends)	Yes, by independent wheels (except for ends) + Tilting	No	Articulated
1,435	1,435	1,435	Track gauge (mm)
25 kV 50 Hz AC / 1.5 kV DC	25 kV 50 Hz AC	25 kV 50 Hz AC	Electrification voltage (kV)
300 / 300	330 / 300	350 / 300	Maximum train speed / operation speed (km/h)
8,800	8,000	8,800	Power (kW)
Concentrated traction	Concentrated traction	Distributed traction	Traction
ASFA / LZB, TVM / KVB / RPS, ETCS	ASFA / LZB, ETCS	ASFA / LZB / ETCS	Signalling
10	16	26	Train sets currently used / planned
			Weight and dimensions
392	322	425	Unladen weight in running order (t)
17.2	17	15	Maximum axle load (t)
21	24.7	20.7	Power weight ratio (kW/t)
200.15	200.24	200	Train length (m)
2.904	2.960	2.950	Train width (m)
			Seats
80 (1)	71 (1)	88 (1)	1st class seats*
265 (+2 hp)	261 (+2 hp)	332 (+2 hp)	2nd class seats
345 (+2 hp)	332 (+2 hp)	420 (+2 hp)	Total seats
			Observations
AVE "3 classes" 10 sets are tri-current and operable in France since 2013 (1) Includes 8 places in club room	AVE "3 classes" (1) Includes 8 places in club room	AVE "3 classes" (1) Includes 8 places in club room	

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	S104 *(Spain)*	S106/106.5 *(Spain)*	S108 *(Spain)*
(1) Composition	4M	M+12T+M	L+8T+L
Suppliers	CAF-Alstom	Talgo-Alstom	Alstom
Owners or operators	Renfe Operadora	Renfe Operadora	SNCF (Ouigo)
Year in service	2004	2024	2021
Articulated	No	Yes, by independent wheels (except for ends) + Tilting	Yes (except for ends) + Double Decker
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC	25 kV 50 Hz AC / 3 kV DC / 1.5 kV DC	25 kV 50 Hz AC / 1.5 kV DC
Maximum train speed / operation speed (km/h)	270 / 250	330 / 300	320 / 320
Power (kW)	4,000	8,000 (25 kV) / 6,500 (3 kV) / 4,300 (1.5 kV)	9,280
Traction	Distributed traction	Concentrated traction	Concentrated traction
Signalling	ASFA / LZB / ETCS	ASFA / ETCS / TVM430 / KVB / RPS	EQS (ETCS/ASFA)
Train sets currently used / planned	20	30	15
Weight and dimensions			
Unladen weight in running order (t)	221.5	317.0	390
Maximum axle load (t)	17	17	17
Power weight ratio (kW/t)	18.1	23.4	21.5
Train length (m)	107.1	201.9	200
Train width (m)	2.920	3.200	2.896
Seats			
1st class seats*	30	76 (+2 hp)	181
2nd class seats	206 (+1 hp)	429	328
Total seats	236 (+1 hp)	505 (+2 hp)	509
Observations			
	"Avant"	Standard (1,435) or dual gauge (1,435 - 1,668) trainsets 10 trainsets for international use, include TVM-430, KVB, RPS S106 Avlo: 581 seats	

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways and miscellaneous data sources

2.5 ROLLING STOCK

S109 *(Spain)*	S112 *(Spain)*	S112 M *(Spain)*	General characteristics
M+T+M+2T+M+T+M	L+12T+L	L+12T+L	(1) Composition
Alstom-Hitachi	Talgo-Alstom	Talgo-Alstom	Suppliers
Trenitalia	Renfe Operadora	Renfe Operadora	Owners or operators
2022	2010	2021	Year in service
No	Yes, by independent wheels (except for ends) + Tilting	Yes, by independent wheels (except for ends) + Tilting	Articulated
1,435	1,435	1,435	Track gauge (mm)
25 kV 50 Hz AC / 16.7 Hz AC 3 kV DC / 1.5 kV DC	25 kV 50 Hz AC	25 kV 50 Hz AC	Electrification voltage (kV)
400 / 300	330 / 300	330 / 300	Maximum train speed / operation speed (km/h)
9,800	8,000	8,000	Power (kW)
Distributed traction	Concentrated traction	Concentrated traction	Traction
ETCS	ASFA / LZB / ETCS	ASFA / LZB / ETCS	Signalling
23	25	5	Train sets currently used / planned
			Weight and dimensions
500 (loaded)	322	322	Unladen weight in running order (t)
17	17	17	Maximum axle load (t)
19.6	24.7	24.7	Power weight ratio (kW/t)
202	200.24	200.24	Train length (m)
2.924	2.960	2.960	Train width (m)
			Seats
-	71	-	1st class seats*
-	292 (+2 hp)	436 (+2 hp)	2nd class seats
459 (+2 hp)	363 (+2 hp)	436 (+2 hp)	Total seats
			Observations
"Iryo"	Similar to S102 but capacity is increased	"Avlo" Similar to S112 but capacity is increased	

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

Source: International Union of Railways

* For 3 classes train, 1st and 2nd classes are included in 1st class

2.5 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	S114 *(Spain)*	S120 *(Spain)*	S120.5 *(Spain)*
(1) Composition	4M	4M	4M
Suppliers	CAF-Alstom	CAF-Alstom	CAF-Alstom
Owners or operators	Renfe Operadora	Renfe Operadora	Renfe Operadora
Year in service	2011	2006	2006
Articulated	No	No	No
Track gauge (mm)	1,435	1,435 / 1,668	1,435 / 1,668
Electrification voltage (kV)	25 kV 50 Hz AC	25 kV 50 Hz AC / 3 kV DC	25 kV 50 Hz AC / 3 kV DC
Maximum train speed / operation speed (km/h)	250	250 (25 kV)-220 (3 kV) / 250 (25 kV)-220 (3 kV)	250 (25 kV)-220 (3 kV) / 250 (25 kV)-220 (3 kV)
Power (kW)	4,000	4,000 (25 kV)-2,500 (3 kV)	4,000 (25 kV)-2,500 (3 kV)
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	ASFA / LZB / ETCS	ASFA / LZB / ETCS / EBICAB	ASFA / LZB / ETCS
Train sets currently used / planned	12	12	15
Weight and dimensions			
Unladen weight in running order (t)	221.5	233	232
Maximum axle load (t)	17	16.2	16.2
Power weight ratio (kW/t)	18.1	17.2	17.2
Train length (m)	107.9	107.4	107.4
Train width (m)	2.830	2.920	2.920
Seats			
1st class seats*	-	81	74 (+1 hp)
2nd class seats	236 (+2 hp)	156 (+1 hp)	148
Total seats	236 (+2 hp)	237 (+1 hp)	222 (+1 hp)
Observations			
	"Avant"	"Alvia" Dual gauge track (1,435 - 1,668)	"Alvia" Dual gauge track (1,435 - 1,668)

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

S121 (Spain)	S130 (Spain)	S730 (Spain)	General characteristics
4M	L+11T+L	M+9T+M	(1) Composition
CAF-Alstom	Talgo-Alstom	Talgo-Alstom	Suppliers
Renfe Operadora	Renfe Operadora	Renfe Operadora	Owners or operators
2008	2007	2012	Year in service
No	Yes, by independent wheels (except for ends) + Tilting	Yes, by independent wheels (except for ends) + Tilting	Articulated
1,435 / 1,668	1,435 / 1,668	1,435 / 1,668	Track gauge (mm)
25 kV 50 Hz AC / 3 kV DC	25 kV 50 Hz AC / 3 kV DC	25 kV 50 Hz AC / 3 kV DC / diesel	Electrification voltage (kV)
250 (25 kV)-220 (3 kV) / 250 (25 kV)-220 (3 kV)	250 (25 kV)-220 (3 kV) / 250 (25 kV)-220 (3 kV)	250 (25 kV)-220 (3 kV)-180 (diesel) / 250 (25 kV)-220 (3 kV)-180 (diesel)	Maximum train speed / operation speed (km/h)
4,000 (25 kV)-2,500 (3 kV)	4,800 (25 kV) / 4,000 (3 kV)	4,800 (25 kV) / 4,000 (3 kV) / 3,600 (diesel)	Power (kW)
Distributed traction	Concentrated traction	Concentrated traction	Traction
ASFA / LZB / ETCS	ASFA / LZB / EBICAB / ETCS	ASFA / LZB / EBICAB / ETCS	Signalling
29	30	14	Train sets currently used / planned
			Weight and dimensions
225	312	384	Unladen weight in running order (t)
15.75	18	18	Maximum axle load (t)
17.8	15.4	12.5	Power weight ratio (kW/t)
107.4	184.2	186	Train length (m)
2.920	2.960	2.960	Train width (m)
			Seats
-	62 (+1 hp)	47 (+1 hp)	1st class seats*
-	236	216	2nd class seats
280 (+2 hp)	298 (+1 hp)	263 (+1 hp)	Total seats
			Observations
"Avant" Dual gauge track (1,435 - 1,668)	"Alvia" Dual gauge track (1,435 - 1,668) 15 sets will be converted to S130H	Diesel hybrid version of S130 Diesel engines are installed on 2 end cars next to the locomotive 15 sets are converted from S130 Dual gauge track (1,435 - 1,668) No. 12 abandoned after the accident at Santiago	

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	X55 (SJ 3000) *(Sweden)*	Snabbtåg *(Sweden)*	RABDe500 (ICN) *(Switzerland)*
(1) Composition	EMU-4 (4M)	(6)	2M+3T+2M
Suppliers	Alstom	Alstom	Alstom
Owners or operators	SJ	SJ	SBB
Year in service	2012	(2026-)	2000
Articulated	No	No	No + Tilting
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	15 kV 16.7 Hz AC	25 kV 50 Hz AC / 15 kV 16.7 Hz AC	15 kV 16.7 Hz AC
Maximum train speed / operation speed (km/h)	250 / 200	250 / 250	220 / 200
Power (kW)	3,180	-	5,200
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	EBICAB700, ETCS	-	ZUB
Train sets currently used / planned	20	0 / 25	44
Weight and dimensions			
Unladen weight in running order (t)	274	-	355
Maximum axle load (t)	-	-	12
Power weight ratio (kW/t)	10.8	-	13.3
Train length (m)	107	-	188
Train width (m)	3.430	-	2.830
Seats			
1st class seats*	64	-	125
2nd class seats	181	-	326
Total seats	245	363	451
Observations			
		"Zefiro Express"	

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

RABe501 (EC250)
(Switzerland)

TB+2MB+4TB+2MB+3TB
Stadler
SBB
2020
Yes
1,435
25 kV 50 Hz AC / 15 kV 16.7 Hz AC 3 kV DC
250 / 250
6,000
Distributed traction
SCMT / BACC / LZB / PZB / ZUB / ETCS
29
380
17.3
15.8
202
2.900
117
288
405
SBB "Giruno" Stadler "SMILE"

IC125
(United Kingdom)

L+7T+L - L+8T+L
BREL
CC, EC, EM, FGW, GC, V
1976
No
1,435
Diesel
200 / 200
3,360
Concentrated traction
AWS / TPWS
80
383 (L+7+L)
10.7
8.8
197 (L+7T+L) - 220 (L+8T+L)
2.740
-
-
472
CC: Cross Country EC: East Coast EM: East Midlands FGW: First Great Western GC: Grand Central V: Virgin

IC225
(United Kingdom)

L+9T
BREL, Alstom
East Coast
1989
No
1,435
25 kV 50 Hz AC
225 / 200
4,350
Concentrated traction
AWS / TPWS
30
476
11.9
9.1
226
2.740
112
368
480

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics
(1) Composition
Suppliers
Owners or operators
Year in service
Articulated
Track gauge (mm)
Electrification voltage (kV)
Maximum train speed / operation speed (km/h)
Power (kW)
Traction
Signalling
Train sets currently used / planned
Weight and dimensions
Unladen weight in running order (t)
Maximum axle load (t)
Power weight ratio (kW/t)
Train length (m)
Train width (m)
Seats
1st class seats*
2nd class seats
Total seats
Observations

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	180 *(United Kingdom)*	220 *(United Kingdom)*	221 *(United Kingdom)*
(1) Composition	5M	4M	4M - 5M
Suppliers	Alstom	Alstom	Alstom
Owners or operators	EC, GC, HT, NR	Cross Country	Cross Country, Virgin
Year in service	2000	2001	2002
Articulated	No	No	No + Tilting
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	Diesel	Diesel	Diesel
Maximum train speed / operation speed (km/h)	200 / 200	200 / 200	200 / 200
Power (kW)	2,800	2,200	2,240 (4M) - 2,800 (5M)
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	AWS / TPWS	AWS / TPWS	AWS / TPWS
Train sets currently used / planned	14	34	4 (4M) - 40 (5M)
Weight and dimensions			
Unladen weight in running order (t)	252.5	185.6	227 (4M) - 282.8 (5M)
Maximum axle load (t)	12.6	11.6	14.1
Power weight ratio (kW/t)	10.2	11	9.2
Train length (m)	116.5	93.34	93.3 (4M) - 116.2 (5M)
Train width (m)	2.730	2.730	2.730
Seats			
1st class seats*	42	26	26
2nd class seats	226	162	162 (4M) - 224 (5M)
Total seats	268	188	188 (4M) - 250 (5M)
Observations			
	"Adelante" EC: East Coast, GC: Grand Central, HT: Hull Trains, NR: Northern Rail	"Voyager"	"Super Voyager"

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

222
(United Kingdom)

4M - 5M - 7M
Alstom
East Midlands
2004
No
1,435
Diesel
200 / 200
2,240 (4M) - 2,800 (5M) - 3,920 (7M)
Distributed traction
AWS / TPWS
4 (4M) - 7 (5M) - 6 (7M)
227 (4M) - 282.5 (5M) - 395.5 (7M)
14.1
9.9
93.3 (4M) - 116.2 (5M) - 161.8 (7M)
2.730
33 (4M) - 50 (5M) - 106 (7M)
132 (4M) - 192 (5M) - 236 (7M)
165 (4M) - 242 (5M) - 342 (7M)
"Meridian"

374 e320
(UK / France / Belgium / The Netherlands)

M+T+M+T+T+M+T+M+M+T+M+T+T+M+T+M
Siemens
Eurostar
2015
No
1,435
25 kV 50 Hz AC / 15 kV 16.7 Hz AC / 3 kV DC / 1.5 kV DC
320 / 300
16,000
Distributed traction
TVM / KVB, TBL, ATB, ETCS
17
878
17
18.2
400
2.950
222
672
894
No. 4001-4034 Siemens Velaro D series

390
(United Kingdom)

2M+T+M+T+M+T+2M
Alstom
Virgin
2002
No + Tilting
1,435
25 kV 50 Hz AC
225 / 200
5,500
Distributed traction
AWS / TPWS
56
458 (loaded)
16.1
12
217
2.730
145
294
439
Decided to increasing train length to 11 car for 31 train sets and creation of 4 new 11 car trainsets

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics
(1) Composition
Suppliers
Owners or operators
Year in service
Articulated
Track gauge (mm)
Electrification voltage (kV)
Maximum train speed / operation speed (km/h)
Power (kW)
Traction
Signalling
Train sets currently used / planned
Weight and dimensions
Unladen weight in running order (t)
Maximum axle load (t)
Power weight ratio (kW/t)
Train length (m)
Train width (m)
Seats
1st class seats*
2nd class seats
Total seats
Observations

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	395 *(United Kingdom)*	800 *(United Kingdom)*	801 *(United Kingdom)*
(1) Composition	T+4M+T	T+3M+T / T+2M+T+M+T+2M+T	T+3M+T / T+2M+T+M+T+2M+T
Suppliers	Hitachi	Hitachi-Hitachi Rail Europe (UK)	Hitachi-Hitachi Rail Europe (UK)
Owners or operators	Southeastern	IEP (Great Western, East Coast main line)	IEP (East Coast main line)
Year in service	2009	2017	2018
Articulated	No	No	No
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC / 0.75 kV DC	25 kV 50 Hz AC + Diesel (Bi-mode)	25 kV 50 Hz AC + Diesel (Bi-mode)
Maximum train speed / operation speed (km/h)	225 / 225	225 / 200	225 / 200
Power (kW)	3,360	2,100 - 3,500	2,100 - 3,500
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	TVM / KVB, AWS / TPWS	AWS / TPWS	AWS / TPWS
Train sets currently used / planned	29	46 (3M 2T) / 13 (5M 4T)	12 (3M 2T) / 30 (5M 4T)
Weight and dimensions			
Unladen weight in running order (t)	265	300 - 540	300 - 540
Maximum axle load (t)	11 (unloaded avg.)	18.4	18.4
Power weight ratio (kW/t)	12.7	-	-
Train length (m)	121.8	93.7 - 208.7	93.7 - 208.7
Train width (m)	2.810	2.730	2.730
Seats			
1st class seats*	-	45-101	45-101
2nd class seats	348	270 - 526	270 - 526
Total seats	348	315 - 627	315 - 627
Observations			
		Agility Trains Bi-mode is possible to be propelled by both electricity and diesel engine 5-cars: 46 sets; 36 (Great Western Main Line), 10 (East CoastMain Line) 9-cars: 34 sets; 21 (Great Western Main Line), 13 (East Coast Main Line)	Agility Trains, 5-cars: 12 sets (East Coast Main Line) 9-cars: 30 sets (East Coast Main Line)

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

2.5 ROLLING STOCK

802
(United Kingdom)

(1) Composition	T+3M+T / T+2M+T+M+T+2M+T
Suppliers	Hitachi-Hitachi Rail Europe (UK)
Owners or operators	Great Western
Year in service	2018
Articulated	No
Track gauge (mm)	1,435
Electrification voltage (kV)	25 kV 50 Hz AC + Diesel (Bi-mode)
Maximum train speed / operation speed (km/h)	225 / 200
Power (kW)	2,100 - 3,500
Traction	Distributed traction
Signalling	AWS / TPWS
Train sets currently used / planned	22 (3M 2T) / 14 (5M 4T)
Weight and dimensions	
Unladen weight in running order (t)	300 - 540
Maximum axle load (t)	18.4
Power weight ratio (kW/t)	-
Train length (m)	130 - 234
Train width (m)	2.730
Seats	
1st class seats*	-
2nd class seats	-
Total seats	326 - 655
Observations	
	Bi-mode, AT300 Bi-mode is possible to be propelled by both electricity and diesel engine who provide electricity to motors

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways


INTERNATIONAL UNION
OF RAILWAYS

1. GLOBAL HIGH - SPEED DATA

2. EUROPE

3. ASIA - PACIFIC

4. AFRICA

5. NORTH AMERICA

6. MIDDLE EAST

7. LATIN AMERICA

INDEX OF COUNTRIES

3.1 HIGH-SPEED RAIL NETWORK

CHINA

High-speed lines in commercial operation in China (I)

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Qinhuangdao - Shenyang North	250	2003	405
Taipei - Kaohsiung	300	2007	345
Nanjing South - Hefei	250	2008	148
Beijing South - Tianjin	350	2008	118
Qingdao - Jinan	200	2009	393
Hefei East - Hankou	250	2009	380
Shijiazhuang North - Taiyuan	250	2009	228
Chongqing North - Liangwu	200	2009	263
Ningbo - Cangnan	250	2009	351
Wuhan - Guangzhou South	350	2009	1,079
Zhengzhou East - Xi'an North	350	2010	553
Cangnan - Fuzhou	250	2010	211
Fuzhou - Xiamen North	250	2010	234
Chengdu - Qingchengshan	200	2010	65
Shanghai - Nanjing	350	2010	323
Jiujiang - Nanchang West	250	2010	138
Shanghai Hongqiao - Hangzhou South	350	2010	174
Haikou - Sanya	250	2010	308
Guangzhou South - Zhuhai	200	2011	143
Changchun - Jilin	250	2011	111
Beijing South - Shanghai Hongqiao	350	2011	1,318
Guangzhou South - Shenzhen North	250	2011	111
Longyan - Beixitou (block station)	200	2012	119
Hankou - Yichang East	200	2012	292
Zhengzhou East - Wuhan	350	2012	526
Bengbu South - Hefei	350	2012	131
Dalian North - Shenyang North	350	2012	383
Shenyang North - Harbin	350	2012	546

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines in commercial operation in China (II)

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Suining - Chengdu East	200	2012	151
Beijing West - Zhengzhou East	350	2012	676
Taishansuo (block station) - Liuzhou	200	2012	498
Taigemu - Baotou	200	2013	146
Nanjing South - Hangzhou East	350	2013	254
Hangzhou South - Ningbo	350	2013	157
Panjin North -Yingxiajiahe (block station)	350	2013	90
Nanchang West - Fuzhou	200	2013	547
Yongtai - Putian	200	2013	59
Jinhu (b.s.) - Longjiaying (b.s.)	350	2013	288
Xi'an North - Baoji South	350	2013	184
Xiamen North - Shenzhen North	250	2013	513
Nanhu East - Xianning South	250	2013	76
Liuzhou - Nanning	250	2013	223
Qinzhou North - Fangchenggang	250	2013	62
Nanning East - Beihai	250	2013	197
Pixian West - Pengzhou	200	2013	21
Nanning - Guangzhou South	250	2014	574
Xiaomayang (block station) - Daye North	250	2014	91
Gedian South - Huanggangdong	250	2014	36
Changfengjie (block station) - Xi'an North	250	2014	574
Hangzhou South - Changsha South	350	2014	911
Changsha South - Xinhuang West	350	2014	420
Jiangyou - Chengdu East	250	2014	153
Chengdu East - Leshan	250	2014	135
Leshan - Emeishan	250	2014	27
Lanzhou West - Ürümqi South	250	2014	1,785
Jiayuguan South - Jiayuguan	250	2014	7

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines in commercial operation in China (III)

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Guizhou East - Guangzhou South	250	2014	860
Qingdao - Rongcheng	250	2014	301
Zhengzhou East - Songchenglu	200	2014	50
Ximotang - Yantai	250	2015	19
Nanyangzhai - Jiaozuo	200	2015	70
Xinhuang West - Guiyang North	350	2015	286
Hefei North City - Fuzhou	350	2015	850
Harbin North - Qiqihar South	250	2015	264
Shenyang South - Dandong	250	2015	208
Tianjin - Haibin	350	2015	43
Jilin - Hunchun	250	2015	361
Nanjing South - Anqing	250	2015	257
Nanning - Yangxu	250	2015	257
Dandong - Dalian North	200	2015	293
Chengdu East - Shapingba	250	2015	300
Tangyasuo (block station) - Wenzhou South	200	2015	190
Ganxian - Longyan	200	2015	248
Tianjin West - Bazhou West	250	2015	72
Bazhou West - Xushui	200	2015	65
Hainan West Circle (Haikou-Sanya)	200	2015	345
Zhengzhou East - Xinzheng Airport	200	2015	28
Taipei - Nangang	130	2016	9
Foshan West - Zhaoqing	200	2016	81
Changping East - Xiaojinkou	200	2016	53
Zhengzhou East- Xuzhou East	350	2016	362
Chongqing North - Wanzhou North	250	2016	246
Hankou - Xiaogan East	200	2016	61
Changsha - Zhuzhou South	200	2016	58

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines in commercial operation in China (IV)

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Muyun - Xiangtan	200	2016	24
Guiyang North - Kunming South	250	2016	463
Yangxu - Kunming East	250	2016	452
Daye North - Yangxin	250	2017	37
Baoji South - Lanzhou West	250	2017	353
Wulanchabu - Hohhot East	250	2017	128
Yangxin - K23 block station	250	2017	82
Xi'an North - Jiangyou	250	2017	505
Huaibei North - Xiaoxian North	250	2017	25
Shijiazhuang - Jinan East	250	2017	308
Quzhou - Jiujiang	200	2017	334
Dongguan - Changping East	200	2017	48
Changsha West - Changsha	200	2017	22
Tongjiaxi (block station) - Guiyang	200	2018	380
Jiangmen - Zhanjiang West	200	2018	355
Harbin - Jiamusi	200	2018	343
Fanjiazhuang (b.s.) - Changfengjie (b.s.)	200	2018	122
Guangtong North - Dali	200	2018	175
Xinhui - Jiangmen	200	2018	3
Shenzhen North - Futian	200	2018	4
Harbin - Harbin North	200	2018	18
Hangzhou South - Huangshan North	250	2018	272
Harbin - Mudanjiang	250	2018	300
Qingdao North - Ganyu North	200	2018	197
Ganyu North - Weiyang (block station)	200	2018	234
Huaihua South - Hengyang East	200	2018	319
Mayuan - Yanjialong	200	2018	5
Changtang (block station) - Hengyang North	200	2018	5

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines in commercial operation in China (V)

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Changtang (block station) - Chashan'ao	200	2018	5
Qihe - Jinan West	200	2018	21
Dazhengzhuang (b.s.) - Damoliu (b.s.)	200	2018	3
Beixindian (b.s.) - Wulitang (b.s.)	200	2018	21
Jinan East - Hongdao	350	2018	305
Tongren - Dazongping	200	2018	46
Chengdu West - Chaoyang Lake	200	2018	100
Yanping - Longyan	200	2018	247
Houling (block station) - Hongxing (block station)	200	2018	8
Huyi (block station) - Aibei (block station)	200	2018	2
Chengde South - Pingquan North	350	2018	67
Pingquan North - Shenyang North	350	2018	435
Dingxiang Lake 2 (b.s.) - Da'erhuan 1 (b.s.)	200	2018	2
Dingxiang Lake 1 (b.s.) - Da'erhuan 2 (b.s.)	200	2018	2
Xinmin North - Tongliao	250	2018	197
Yaojiawopu (block station) - Tianjiawopu (b.s.)	200	2018	6
Tuancun (block station) - Daguhe (block station)	350	2018	4
Leshan - Yibin West	350	2019	145
Liying - Daxing Airport	200	2019	32
Meizhou West - Chaoshan	200	2019	121
Rizhao West - Dawangzhuang (block station)	350	2019	226
Qufu East - Dawangzhuang (block station)	200	2019	10
Qufu East - Nanxiasong (block station)	200	2019	4
Xiaogan East - Yunmeng East	250	2019	21
Yunmeng East - Shiyan East	350	2019	377
Shangqiu - Hefei North City	350	2019	378
Zhengzhou East - Xiangyang East	350	2019	389
Zhengzhou South - Fuyang West	350	2019	280

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines in commercial operation in China (VI)

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Yinchuan - Zhongwei South	250	2019	207
Xintang South - Shenzhen Airport	140	2019	73
Xintang South - Xintang	140	2019	3
Xuzhou East (Xulan o.s.) - Yancheng (Xuyan o.s.)	250	2019	313
Dongji - Huai'an East	250	2019	105
Yibin West - Guiyang East	250	2019	368
Jianpo (block station) - Guiyang North	250	2019	9
Hejia (block station) - Yangtaishan (b.s.)	350	2019	385
Henggang - Hejia (block station)	200	2019	11
Dongcun (block station) - Pushu (block station)	200	2019	5
Fanjia (block station) - Nanjie (block station)	200	2019	2
Ganxian North - Pingjiang (block station)	200	2019	3
Qianjiang - Changde	200	2019	333
Beijing North - Zhangjiakou	350	2019	174
Zhangjiakou - Wulanchabu	350	2019	159
Xiahuayuan - Taizicheng	250	2019	52
Huai'an - Taishancun (block station)	250	2019	136
Kazuo - Chifeng	250	2020	156
Sunjiagou (b.s.) - Zhengzhangzi (b.s.)	200	2020	5
Feidong - Huzhou	350	2020	309
Zhaodian - Huangdu	200	2020	143
Pingdong (b.s.) - Nantong West	200	2020	5
Anshun West - Shuicheng	250	2020	120
Guangzhou North - Qingyuan	200	2020	38
Weifang North - Laixi East	350	2020	124
Langjiazhuang (b.s.) - Pangjiatun (b.s.)	200	2020	3
Huai'an East - Dantu	250	2020	199
Shaobo (b.s.) - Jiangdu	200	2020	4

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines in commercial operation in China (VII)

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Shaobo (b.s.) - Tai'anzhen	200	2020	5
Hengshan (b.s.) - Zhenjiang (Intercity o.s.)	200	2020	12
Jiaozuo - Changfengjie (b.s.)	250	2020	362
Feixi Jinggang (b.s.) - Shuangling (b.s.)	350	2020	134
Shuangling (b.s.) - Longshan (b.s.)	200	2020	4
Longshan (b.s.) - Anqing	200	2020	22
Fuzhou - Pingtan	200	2020	88
Xi'an North - Wuzhong	250	2020	545
Huwang (b.s.) - Liquan South	200	2020	6
Daxing Airport - Xiong'an	350	2020	59
Yancheng (Xuyan o.s.) - Nantong West	350	2020	158
Guodaocun (b.s.) - Chenqiao (b.s.)	200	2020	6
Jixianlu (b.s) - Feixi Jinggang o.s.	200	2020	10
Dafu - Xiantao	200	2020	17
Beijing Chaoyang - Chengde South	350	2021	192
Xuzhou East - Houmazhuang	350	2021	185
Shenxu (b.s.) - Lianyungang (Xuzhou o.s.)	200	2021	5
Neijiang North - Luzhou	250	2021	129
Liaoning Chaoyang - Linghai South	350	2021	107
Zhangjiajie West - Huaihua South	350	2021	245
Zhangjiajie West - Shadi (b.s.)	200	2021	3
Longxingcun (b.s.) - Huaihua South	200	2021	4
Mudanjiang - Jiamusi	250	2021	372
Changbaishan - Dunhua South	250	2021	99
Dunhua - Dunhua South	200	2021	12
Hejia (b.s.) - Yangtaishan (b.s.)	350	2021	431
Shuangling (b.s.) - Lushan	350	2021	176
Tangxia (b.s.) - Dongguan South	200	2021	3

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines in commercial operation in China (VIII)

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Dongguan South - Tangxia (b.s.)	200	2021	2
Yangtaishan (b.s.) - Shenzhen North	200	2021	8
Anqing West - Longshan (b.s.)	200	2021	7
Dawangzhuang - Zhuangzhai	350	2021	199
Xiaobeishan (b.s.) - Nanxiasong (b.s.)	200	2021	5
Shaoxing North - Wenling	350	2022	223
Shaoxing North - Jinghu (b.s.)	350	2022	3
Webling North (b.s.) - Wenling	350	2022	4
Bahe (b.s.) - Huangmei East	350	2022	116
Huanggang East - Bahe (b.s.)	250	2022	9
Puyang East - Zhengzhou East	350	2022	195
Yangzhuang (b.s.) - Hongbao (b.s.)	250	2022	3
Beijing Fengtai - Dujiakan (b.s.)	350	2022	9
Xiangyang East - Wanzhou North	350	2022	450
Huanglou (b.s.) - Gongxing (b.s.)	250	2022	6
Yiyang South - Huangjinyuan (b.s.)	350	2022	60
Huangjinyuan (b.s.) - Changsha West	350	2022	3
Huzhou - Tonglu East	350	2022	129
Tonglu East - Tonglu	350	2022	9
Nanning South - Chongzuo	250	2022	121
Mile - Honghe	250	2022	106
Changde - Yiyang South	350	2022	97
Zhongwei South - Shuping	250	2022	221
Dingjiagou (b.s.) - Lanzhou New Area	250	2022	7
Baodi - Beichen	250	2022	54
Beiliugezhuang (b.s.) - Tangshan	350	2022	141
Gaoxinzhuang - Beiliugezhuang (b.s.)	250	2022	2
Tangshan West - Laozhuangzi (b.s.)	250	2022	10
Jinan - Laiwu	350	2022	116

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines in commercial operation in China (IX)

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Longli North - Libo	350	2023	176
Libo - Nanning East	350	2023	305
Fengling North (b.s.) - Xiangzhu (b.s.)	250	2023	3
Shanwei - Xintang	350	2023	200
Huizhou North - Xiangzhu (b.s.)	250	2023	14
Madiling (b.s.) - Zhongkai	250	2023	11
Fuzhou Nanyong Square - Beixitou (b.s.)	350	2023	267
Zhanglan (b.s.) - Fuzhou Nanyong Square	250	2023	2
Heshan (b.s.) - Xiamen North (Hangshen o.s.)	250	2023	4
Nanjing South Ning'an o.s. - Taicang Riverside o.s.	350	2023	275
Jiangning - Gaoxinyuan (b.s.)	250	2023	3
Taicang Riverside o.s. - Ludu (b.s.)	250	2023	5
Qingbaijiang - Zhenjiangguan	200	2023	207
Qingbaijiang East - Sanxingdui	200	2023	5
Jinan West - Puyang East	350	2023	212
Damiaotun (b.s.) - Yufuhe (b.s.)	250	2023	4
Laixi - Rongcheng	350	2023	193
Laixi - Laixi East (b.s.)	250	2023	3
Gu'an East - Shengfang	250	2023	49
Shantou South - Shanwei	350	2023	142
Chengdu East - Yibin East	350	2023	246
Yibin East - Yibin	350	2023	17
Huaxingcun (b.s.) - Jinrui (b.s.)	250	2023	2
Yibin - Yibin West	250	2023	2
Yibin - Zaojuebang (b.s.)	250	2023	2
Fangchenggang North - Dongxing City	200	2023	47
Longyan - Wuping	250	2023	64
Huangshan North - Nanchang South	350	2023	304
Guangzhou North - Guangzhou Baiyun	250	2023	22
			Total km = 45,390

Source: compiled by authors based on International Union of Railways

High-speed lines under construction in China (I)

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Yixian - Chizhou	350	2024	123
Foshan West - Guangzhou South	200	2024	36
Guangzhou South - Wanghong	200	2024	37
Bazhong East - Qiangjiawan (b.s.)	250	2024	145
Qiangjiawan (b.s.) - Nanchong North (Lanyu o.s.)	200	2024	2
Zhongchuan Airport - Wuwei South	250	2024	193
Zhuangzhai - Lankao South	350	2024	47
Zhenjiangguan - Huangshengguan	200	2024	67
Tonglu East - Wenzhou North	350	2024	261
Yongjia (b.s.) - Wenzhou North	200	2024	3
Meizhou - Longyan	350	2024	103
Jiulongpo - Yibin East	350	2024	192
Huinong South - Yinchuan	250	2024	96
Xuancheng - Jixi North	350	2024	115
Huazhen (b.s.) - Feixi (Jinggang o.s.)	200	2024	3
Changyi - Zhifu	350	2024	237
Ximu (b.s.) - Zhenshan (b.s.)	200	2024	2
Jingmen West - Jingzhou	350	2024	79
Shanghai Hongqiao - Huzhou	350	2024	164
Kangshan (b.s.) - Miaoxizhen (b.s.)	200	2024	4
Langfang North - Daxing Airport	200	2024	28
Daxing Airport - Gu'an East	250	2024	18
Nanning - Yulin	350	2024	190
Datong - Ulanqab	250	2024	122
Huairen East - Fanjiazhuang (b.s.)	250	2024	133
Huai'an - Huairen East	250	2024	14
Xi'an - Hancheng (intercity railway)	250	2025	176

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines under construction in China (II)

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Panxian - Xingyi	250	2025	98
Chongqing - Qianjiang	350	2025	265
Tieli - Yichun	250	2025	112
Hefei - Xinyi	350	2025	208
Shijiazhuang - Hengshui - Cangzhou (i.r.)	350	2025	224
Yulin - Cenxi	350	2025	111
Chongzuo - Pingxiang	250	2025	81
Guangzhou - Zhanjiang	350	2025	400
Xi'an - Yan'an	350	2025	292
Yichang - Zhengwan HS (tie line)	350	2025	109
Chongqing - Fuling	350	2025	69
Shenyang - Baihe	350	2025	429
Yibin East - Kunming	350	2025	507
Huaibei - Fuyang	350	2026	230
Chaohu - Ma'anshan (intercity railway)	250	2026	75
Huangbei - Suzhou - Bengbu (intercity railway)	350	2026	160
Fuling - Wanzhou	350	2026	183
Lu'an - Anqing	250	2026	168
Lanzhou - Hezuo	200	2026	184
Xi'an - Shiyan	350	2026	256
Nanjing - Huai'an (intercity railway)	350	2027	201
Taicang - Situan	200	2027	112
Chengdu - Dazhou - Wanzhou	350	2027	488
Shenzhen - Jiangmen	250	2027	116
Tianjin - Weifang	350	2027	350
Hepu - Zhanjiang	350	2028	137
Xining - Huangshengguan	200	2028	502
			Total km = 8,656

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines planned in China

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Shanghai - Hangzhou	350	After 2025	193
Zhangzhou - Shantou	350	After 2025	167
Shenzhen - Shanwei	350	After 2025	126
Xiong'an - Shangqiu	350	After 2025	638
Jiujiang - Nanchang	350	After 2025	137
Xiangyang - Jingmen	350	After 2025	117
Shaoyang - Yongzhou	250	After 2025	91
Xiong'an - Xinzhou	350	After 2025	343
Baotou - Huinong	250	After 2025	440
Wuhan - Hefei	350	After 2025	332
Wuhan - Jingmen - Yichang	350	After 2025	296
Wuhan hub through line	350	After 2025	121
Changsha - Zhangzhou	350	After 2025	421
Harbin - Suihua - Tieli	250	After 2025	190
Nanjing - Ma'anshan	250	After 2025	65
Nangang - Yilan	-	2030	77
			Total km = 3,754

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines with long-term planning in China

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Wenzhou - Fuzhou	350	After 2025	290
Weifang - Suqian	350	After 2025	342
Fuyang - Macheng - Huanggang	350	After 2025	325
Guangzhou - Zhuhai - Macao (& Guig. - Nang. t. l.)	350	After 2025	358
Yichang - Changde	350	After 2025	212
Yiyang - Loudi	250	After 2025	109
Xi'an - Ankang	350	After 2025	170
Chongqing - Ankang	350	After 2025	540
Baotou - Ordos	350	After 2025	130
Ordos - Yan'an	350	After 2025	390
Taiyuan - Suide	350	After 2025	270
Hefei - Nanjing - Shanghai	350	After 2025	532
Fuling - Yichang	350	After 2025	430
Chengdu - Chongqing (midline)	350	After 2025	275
Dunhua - Mudanjiang	250	After 2025	190
Nantong - Suzhou - Jiaxing	350	After 2025	208
Jiaxing - Ningbo (cross-sea project)	350	After 2025	90
Wuwei - Zhangye	250	After 2025	244
Tianjin - Chengde (intercity railway)	350	After 2025	234
Yancheng - Taizhou - Wuxi - Changz. - Yixing	250	After 2025	358
Zhenjiang - Xuancheng	250	After 2025	173
Nanjing - Shangyuanmen (cross. Yangzi river)	250	After 2025	17
Nanjing - Chuzhou - Bengbu (intercity railway)	250	After 2025	197
Jinhua - Yiwu (intercity railway)	350	After 2025	52
Guangzhou - Zhongshan - Zhujiang - Macao (i. r.)	350	After 2025	85
Mianyang - Suining - Neijiang (i. r.)	250	After 2025	257
Changchun - Liaoyuan - Tonghua	250	After 2025	255
Jinan - Binzhou	350	After 2025	146
Jiaozuo - Luoyang - Pingdingshan	350	After 2025	255
			Total km = 7,134

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines in China

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

INDIA

High-speed lines under construction in India

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Mumbai - Ahmedabad	320	-	508
			Total km = 508

High-speed lines with long-term planning in India

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Delhi - Varanasi	-	-	855
Varanasi - Patna	-	-	250
Patna - Kolkata	-	-	530
Delhi - Udaipur - Ahmedabad	-	-	886
Hyderabad - Bangalore	-	-	618
Nagpur - Varanasi	-	-	855
Mumbai - Nagpur	-	-	789
Mumbai - Hyderabad	-	-	709
Patna - Guwahati	-	-	850
Delhi - Chandigarh - Amritsar	-	-	485
Amritsar - Pathankot - Jammu	-	-	190
Chennai - Bangalore - Mysuru	-	-	462
			Total km = 7,479

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines in India

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

INDONESIA
MALAYSIA
SINGAPORE
THAILAND
VIETNAM

High-speed lines in operation in Indonesia

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Jakarta - Bandung	300	2023	142
			Total km = 142

High-speed lines long-term planning in Indonesia

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Bandung - Surabaya	-	-	570
			Total km = 570

High-speed lines long-term planning in Malaysia and Singapore

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Kuala Lumpur - Johor Bahru - Singapore	320	-	350
			Total km = 350

High speed lines under construction in Thailand

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Bangkok - Nakhon Ratchasima	250	2027	253
3 Airports Link	250	2029	220
			Total km = 473

High-speed lines with long-term planning in Thailand

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Nakhon Ratchasima - Vientiane	250	-	355
Bangkok - Phitsanulok	300	-	380
Phitsanulok - Chiang Mai	300	-	288
Hua Hin - Padang Besar	250	-	765
Bangkok - Hua Hin	250	-	211
U Tapao - Rayong - Trat	-	-	170
			Total km = 2,169

High-speed lines planned in Vietnam

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Hanoi - Vinh	320	2032	285
Nha Trang - Hô Chi Minh	320	2032	264
Vinh - Nha Trang	320	>2050	996
			Total km = 1,545

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Indonesia, Malaysia and Singapore, Thailand and Vietnam

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

JAPAN

High-speed lines in commercial operation in Japan

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Tokyo - Shin Osaka (Tokaido)	285	1964	515
Shin Osaka - Okayama (San-yo)	300	1972	161
Okayama - Hakata (San-yo)	300	1975	393
Omiya - Utsunomiya (Tohoku)	275	1982	79
Utsunomiya - Morioka (Tohoku)	320	1982	426
Omiya - Niigata (Joetsu)	275	1982	270
Ueno - Omiya (Tohoku)	130	1985	28
Tokyo - Ueno (Tohoku)	110	1991	4
Fukushima - Yamagata (Yamagata)	130	1992	87
Morioka - Akita (Akita)	130	1997	127
Takasaki - Nagano (Hokuriku)	260	1997	117
Yamagata - Shinjo (Yamagata)	130	1999	62
Morioka - Hachinohe (Tohoku)	260	2002	97
Shin Yatsuhiro - Kagoshima Chuo (Kyushu)	260	2004	127
Hachinohe - Shin Aomori (Tohoku)	260	2010	82
Hakata - Shin Yatsushiro (Kyushu)	260	2011	130
Nagano - Kanazawa (Hokuriku)	260	2015	228
Shin Aomori - Shin Hakodate (Hokkaido)	260	2016	149
Takeo Onsen - Nagasaki (Nishi Kyushu)	260	2022	66
			Total km = 3,147

High-speed lines under construction in Japan

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Kanazawa - Tsuruga (Hokuriku)	-	2024	125
Shin Hakodate - Sapporo (Hokkaido)	-	2031	211
			Total km = 336

High-speed lines planned in Japan

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Tsuruga - Shin Osaka (Hokuriku)	-	2046	143
Shin Tosu - Takeo Onsen (Nishi Kyushu)	-	-	51
			Total km = 194

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Japan

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

SOUTH KOREA

High-speed lines in commercial operation in South Korea

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Geumcheon-gu (Seoul) - Dongdaegu	305	2004	269
Dongdaegu - Busan	305	2010	131
Osong - Gwangju	305	2015	182
Suseo - Pyeongtaek	305	2016	61
Seoul - Gangneung	250	2017	230
			Total km = 873

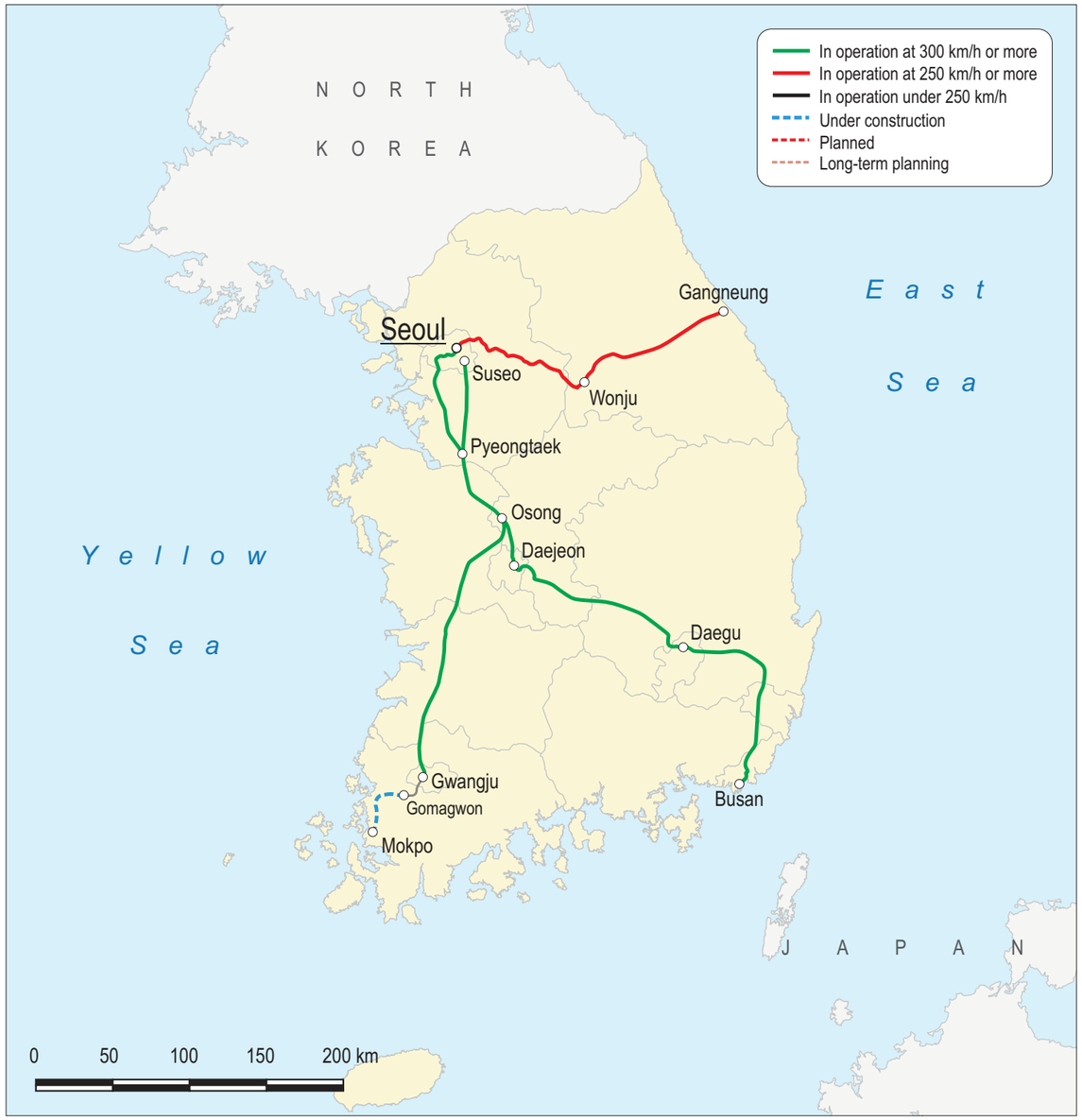
High-speed lines under construction in South Korea

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Gwangju - Mokpo	230	2025	60
Gomagwon - Imseong-ri	230	2025	44
			Total km = 104

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines in South Korea



Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

AUSTRALIA

High-speed lines with long-term planning in Australia

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Sydney - Canberra	350	2035	283
Melbourne - Gunning (- Sydney)	350	2040	611
Sydney - Newcastle	350	2045	134
Brisbane - Gold Coast	350	2051	115
Newcastle - Bronelton (- Gold Coast)	350	2058	606
			Total km = 1,749

Source: compiled by authors based on International Union of Railways

3.1 HIGH-SPEED RAIL NETWORK

High-speed lines with long-term planning in Australia

Source: compiled by authors based on International Union of Railways

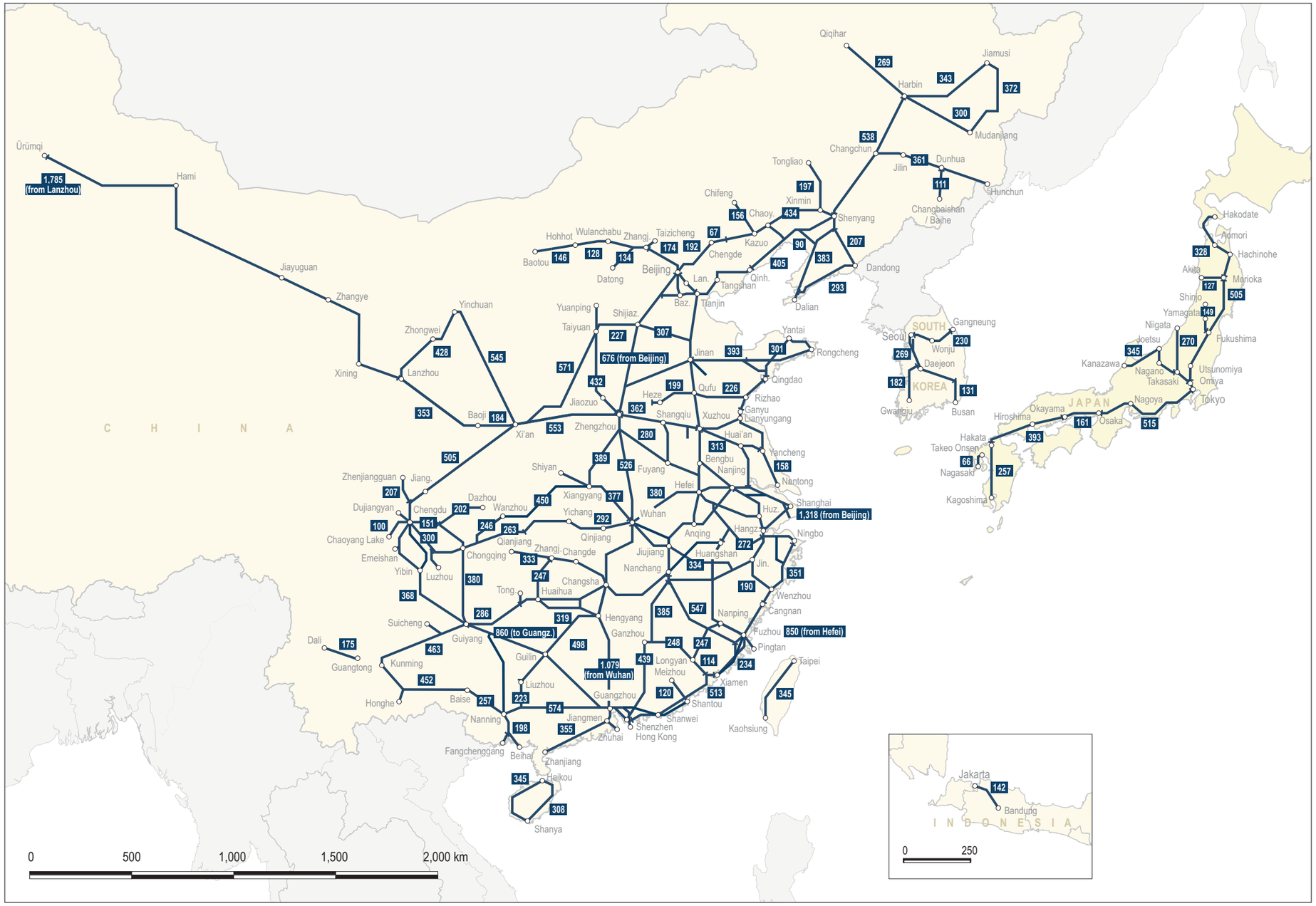
3.2 CHARACTERISTICS AND EQUIPMENT

Maximum commercial speed

Source: compiled by authors based on International Union of Railways

3.2 CHARACTERISTICS AND EQUIPMENT

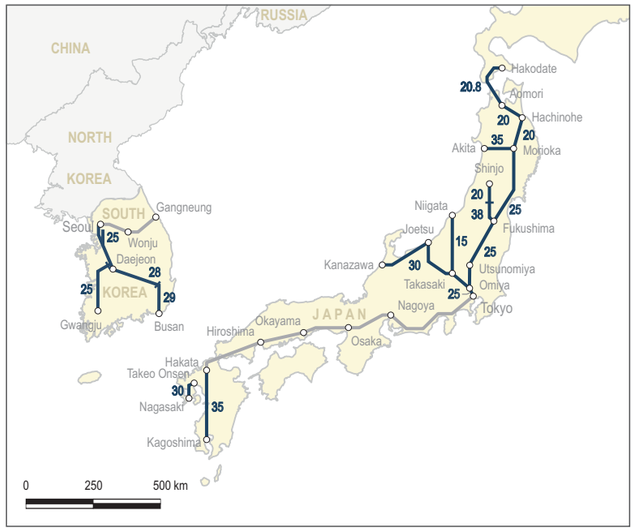
Distance (kilometres)



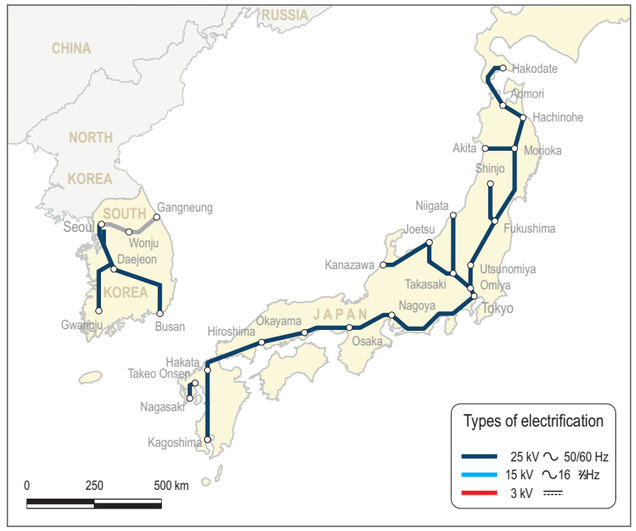
Source: compiled by authors based on International Union of Railways

3.2 CHARACTERISTICS AND EQUIPMENT (Japan / South Korea)

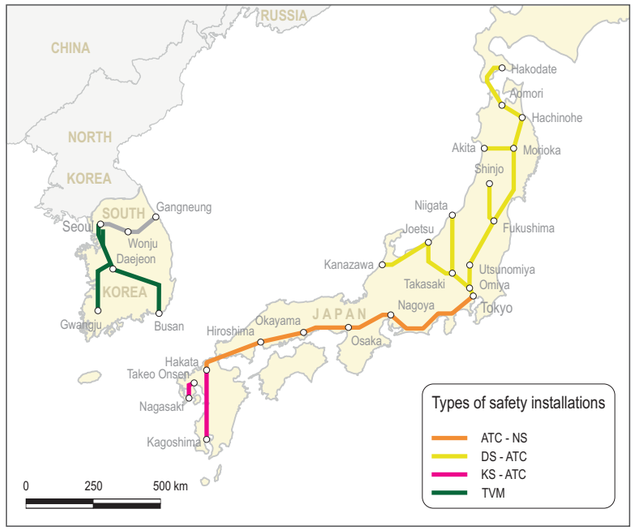
Maximum slope (‰)



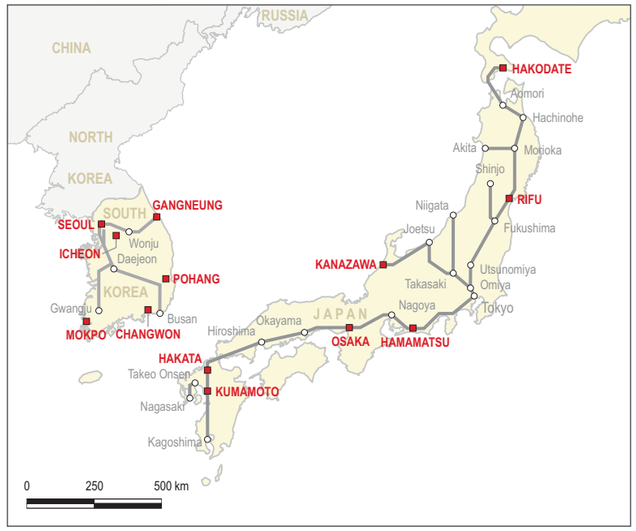
Electrification



Signalling



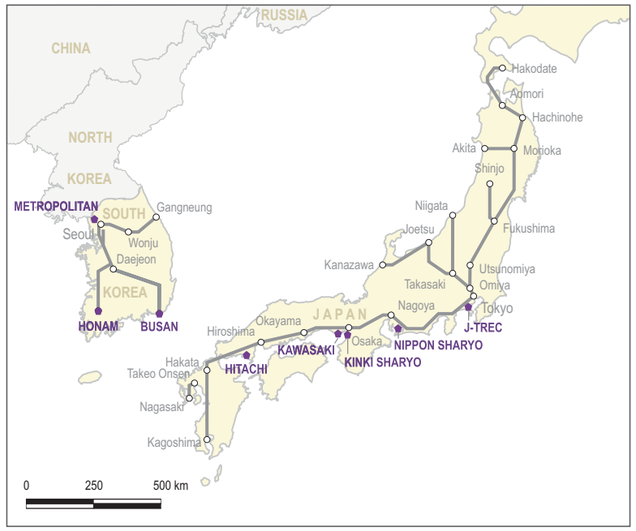
High-speed rolling stock main workshops



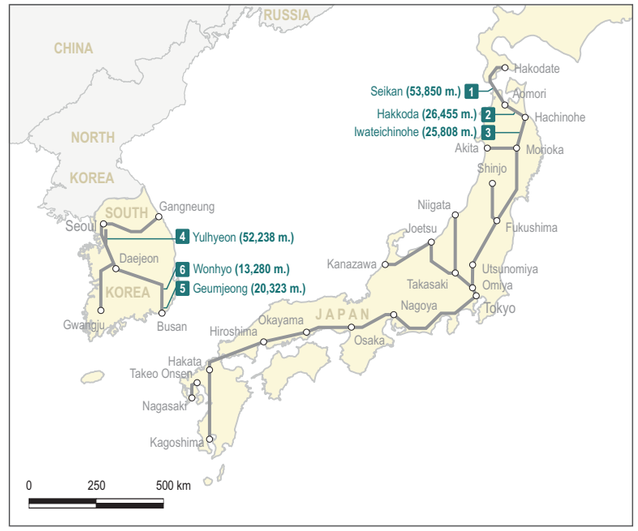
Source: compiled by authors based on International Union of Railways

3.2 CHARACTERISTICS AND EQUIPMENT (Japan / South Korea)

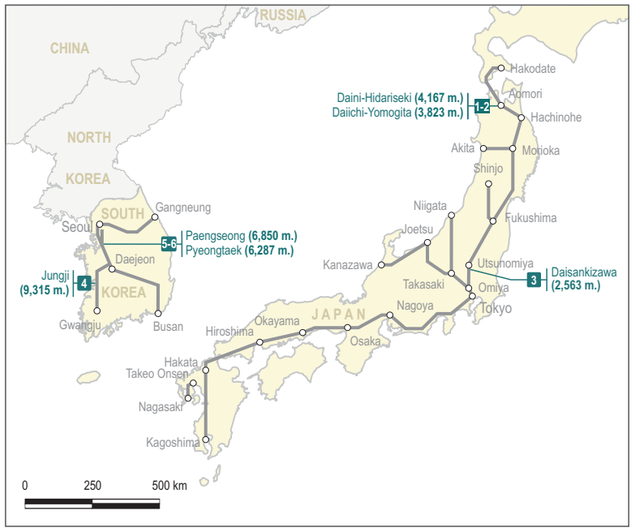
High-speed rolling stock main factories



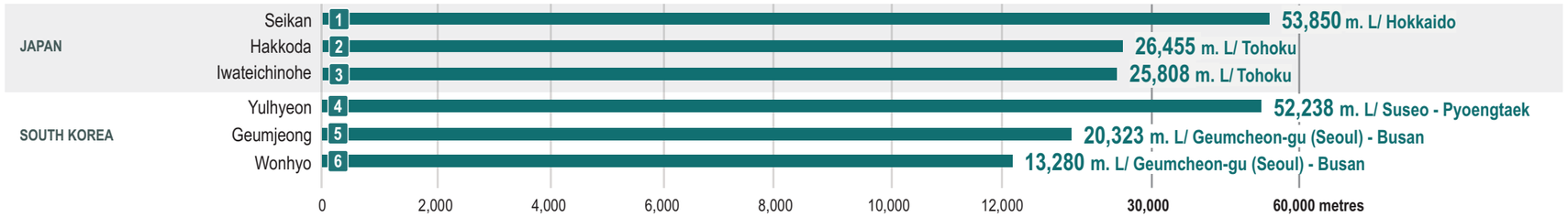
Longest tunnels



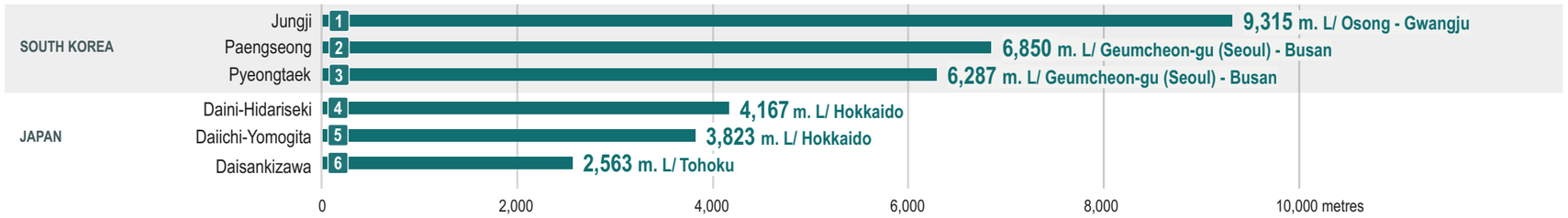
Longest viaducts



Longest tunnels of the high-speed rail network in Japan / South Korea



Longest viaducts of the high-speed rail network in Japan / South Korea

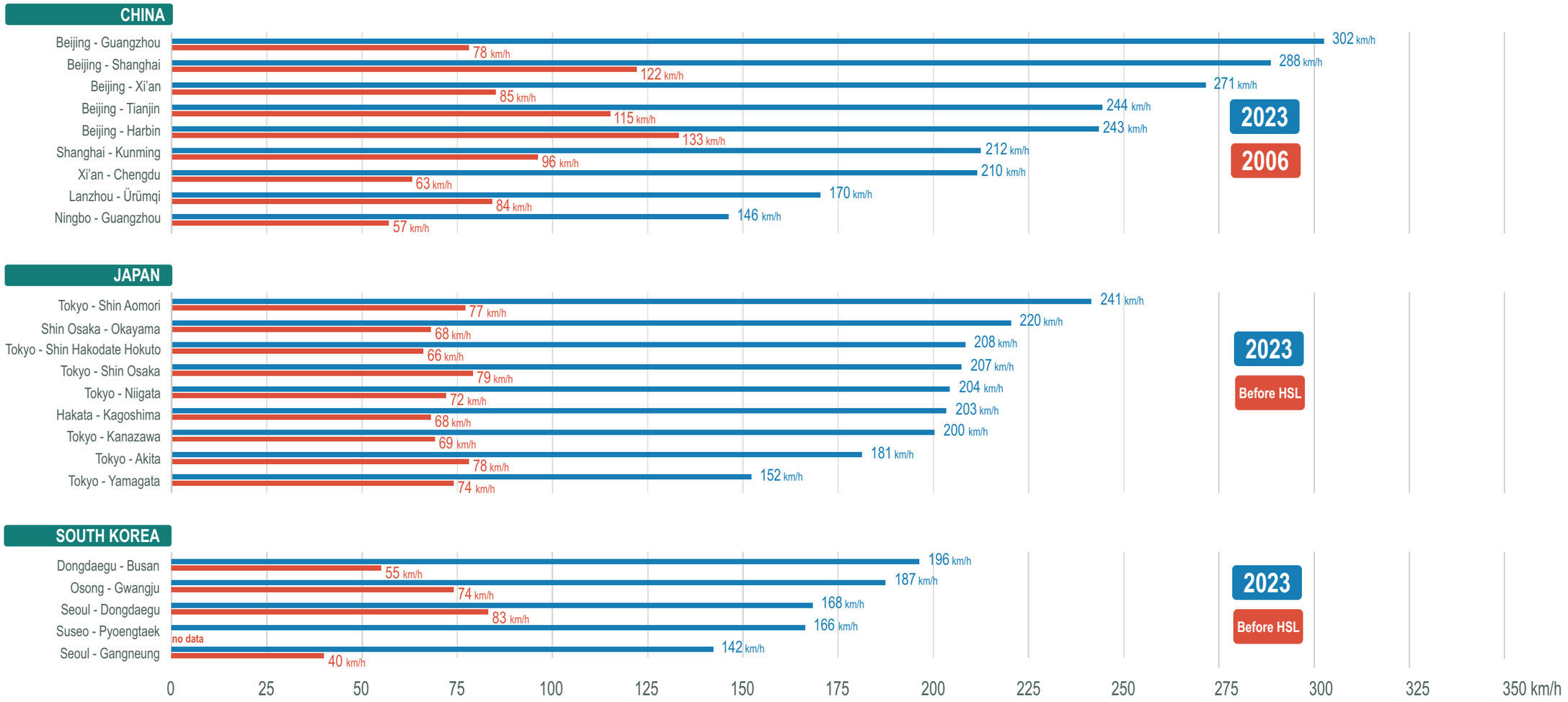


Source: compiled by authors based on International Union of Railways

International Union of Railways

3.3 SPEED AND TRAVEL TIMES

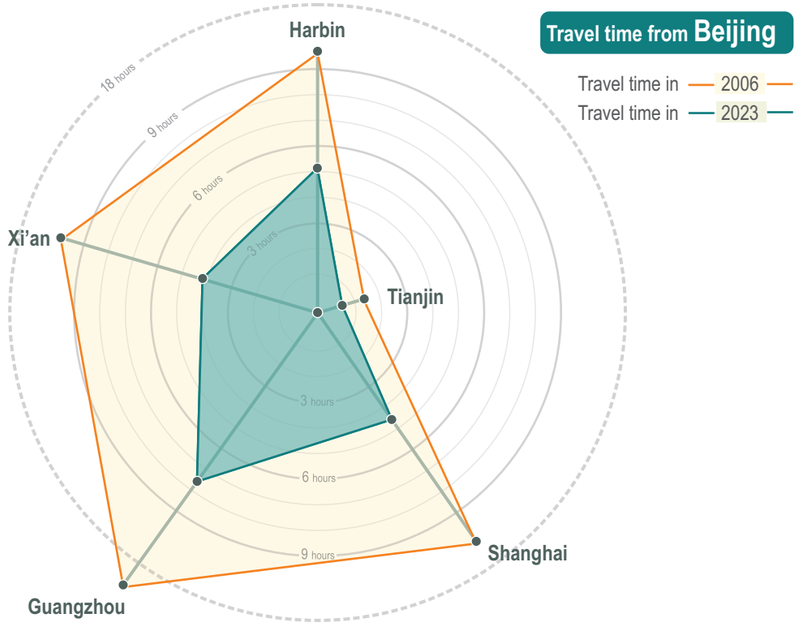
Evolution of average speed on Asia-Pacific high-speed lines

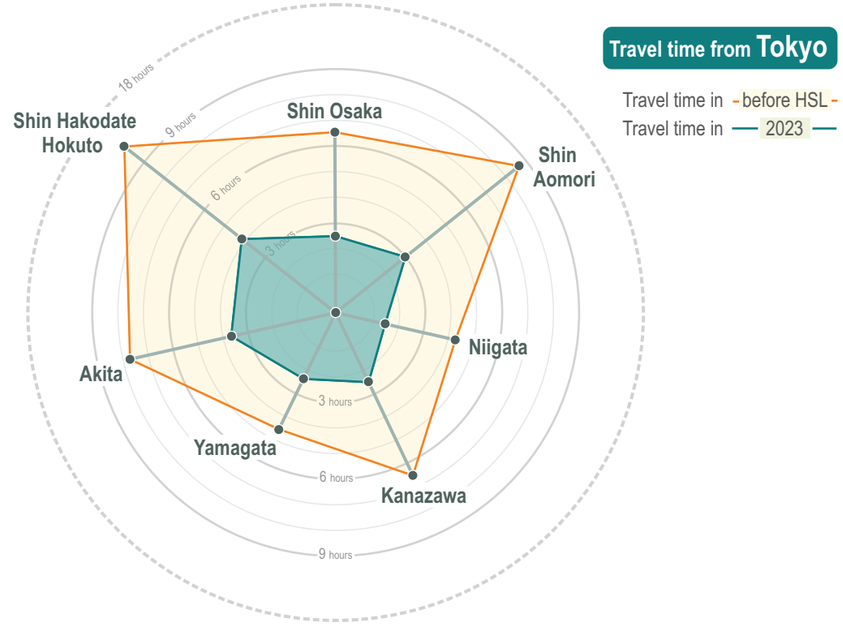


Source: International Union of Railways

3.3 SPEED AND TRAVEL TIMES

Evolution of travel time from the main chinese and japanese cities





Source: International Union of Railways

3.4 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	CRH1A (China)	CRH1A-A (China)	CRH1B (China)
(1) Composition	M+T+2M+T+M+T+M	M+T+2M+T+M+T+M	M+T+2M+T+M+T+2M+T+M+T+2M+T+M
Suppliers	CSR-Alstom	CSR-Alstom	CSR-Alstom
Owners or operators	CR	CR	CR
Year in service	2006	2016	2008
Articulated	No	No	No
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC	25 kV 50 Hz AC	25 kV 50 Hz AC
Maximum train speed / operation speed (km/h)	250 / 200	250 / 200	250 / 200
Power (kW)	5,500	5,500	11,000
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	CTCS 2	CTCS 2	CTCS 2
Train sets currently used / planned	128	87	24
Weight and dimensions			
Unladen weight in running order (t)	435	435	850
Maximum axle load (t)	16.5	16.5	16.5
Power weight ratio (kW/t)	11.3	11.3	11.5
Train length (m)	213.5	213.5	426,3
Train width (m)	3.328	3.328	3.328
Seats			
1st class seats*	144 (128)	40	208
2nd class seats	524 (483)	565	1,091
Total seats	668 (611)	605	1,299+56
Observations			
	As for the number of seats, outside the parenthesis is for the fixed seats, inside the parenthesis is for the rotatable seats No. 46 was abandoned after the accident in Wenzhou		

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

	CRH1E *(China)*	CRH2A *(China)*	CRH2B *(China)*
(1) Composition	M+T+2M+T+M+T+2M+T+M+T+2M+T+M	T+2M+2T+2M+T	T+2M+2T+2M+2T+2M+2T+2M+T
Suppliers	CSR-Alstom	Kawasaki Heavy Industries, CSR-Sifang	CSR-Sifang
Owners or operators	CR	CR	CR
Year in service	2009	2008	2008
Articulated	No	No	No
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC	25 kV 50 Hz AC	25 kV 50 Hz AC
Maximum train speed / operation speed (km/h)	250 / 200	250 / 200	250 / 200
Power (kW)	11,000	4,800	9,600
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	CTCS 2	CTCS 2	CTCS 2
Train sets currently used / planned	20	491	27
Weight and dimensions			
Unladen weight in running order (t)	890	359.7	758.8
Maximum axle load (t)	16.5	14	14
Power weight ratio (kW/t)	11.7	11.8	11.8
Train length (m)	428.9	201.4	401.4
Train width (m)	3.328	3.380	3.380
Seats			
1st class seats*	16+480 (sleeping car)	51	155
2nd class seats	122	559	1,075
Total seats	618+58	610	1,230+32
Observations			
	13 cars are class sleeping cars (1 car is special 1st class sleeping) 2 cars are 2nd class seating cars 1 car is a dining car	1 car is 1st seating car 7 cars are 2nd seating cars 1 set is used as the inspection car	3 cars are 1st seating cars,12 cars are 2nd seating cars, 1 car is dining car

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	CRH2C *(China)*	CRH2C2 *(China)*	CRH2E *(China)*
(1) Composition	T+6M+T	T+6M+T	T+2M+2T+2M+2T+2M+2T+2M+T
Suppliers	CSR-Sifang	CSR-Sifang	CSR-Sifang
Owners or operators	CR	CR	CR
Year in service	2008	2008	2009
Articulated	No	No	No
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC	25 kV 50 Hz AC	25 kV 50 Hz AC
Maximum train speed / operation speed (km/h)	350 / 300	350 / 300	250 / 200
Power (kW)	8,760	8,760	9,600
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	CTCS 2,3	CTCS 2,3	CTCS 2
Train sets currently used / planned	49	11	24
Weight and dimensions			
Unladen weight in running order (t)	370.8	370.8	778.9
Maximum axle load (t)	14	15	14
Power weight ratio (kW/t)	19.5	19.5	11.6
Train length (m)	201.4	201.4	401
Train width (m)	3.380	3.380	3.380
Seats			
1st class seats*	51	51	520 (Sleeping car)
2nd class seats	559	559	100
Total seats	610	610	620
Observations			
	1 car is 1st seating car 6 cars are 2nd seating cars 1 car is 2nd seating/dining car 1 set is used as the inspection car	1 car is 1st seating car 6 cars are 2nd seating cars 1 car is 2nd seating/dining car 1 set is used as the inspection car	13 cars are 1st sleeping cars 2 cars are 2nd seating cars 1 car is 2nd seating/dining car

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

General characteristics	CRH2G (China)	CRH3A (China)	CRH3C (China)
(1) Composition	T+2M+2T+2M+T	T+2M+2T+2M+T	M+T+M+2T+M+T+M
Suppliers	CSR-Sifang	CNR-Tangshan	Siemens, CNR-Tangshan
Owners or operators	CR	CR	CR
Year in service	2015	2017	2008
Articulated	No	No	No
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC	25 kV 50 Hz AC	25 kV 50 Hz AC
Maximum train speed / operation speed (km/h)	250 / 250	250 / 250	350 / 300
Power (kW)	9,280	5,120	8,800
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	CTCS 2	CTCS 2	CTCS 2.3
Train sets currently used / planned	29	61	80
Weight and dimensions			
Unladen weight in running order (t)	494.4	-	425
Maximum axle load (t)	15.45	-	17
Power weight ratio (kW/t)	18.8	-	18.7
Train length (m)	201.4	-	200
Train width (m)	3.380	3.300	3.260
Seats			
1st class seats*	48	48	66
2nd class seats	565	565	490
Total seats	613	613	556+1
Observations			1 car is 1st seating car 6 cars are 2nd seating cars 1 car is 2nd seating/dining car

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	CRH5A (China)	CRH5G (China)	CRH6A (China)
(1) Composition	2M+T+M+2T+2M	2M+T+M+2T+2M	T+2M+2T+2M+T
Suppliers	Alstom, CNR-Changchun	Alstom, CNR-Changchun	CSR-Puzhen Rolling stock Co. Lit.
Owners or operators	CR	CR	CR
Year in service	2007	2007	2013
Articulated	No	No	No
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC	25 kV 50 Hz AC	25 kV 50 Hz AC
Maximum train speed / operation speed (km/h)	250 / 200	250 / 200	220 / 200
Power (kW)	5,500	5,500	5,520
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	CTCS 2	CTCS 2	CTCS 2,3
Train sets currently used / planned	142	84	27
Weight and dimensions			
Unladen weight in running order (t)	451	451	496
Maximum axle load (t)	<17	<17	15.5
Power weight ratio (kW/t)	11	11	0,0
Train length (m)	211.5	211.5	201.4
Train width (m)	3.200	3.200	3.300
Seats			
1st class seats*	60 (112)	60 (112)	-
2nd class seats	562 (474)	562 (474)	549
Total seats	622 (586)	622 (586)	549
Observations			
	As for the seat's number, the figure outside the parenthesis is for the fixed seats Inside the parenthesis is for the rotatable seats	As for the seat's number, the figure outside the parenthesis is for the fixed seats Inside the parenthesis is for the rotatable seats	CRH6A will be existed. Operating speed is under 200 km/h

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

CRH380A
(China)

T+6M+T
CSR-Sifang
CR
2010
No
1,435
25 kV 50 Hz AC
350 / 300
9,600
Distributed traction
CTCS 2.3
320
480
<15
20
203
3.380
12+95
373
480
12 seats: "sightseeing" There are other 14 seats for dining car

CRH380AL
(China)

T+14M+T
CSR-Sifang
CR
2011
No
1,435
25 kV 50 Hz AC
350 / 300
21,560
Distributed traction
CTCS 2.3
113
960
<15
22.5
403
3.380
56+6+76
923
1,061
56 seats: business class 6 seats: "sightseeing"

CRH380B
(China)

M+T+M+2T+M+T+M
CNR-Changchun
CR
2011
No
1,435
25 kV 50 Hz AC
350 / 300
9,200
Distributed traction
CTCS 2.3
353
544
<17
16.9
200
3.260
72
528
600+1

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics
(1) Composition
Suppliers
Owners or operators
Year in service
Articulated
Track gauge (mm)
Electrification voltage (kV)
Maximum train speed / operation speed (km/h)
Power (kW)
Traction
Signalling
Train sets currently used / planned
Weight and dimensions
Unladen weight in running order (t)
Maximum axle load (t)
Power weight ratio (kW/t)
Train length (m)
Train width (m)
Seats
1st class seats*
2nd class seats
Total seats
Observations

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	CRH380BL (China)	CRH380BG (China)	CRH380CL (China)
(1) Composition	M+T+M+2T+M+T+2M+T+M+2T+M+T+M	M+T+M+2T+M+T+M	M+T+M+2T+M+T+2M+T+M+2T+M+T+M
Suppliers	CNR-Tanshang, CNR-Changchun	CNR-Changchun	CNR-Changchun
Owners or operators	CR	CR	CR
Year in service	2011	2011	2011
Articulated	No	No	No
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC	25 kV 50 Hz AC	25 kV 50 Hz AC
Maximum train speed / operation speed (km/h)	350 / 300	350 / 300	350 / 300
Power (kW)	18,400	9,200	18,400
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	CTCS 2.3	CTCS 2.3	CTCS 2.3
Train sets currently used / planned	149	157	25
Weight and dimensions			
Unladen weight in running order (t)	1,088	544	1,088
Maximum axle load (t)	<17	<17	<17
Power weight ratio (kW/t)	16.9	16.9	16.9
Train length (m)	400	200	428
Train width (m)	3.260	3.260	3.358
Seats			
1st class seats*	24+190	72	118
2nd class seats	791	528	897
Total seats	1,005	600	977+38
Observations			
	24 seats: business		

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

CRH380D (China)	CR300AF (China)	CR300BF (China)	General characteristics
M+T+M+2T+M+T+M	T+M+T+2M+T+M+T	T+M+T+3M+T+M+T	(1) Composition
CSR-Alstom	CRRC-Sifang, CRRC-Nanjing Puzhen	CRRC-Tangshan	Suppliers
CR	CR	CR	Owners or operators
2012	2020	2020	Year in service
No	No	No	Articulated
1,435	1,435	1,435	Track gauge (mm)
25 kV 50 Hz AC	25 kV 50 Hz AC	25 kV 50 Hz AC	Electrification voltage (kV)
350 / 300	300 / 250	300 / 250	Maximum train speed / operation speed (km/h)
10,000	5,460	5,460	Power (kW)
Distributed traction	Distributed traction	Distributed traction	Traction
CTCS 2,3	CTCS 2,3	CTCS 2,3	Signalling
85	67	70	Train sets currently used / planned
			Weight and dimensions
462	417	417	Unladen weight in running order (t)
17	<17	<17	Maximum axle load (t)
17.6	13.1	13.1	Power weight ratio (kW/t)
251.3	208.95	208.95	Train length (m)
3.358	3.360	3.360	Train width (m)
			Seats
52+126	48	48	1st class seats*
835	5.565	5.565	2nd class seats
1,013	613	613	Total seats
			Observations
VIP class: 52 seats			

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	CR400AF (China)	CR400AF-A (China)	CR400BF (China)
(1) Composition	M+T+M+2T+M+T+M	M+T+M+2T+M+T+2M+T+M+2T+M+T+M	M+T+M+2T+M+T+M
Suppliers	CRRC-Sigang, CRRC-Changchun CRRC-Tangshan	CRRC-Sigang, CRRC-Changchun CRRC-Tangshan	CRRC-Sigang, CRRC-Changchun CRRC-Tangshan
Owners or operators	CR	CR	CR
Year in service	2017	2018	2017
Articulated	No	No	No
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC	25 kV 50 Hz AC	25 kV 50 Hz AC
Maximum train speed / operation speed (km/h)	400 / 350	400 / 350	400 / 350
Power (kW)	< 9,600	19,500	< 9,600
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	CTCS 3	CTCS 3	CTCS 3
Train sets currently used / planned	181	77	145
Weight and dimensions			
Unladen weight in running order (t)	544	1,088	-
Maximum axle load (t)	<17	<17	< 17
Power weight ratio (kW/t)	17.6	17.6	-
Train length (m)	209	414.15	209
Train width (m)	3.360	3.360	3.360
Seats			
1st class seats*	10+28	148	10+28
2nd class seats	518	1,045	518
Total seats	556	1,193	556
Observations			
	Business class: 10 seats First class: 28 seats		Business class: 10 seats First class: 28 seats

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

CR400BF-A *(China)*	CR400BF-GZ *(China)*	MTR CRH380A *(China)*	General characteristics
M+T+M+2T+M+T+2M+T+M+2T+M+T+M	M+T+M+2T+M+T+M	T+6M+T	(1) Composition
CRRC Tagshan	CRRC-Changchun	CRRC	Suppliers
CR	CR	MTR	Owners or operators
2018	2021	2018	Year in service
No	No	No	Articulated
1,435	1,435	1,435	Gauge (mm)
25 kV 50 Hz AC	25 kV 50 Hz AC	25 kV 50 Hz AC	Electrification voltage (kV)
400 / 350	400 / 350	350 / 300	Maximum train speed / operation speed (km/h)
20,280	10,140	9,600	Power (kW)
Distributed traction	Distributed traction	Distributed traction	Traction
CTCS 3	CTCS 3	CTCS 2.3	Signalling
74	6	9	Train sets currently used / planned
			Weight and dimensions
-	-	408	Unladen weight in running order (t)
<17	<17	< 15	Maximum axle load (t)
-	-	23.5	Power weight ratio (kW/t)
414.26	211.31	203	Train length (m)
3.360	3.360	3.380	Train width (m)
			Seats
148	34	68	1st class seats*
1,045	544	511	2nd class seats
1,193	578	579 (+2 hp)	Total seats
			Observations
		For Guangzhou, Shenzhen and Hong Kong link	

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	700T *(China)*	0 *(Japan)*	100 *(Japan)*
(1) Composition	T+3M+T+6M+T	16 M	12M + 4T
Suppliers	Hitachi-Kawasaki Heavy Industries-Nippon Sharyo	Hitachi-Kawasaki Heavy Ind.-Kinki Sharyo-Nippon Sharyo-Tokyu Car Corp.-Kisha Seizo	Hitachi-Kawasaki Heavy Industries-Kinki Sharyo-Nippon Sharyo-Tokyu Car Corporation
Owners or operators	THSRC	JNR	JNR
Year in service	2007	1964-2008	1985-2012
Articulated	No	No	No
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 60 Hz AC	25 kV 60 Hz AC	25 kV 60 Hz AC
Maximum train speed / operation speed (km/h)	300 / 300	220 / 220	220 / 220
Power (kW)	10,260	11,840	11,840
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	ATP	ATC	ATC
Train sets currently used / planned	46	0	0
Weight and dimensions			
Unladen weight in running order (t)	503	970	925
Maximum axle load (t)	10.5	16	15
Power weight ratio (kW/t)	17.6	12.2	11.9
Train length (m)	304	400.3	402.1
Train width (m)	3.380	3.380	3.380
Seats			
1st class seats*	66	68	168
2nd class seats	923	1,323	1,153
Total seats	989	1,391	1,321
Observations			
	Used in Chinese Taipei, not in the mainland of China	First HS train in the world Information data of original 16 cars train set Initially 210 km/h maximum speed Various train exists (16, 12, 6 and 4 cars) Operation finished in 11/2008 3,216 cars were produced	Maximum speed was 230 km/h for V sets owned by JWR

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

200
(Japan)

10M
Hitachi-Kawasaki Heavy Industries-Kinki Sharyo-Nippon Sharyo-Tokyu Car Corporation
JRE
1982-2013
No
1,435
25 kV 50 Hz AC
240 / 240
9,200
Distributed traction
ATC / DS-ATC
0
583
16.4
14.6
250
3.380
52
710
762
It was 12 cars when introduced A trainset was abandoned after the derailment at Chetsu earthquake

300
(Japan)

T+M+T+2M+T+2M+T+2M+T+2M+T+M
Hitachi-Kawasaki Heavy Industries-Kinki Sharyo-Nippon Sharyo
JRC / JRW
1992-2012
No
1,435
25 kV 60 Hz AC
270 / 270
12,000
Distributed traction
ATC / ATC-NS
0
711
12
16.9
402.1
3.380
200
1,123
1,323

400
(Japan)

4M+T+2M
Kawasaki Heavy Industries-Tokyu Car Corporation
JRE
1992-2010
No
1,435
25 kV 50 Hz AC / 20 kV 50 Hz AC
240 / 240
5,040
Distributed traction
ATC / DS-ATC / ATS-P
0
318
12.9
14.7
149
2.947
20
379
399
For through operation b/w Shinkansen line and improved classical line (Yamagata line) All 12 sets were replaced by E2-2000

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics
(1) Composition
Suppliers
Owners or operators
Year in service
Articulated
Track gauge (mm)
Electrification voltage (kV)
Maximum train speed / operation speed (km/h)
Power (kW)
Traction
Signalling
Train sets currently used / planned
Weight and dimensions
Unladen weight in running order (t)
Maximum axle load (t)
Power weight ratio (kW/t)
Train length (m)
Train width (m)
Seats
1st class seats*
2nd class seats
Total seats
Observations

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	500 *(Japan)*	500-7000 *(Japan)*	700 / 700-3000 *(Japan)*
(1) Composition	16M	8M	T+6M+2T+6M+T
Suppliers	Hitachi-Kawasaki Heavy Industries- Kinki Sharyo-Nippon Sharyo	Hitachi-Kawasaki Heavy Industries- Kinki Sharyo-Nippon Sharyo	Hitachi-Kawasaki Heavy Industries- Kinki Sharyo-Nippon Sharyo
Owners or operators	JRW	JRW	JRC / JRW
Year in service	1996-2010	2008	1999
Articulated	No	No	No
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 60 Hz AC	25 kV 60 Hz AC	25 kV 60 Hz AC
Maximum train speed / operation speed (km/h)	300 / 300	285 / 285	285 / 285
Power (kW)	18,240 or 17,600	8,800	13,200
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	ATC / ATC-NS	ATC-NS	ATC / ATC-NS
Train sets currently used / planned	0	6	0
Weight and dimensions			
Unladen weight in running order (t)	688 (loaded)	344 (loaded)	708
Maximum axle load (t)	11.7	11	11.4
Power weight ratio (kW/t)	26.5	25.6	18.6
Train length (m)	404	204	404.7
Train width (m)	3.380	3.380	3.380
Seats			
1st class seats*	200	-	200
2nd class seats	1,124	-	1,123
Total seats	1,324	557	1,323
Observations			
	9 sets had existed	8 sets were renovated from 16-car 500	

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

	700-7000 *(Japan)*	N700 / N700A / N700-5000 / N700A-4000 *(Japan)*	N700-7000 / N700-8000 *(Japan)*
(1) Composition	T+6M+T	T+14M+T	8M
Suppliers	Hitachi-Kawasaki Heavy Industries- Kinki Sharyo-Nippon Sharyo	Hitachi-Kawasaki Heavy Industries- Kinki Sharyo-Nippon Sharyo	Hitachi-Kawasaki Heavy Industries- Kinki Sharyo-Nippon Sharyo
Owners or operators	JRW	JRC / JRW	JRW / JRK
Year in service	2000	2007	2011
Articulated	No	No + Tilting	No + Tilting
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 60 Hz AC	25 kV 60 Hz AC	25 kV 60 Hz AC
Maximum train speed / operation speed (km/h)	285 / 285	300 / 300	300 / 300
Power (kW)	6,600	17,080	9,760
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	ATC-NS	ATC-NS	ATC-NS / KS-ATC
Train sets currently used / planned	16	126	19 (JRW) - 11 (JRK)
Weight and dimensions			
Unladen weight in running order (t)	356 (loaded)	715 (loaded)	344 (loaded)
Maximum axle load (t)	11.4	11.4	-
Power weight ratio (kW/t)	18.5	23.9	28.4
Train length (m)	204.7	404.7	204.7
Train width (m)	3.380	3.360	3.360
Seats			
1st class seats*	-	200	24
2nd class seats	-	1,123	522
Total seats	571	1,323	546
Observations			
		JRC: N700 35 sets / N700A 51 sets JRW: N700A-5000 16 sets N700A-4000 24 sets	JRW (N700-7000) 19 sets JRK (N700-8000) 11 sets

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	N700S (Japan)	N700S (Japan)	800 (Japan)
(1) Composition	14M + 2T	6M	6M
Suppliers	Hitachi-Nippon Sharyo	Hitachi	Hitachi
Owners or operators	JRC-JRW-JRK	JRK	JRK
Year in service	2020	2022	2004
Articulated	No + Tilting	No + Tilting	No
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 60 Hz AC	25 kV 60 Hz AC	25 kV 60 Hz AC
Maximum train speed / operation speed (km/h)	300 / 300	260 / 260	260 / 260
Power (kW)	17,080	7,320	6,600
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	ATC-NS	ATC / KS-ATC	ATC / KS-ATC
Train sets currently used / planned	46 (JRC)	5	5
Weight and dimensions			
Unladen weight in running order (t)	-	-	276 (loaded)
Maximum axle load (t)	-	-	11.4
Power weight ratio (kW/t)	-	-	23.9
Train length (m)	404.7	154.7	154.7
Train width (m)	3.360	3.360	3.380
Seats			
1st class seats*	200	0	0
2nd class seats	1,123	391	378
Total seats	1,323	391	378
Observations			

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

800-1000 / 800-2000
(Japan)

6M
Hitachi
JRK
2009
No
1,435
25 kV 60 Hz AC
260 / 260
6,600
Distributed traction
ATC / KS-ATC
3
276 (loaded)
11.4
23.9
154.7
3.380
-
378
378
2 sets: 800-1000, track inspection is capable 1 set: 800-2000, catenary, signalling and communication inspection are capable

E1
(Japan)

T+2M+2T+2M+2T+2M+T
Hitachi-Kawasaki Heavy Industries
JRE
1994-2012
No+Double Decker
1,435
25 kV 50 Hz AC
240 / 240
9,840
Distributed traction
ATC / DS-ATC
0
693
17
12.8
302
3.380
102
1,133
1,235

E2
(Japan)

T+6M+T
Hitachi-Kawasaki Heavy Industries-Nippon Sharyo-Tokyu Car Corporation
JRE
1997
No
1,435
25 kV 50 Hz AC / 25 kV 60 Hz AC
275 / 275
7,200
Distributed traction
DS-ATC
0
349
13
18.6
201.4
3.380
51
579
630

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics
(1) Composition
Suppliers
Owners or operators
Year in service
Articulated
Track gauge (mm)
Electrification voltage (kV)
Maximum train speed / operation speed (km/h)
Power (kW)
Traction
Signalling
Train sets currently used / planned
Weight and dimensions
Unladen weight in running order (t)
Maximum axle load (t)
Power weight ratio (kW/t)
Train length (m)
Train width (m)
Seats
1st class seats*
2nd class seats
Total seats
Observations

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	E2-1000 *(Japan)*	E3 *(Japan)*	E3-700 *(Japan)*
(1) Composition	T+8M+T	2M+2T+2M	T+6M+T
Suppliers	Hitachi-Kawasaki Heavy Industries Nippon Sharyo-Tokyu Car Corporation	Kawasaki Heavy Industries Tokyu Car Corporation	Kawasaki Heavy Industries
Owners or operators	JRE	JRE	JRE
Year in service	2002	1997	2014
Articulated	No	No	No
Gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC	25 kV 50 Hz AC / 20 kV 50 Hz AC	25 kV 50 Hz AC / 20 kV 50 Hz AC
Maximum train speed / operation speed (km/h)	275 / 275	275 / 275	275 / 275
Power (kW)	9,600	4,800	4,800
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	DS-ATC	ATC / DS-ATC / ATS-P	ATC / DS-ATC / ATS-P
Train sets currently used / planned	10	0	0
Weight and dimensions			
Unladen weight in running order (t)	442	258	258
Maximum axle load (t)	13	12.3	12.3
Power weight ratio (kW/t)	19.6	17.2	18
Train length (m)	251.4	128.2	128.2
Train width (m)	3.380	2.945	2.945
Seats			
1st class seats*	51	23	-
2nd class seats	763	315	-
Total seats	814	338	143
Observations			
	For Tohoku and Joetsu line	For Tohoku line, coverted from through operation b/w Akita Shinkansen in 2014	A luxury train for tourist-oriented services,"Toreiyu", on Yamagata-Shinkansen line (the regauged section) It was convered from E3 on 2014

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

E3-700
(Japan)

(1) Composition	T+6M+T
Suppliers	Kawasaki Heavy Industries
Owners or operators	JRE
Year in service	2016-2020
Articulated	No
Track gauge (mm)	1,435
Electrification voltage (kV)	25 kV 50 Hz AC / 20 kV 50 Hz AC
Maximum train speed / operation speed (km/h)	275 / 275
Power (kW)	4,800
Traction	Distributed traction
Signalling	ATC / DS-ATC / ATS-P
Train sets currently used / planned	0
Weight and dimensions	
Unladen weight in running order (t)	258
Maximum axle load (t)	12.3
Power weight ratio (kW/t)	18
Train length (m)	128.2
Train width (m)	2.945
Seats	
1st class seats*	-
2nd class seats	-
Total seats	143
Observations	
	A luxury train for tourist-oriented services,"Genbi-Shinkansen", on Joetsu-Shinkansen line It was convered from E3 on 2015 2020: End of operation

E3-1000
(Japan)

(1) Composition	2M+T+M+T+2M
Suppliers	Kawasaki Heavy Industries Tokyu Car Corporation
Owners or operators	JRE
Year in service	1999-2014
Articulated	No
Track gauge (mm)	1,435
Electrification voltage (kV)	25 kV 50 Hz AC / 20 kV 50 Hz AC
Maximum train speed / operation speed (km/h)	275 / 275
Power (kW)	6,000
Traction	Distributed traction
Signalling	ATC / DS-ATC / ATS-P
Train sets currently used / planned	3
Weight and dimensions	
Unladen weight in running order (t)	311
Maximum axle load (t)	12.2
Power weight ratio (kW/t)	17.9
Train length (m)	148.7
Train width (m)	2.945
Seats	
1st class seats*	23
2nd class seats	379
Total seats	402
Observations	
	For through operation b/w Shinkansen line and improved classical line (Yamagata Shinkansen line) 1 additional train set was convered from E3 of 2 train sets on 2014

E3-2000
(Japan)

(1) Composition	2M+T+M+T+2M
Suppliers	Kawasaki Heavy Industries Tokyu Car Corporation
Owners or operators	JRE
Year in service	2008
Articulated	No
Track gauge (mm)	1,435
Electrification voltage (kV)	25 kV 50 Hz AC / 20 kV 50 Hz AC
Maximum train speed / operation speed (km/h)	275 / 275
Power (kW)	6,000
Traction	Distributed traction
Signalling	ATC / DS-ATC / ATS-P
Train sets currently used / planned	12
Weight and dimensions	
Unladen weight in running order (t)	307
Maximum axle load (t)	12.5
Power weight ratio (kW/t)	18.1
Train length (m)	148.7
Train width (m)	2.945
Seats	
1st class seats*	23
2nd class seats	371
Total seats	394
Observations	
	All sets had replaced Series 400

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	E4 *(Japan)*	E5 *(Japan)*	H5 *(Japan)*
(1) Composition	T+2M+2T+2M+T	T+6M+T	T+6M+T
Suppliers	Hitachi-Kawasaki Heavy Industries	Hitachi-Kawasaki Heavy Industries	Hitachi-Kawasaki Heavy Industries
Owners or operators	JRE	JRE	JRH
Year in service	1997	2011	2016
Articulated	No+Double Decker	No+Tilting	No+Tilting
Gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC	25 kV 50 Hz AC	25 kV 50 Hz AC
Maximum train speed / operation speed (km/h)	240 / 240	320 / 320 (300 until 2012)	320 / 320
Power (kW)	6,720	9,600	9,600
Traction	Distributed traction	Distributed traction	Distributed traction
Signalling	DS-ATC	DS-ATC	DS-ATC
Train sets currently used / planned	0	51	4
Weight and dimensions			
Unladen weight in running order (t)	428	453.5	453.5
Maximum axle load (t)	16	13	13
Power weight ratio (kW/t)	14.1	19.3	19.3
Train length (m)	201.4	253	253
Train width (m)	3.380	3.350	3.350
Seats			
1st class seats*	54	18 / 55	18 / 55
2nd class seats	763	650	650
Total seats	817	723	723
Observations			
		3 classes, for Hokkaido-Shinkansen, through operation between JR East and JR Hokkaido	3 classes, for Hokkaido-Shinkansen, through operation betwee JR East and JR Hokkaido

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

E6
(Japan)

M+T+3M+T+M
Hitachi-Kawasaki Heavy Industries
JRE
2013
No+Tilting
1,435
25 kV 50 Hz AC / 20 kV 50 Hz AC
320 / 320 (300 until 2012)
6,000
Distributed traction
DS-ATC / ATS-P
23
306.5
10.9
18.4
148.7
2.945
22
310
332
For through operation b/w Shinkansen line and improved classical line (Akita Shinkasen line)

E7 / W7
(Japan)

T+10M+T
Hitachi-Kawasaki Heavy Industries-Kinki Sharyo-J-TREC
JRE / JRW
2014
No
1,435
25 kV 50 Hz AC / 25 kV 60 Hz AC
275 / 260
12,000
Distributed traction
DS-ATC
39 (JRE) - 22 (JRW)
540
11.3
20.1
302
3.380
18 / 63
831
912
3 classes, JRE (E7) 33 sets, JRW (W7) 14 sets for Hokuriku-Shinkansen, operating from 2014

KTX
(South Korea)

L+18T+L (+2MB)
Alstom-Hyundai Rotem
KORAIL
2004
Yes
1,435
25 kV 60 Hz AC
300 / 300
13,560
Concentrated traction
ATC (TVM) / ATS
46
701
17
17.5
388
2.904
127
808
935

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics
(1) Composition
Suppliers
Owners or operators
Year in service
Articulated
Gauge (mm)
Electrification voltage (kV)
Maximum train speed / operation speed (km/h)
Power (kW)
Traction
Signalling
Train sets currently used / planned
Weight and dimensions
Unladen weight in running order (t)
Maximum axle load (t)
Power weight ratio (kW/t)
Train length (m)
Train width (m)
Seats
1st class seats*
2nd class seats
Total seats
Observations

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

3.4 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

KTX-Sancheon
(South Korea)

KTX-Sancheon 2
(South Korea)

KTX-EUM
(South Korea)

General characteristics			
(1) Composition	L+8T+L	L+8T+L	T+4M+T
Suppliers	Hyundai Rotem	Hyundai Rotem	Hyundai Rotem
Owners or operators	KORAIL	KORAIL	KORAIL
Year in service	2010	2017	2021
Articulated	Yes	Yes	Yes
Track gauge (mm)	1,435	1,435	1,435
Electrification voltage (kV)	25 kV 60 Hz AC	25 kV 60 Hz AC	25 kV 60 Hz AC
Maximum train speed / operation speed (km/h)	330 / 300	330 / 300	286 / 260
Power (kW)	8,800	8,800	-
Traction	Concentrated traction	Concentrated traction	Distributed traction
Signalling	ATC (TVM) / ATS / ATP	ATC (TVM) / ATS / ATP	ATC (TVM) / ATS / ATP / ETCS
Train sets currently used / planned	24	15	19
Weight and dimensions			
Unladen weight in running order (t)	434	434	318
Maximum axle load (t)	25.5	25.5	15
Power weight ratio (kW/t)	19	20.3	-
Train length (m)	201	201	150.5
Train width (m)	2.970	2.970	3.150
Seats			
1st class seats*	30	33	46
2nd class seats	333	377	335
Total seats	363	410	381
Observations			
	"Sancheon"	"Wongang" For Wonju - Gangneung	84 cars are operating in Gangneung and Joongang lines

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways

SRT-Suseo
(South Korea)

L+8T+L	(1) Composition
Hyundai Rotem	Suppliers
SR	Owners or operators
2016	Year in service
Yes	Articulated
1,435	Gauge (mm)
25 kV 60 Hz AC	Electrification voltage (kV)
330 / 300	Maximum train speed / operation speed (km/h)
8,800	Power (kW)
Concentrated traction	Traction
ATC (TVM) / ATS / ATP	Signalling
12	Train sets currently used / planned
	Weight and dimensions
434	Unladen weight in running order (t)
25.5	Maximum axle load (t)
18.9	Power weight ratio (kW/t)
201	Train length (m)
2.970	Train width (m)
	Seats
33	1st class seats*
377	2nd class seats
410	Total seats
	Observations
"Suseo" SR is on of the High Speed train operation company in South Korea	

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways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4.1 HIGH-SPEED RAIL NETWORK

EGYPT

High-speed lines planned in Egypt

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
El Alamein - Marsa Matrouh	250	2025	200
El Alamein - Ain Sokhna	250	2025	395
Borg El Arab - Alexandria	250	2025	50
			Total km = 645

High-speed lines with long-term planning in Egypt

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
October Gardens - Qena	250	-	573
Qena - Luxor	250	-	61
Luxor - Aswan - Abu Simbel	250	-	472
Qena - Hurghada	250	-	220
Hurghada - Safaga	250	-	62
			Total km = 1,388

Source: compiled by authors based on International Union of Railways

4.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Egypt

Source: compiled by authors based on International Union of Railways

4.1 HIGH-SPEED RAIL NETWORK

MOROCCO

High-speed lines in commercial operation in Morocco

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Tanger - Kenitra	320	2018	186
			Total km = 186

High-speed lines planned in Morocco

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Kenitra - Rabat	320	2027	55
Casablanca - Marrakech	320	2028	240
Rabat - Casablanca	320	2029	105
Marrakech - Agadir	250	-	240
			Total km = 640

Source: compiled by authors based on International Union of Railways

4.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Morocco

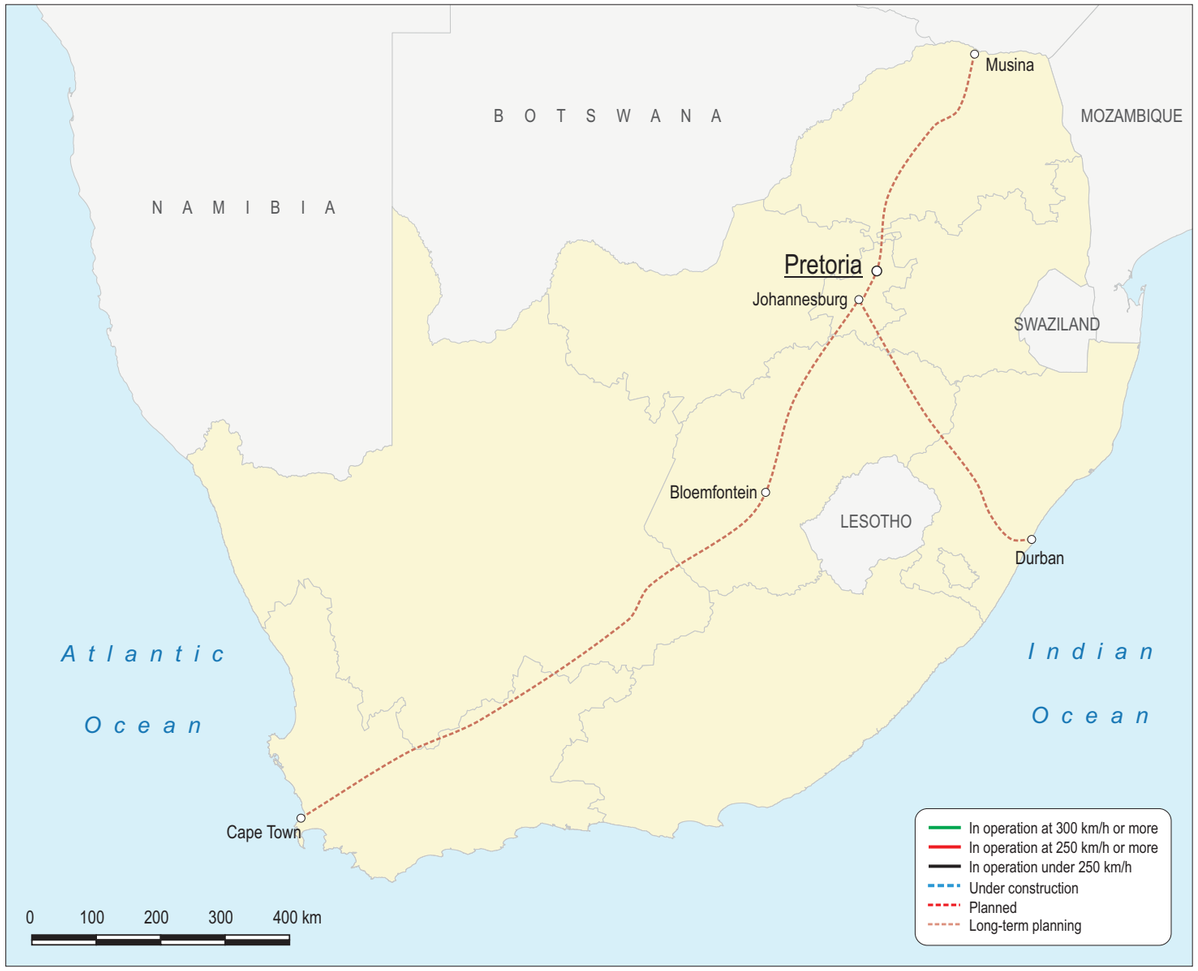
Source: compiled by authors based on International Union of Railways

4.1 HIGH-SPEED RAIL NETWORK

SOUTH AFRICA

High-speed lines with long-term planning in South Africa

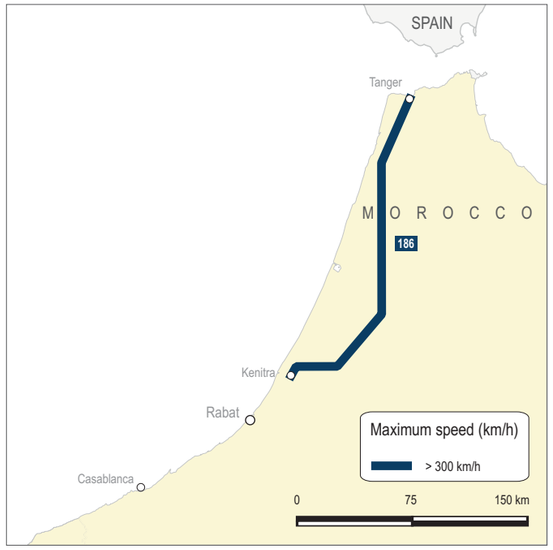
LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Johannesburg - Durban	300	-	610
Johannesburg - Musina	300	-	480
Johannesburg - Cape Town	300	-	1,300
			Total km = 2,390



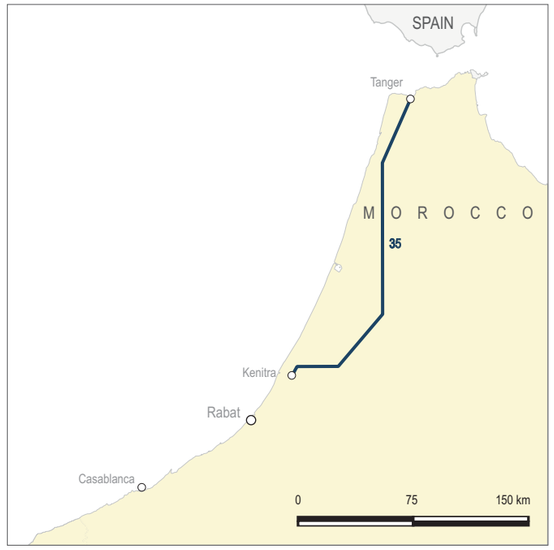
Source: compiled by authors based on International Union of Railways

4.2 CHARACTERISTICS AND EQUIPMENT

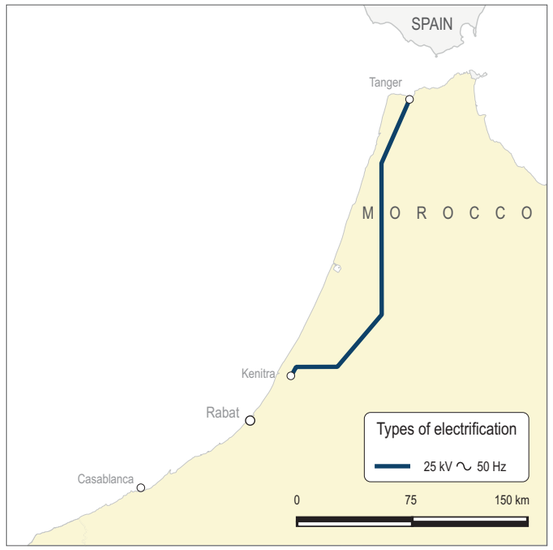
Maximum com. speed and distance (km)



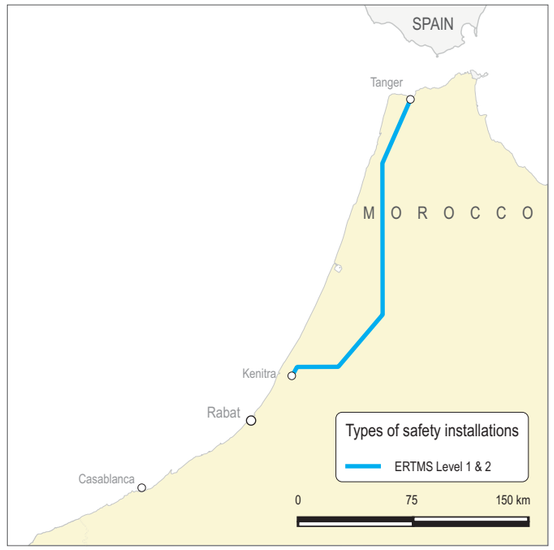
Maximum slope (‰)



Electrification



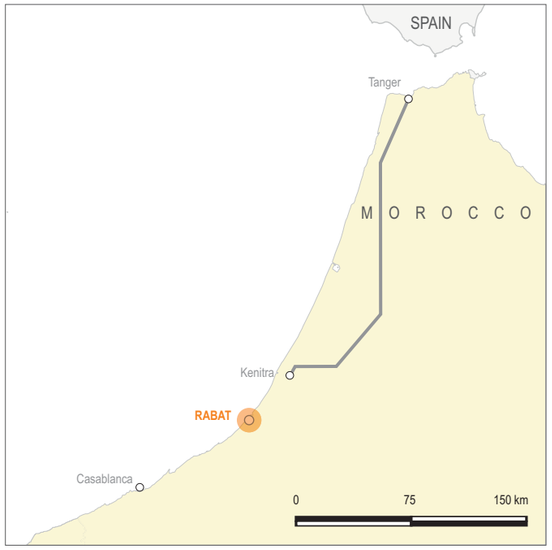
Signalling



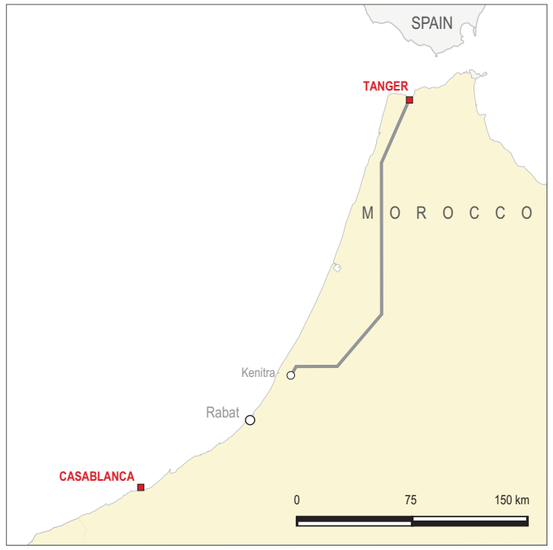
Source: compiled by authors based on International Union of Railways

4.2 CHARACTERISTICS AND EQUIPMENT

Centralized Traffic Control (CTC)

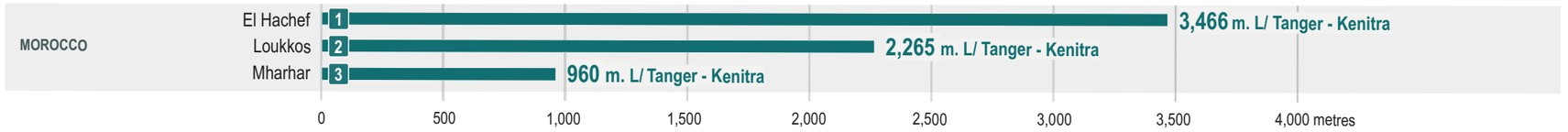


High-speed rolling stock workshops



Longest viaducts

Longest viaducts of the high-speed rail network in Africa



Source: compiled by authors based on International Union of Railways

4.3 ROLLING STOCK

RGV-M
(Morocco)

L+8T+L	(1) Composition
Alstom	Suppliers
ONCF	Owners or operators
2018	Year in service
Yes + Double Decker	Articulated
1,435	Track gauge (mm)
25 kV 50 Hz AC / 3 kV DC	Electrification voltage (kV)
320 / 300	Maximum train speed / operation speed (km/h)
-	Power (kW)
Concentrated traction	Traction
ETCS	Signalling
12	Train sets currently used / planned
	Weight and dimensions
-	Unladen weight in running order (t)
-	Maximum axle load (t)
-	Power weight ratio (kW/t)
200	Train length (m)
2.896	Train width (m)
	Seats
-	1st class seats*
-	2nd class seats
533	Total seats
	Observations
No. 1201-1212	

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

Source: International Union of Railways

* For 3 classes train, 1st and 2nd classes are included in 1st class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5.1 HIGH-SPEED RAIL NETWORK

CANADA

MEXICO

USA

High-speed lines with long-term planning in Canada

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Quebec - Windsor	300	-	1,229
Calgary - Edmonton	300	-	294
			Total km = 1,523

High-speed lines planned in Mexico

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Mexico D.F. - Querétaro	300	-	210
			Total km = 210

Source: compiled by authors based on International Union of Railways

5.1 HIGH-SPEED RAIL NETWORK

High-speed lines in commercial operation in USA

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
NE Corridor (Boston - New York - Washington DC)	240	2000	735
			Total km = 735

High-speed lines under construction in USA

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Merced - Bakersfield	350	2030-2033	275
			Total km = 275

High-speed lines planned in USA

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Las Vegas - Rancho Cucamonga	322	2028	420
Houston - Dallas	330	-	385
San Francisco - Merced	350	-	265
Bakersfield - Anaheim	350	-	269
			Total km = 1,339

High-speed lines with long-term planning in USA

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
NEC Future (Boston - New York - Washington DC)	350	2040	735
Merced - Sacramento	-	-	180
Los Angeles - San Diego	-	-	269
Orlando - Tampa	-	-	137
Vancouver (Canada) - Seattle - Portland	-	-	509
Palmdale-Apple Valley	-	-	87
			Total km = 1,917

Source: compiled by authors based on International Union of Railways

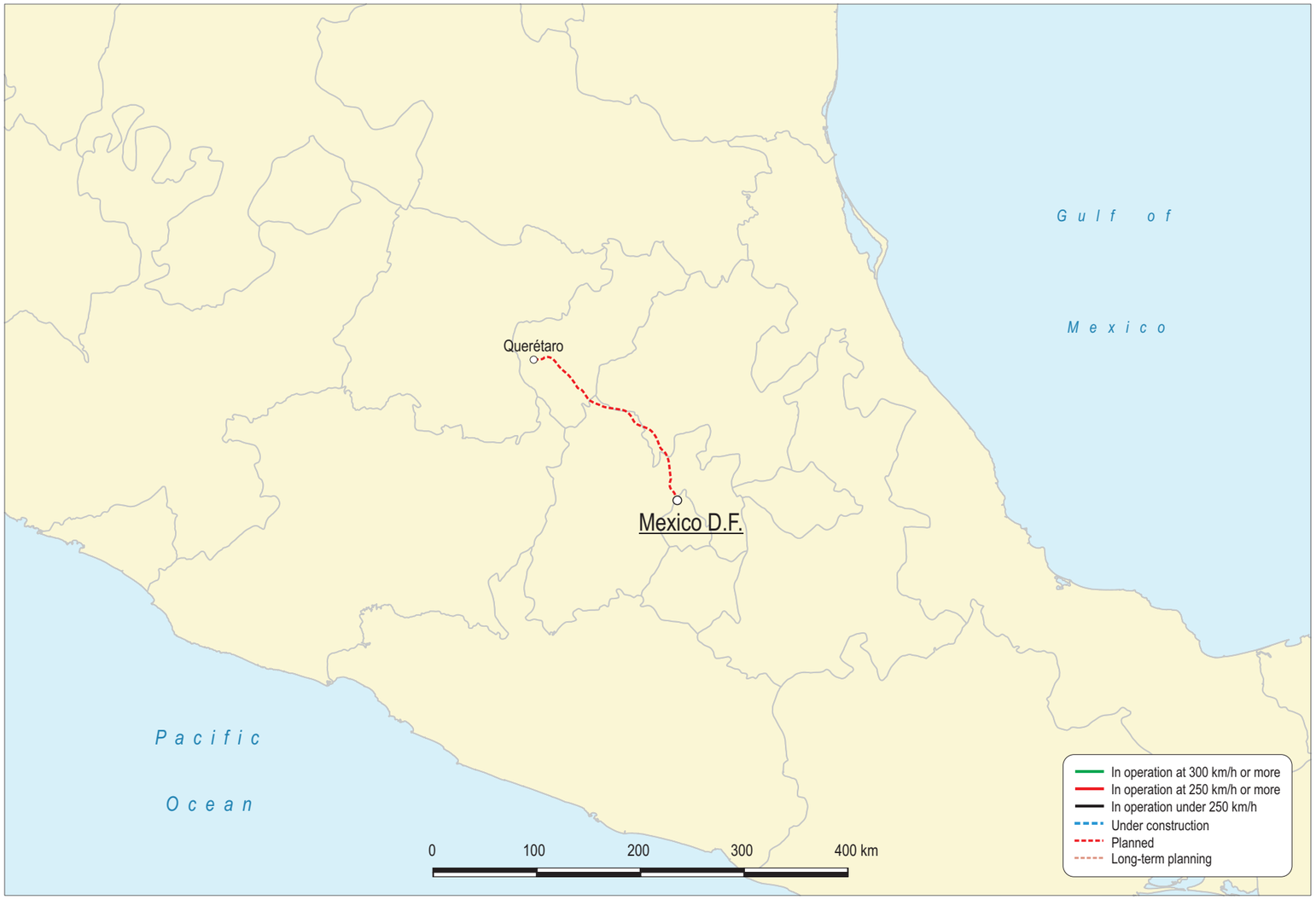
5.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Canada and USA

Source: compiled by authors based on International Union of Railways

5.1 HIGH-SPEED RAIL NETWORK

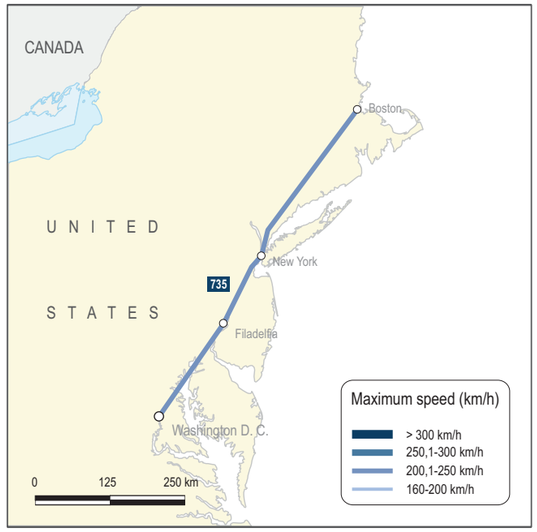
High-speed lines in Mexico



Source: compiled by authors based on International Union of Railways

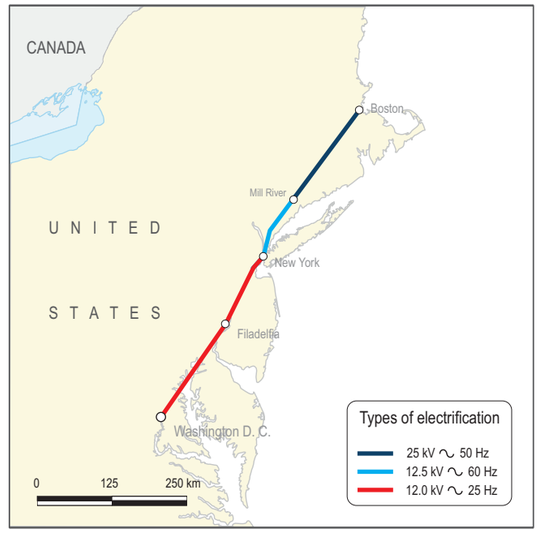
5.2 CHARACTERISTICS AND EQUIPMENT

Maximum com. speed and distance (km)

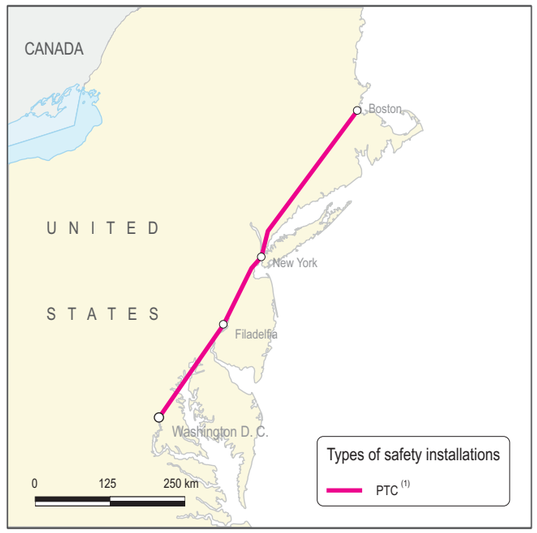


Maximum slope (‰)

Electrification



Signalling



Centralized Traffic Control (CTC)

High-speed rolling stock workshops

Note:
(1): Positive Train Control

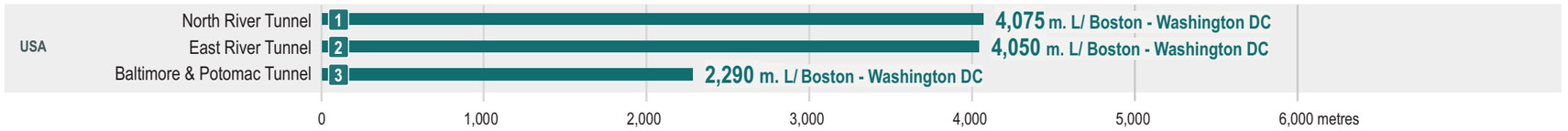
Source: compiled by authors based on International Union of Railways

5.2 CHARACTERISTICS AND EQUIPMENT

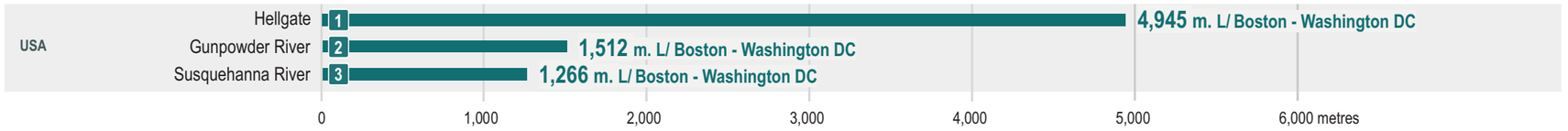
Longest tunnels

Longest viaducts

Longest tunnels of the high-speed rail network in North America



Longest viaducts of the high-speed rail network in North America



Source: compiled by authors based on International Union of Railways

International Union of Railways

5.3 SPEED AND TRAVEL TIMES

Evolution of average speed on American high-speed lines

Source: International Union of Railways

5.4 ROLLING STOCK

Acela (USA)	Acela II (USA)	General characteristics
L+6T+L	L+10T+L	(1) Composition
Bombardier-Alstom	Alstom	Suppliers
Amtrak	Amtrak	Owners or operators
2000	2021-2022	Year in service
No	No + Tilting	Articulated
1,435	1,435	Track gauge (mm)
25 kV 60 Hz AC / 12.5 kV 60 Hz AC / 12 kV 25 Hz AC	25 kV 60 Hz AC / 12.5 kV 60 Hz AC / 12 kV 25 Hz AC	Electrification voltage (kV)
241 / 241	300 / 257	Maximum train speed / operation speed (km/h)
9,200	7,000	Power (kW)
Concentrated traction	Concentrated traction	Traction
ATP	ATP	Signalling
20	0 / 28	Train sets currently used / planned
		Weight and dimensions
566	-	Unladen weight in running order (t)
23	-	Maximum axle load (t)
15.6	-	Power weight ratio (kW/t)
203	212	Train length (m)
3.175	-	Train width (m)
		Seats
44		1st class seats*
260		2nd class seats
304	512	Total seats
		Observations

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways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6.1 HIGH-SPEED RAIL NETWORK

BAHRAIN AND QATAR
IRAN
IRAQ
ISRAEL
SAUDI ARABIA
TÜRKIYE

High-speed lines with long-term planning in Bahrain and Qatar

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Doha - Manama	350	-	180
			Total km = 180

High-speed lines under construction in Iran

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Tehran - Qom - Esfahan	250	2025	410
			Total km = 410

High-speed lines planned in Iran

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Tehran - Mashhad	200	2025	926
Qom - Arak	250	2025	117
			Total km = 1,043

High-speed lines with long-term planning in Iran

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Tehran - Hamedan	-	-	284
Tehran - Zanjan - Tabriz	-	-	613
Esfahan - Shiraz	-	-	470
Esfahan - Yazd	-	-	284
			Total km = 1,651

High-speed lines under construction in Iraq

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Al Faw Port - Turkish border / Syrian border	-	-	1,200
			Total km = 1,200

High-speed lines planned in Israel

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Tel Aviv - Haifa	250	-	85
			Total km = 85

Source: compiled by authors based on International Union of Railways

6.1 HIGH-SPEED RAIL NETWORK

High-speed lines in commercial operation in Saudi Arabia

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Medina - Jeddah - Mecca	300	2018	449
			Total km = 449

High-speed lines in commercial operation in Türkiye

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Ankara - Eskişehir	250	2009	245
(Ankara) Polatlı - Konya	250	2011	212
Eskisehir - İzmit - Pendik (Istanbul)	250	2014	257
Kayseri North Passage	160	2016	23
Balışeyh (Kırıkkale) - Sivas	300	2022	315
Konya - Karaman	200	2022	102
(Ankara) Kayaş - Balışeyh (Kırıkkale)	300	2023	78
			Total km = 1,232

High-speed lines under construction in Türkiye

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Karaman - Ulukışla	200	2024	135
Mersin - Adana - Gaziantep	200	2025	313
Halkalı - Ispartakule	200	2025	9
Bandırma - Bursa - Yenişehir - Osmaneli	200	2025	201
(Ankara) Polatlı - Menemen (Izmir)	250	2027	508
Ispartakule - Çerkezköy	200	2028	67
Yerköy - Kayseri	250	2028	142
Aksaray - Ulukışla - Yenice	200	2029	192
Çerkezköy - Kapıkule (Bulgarian border)	200	-	153
			Total km = 1,720

High-speed lines planned in Türkiye

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Eskişehir - Antalya	200	-	428
Delice (Kırıkkale) - Samsun	200	-	293
Sivas - Erzincan	200	-	242
Erzincan - Kars	200	-	382
Kayseri - Antalya	200	-	541
Gaziantep - Mardin	200	-	300
			Total km = 2,186

Source: compiled by authors based on International Union of Railways

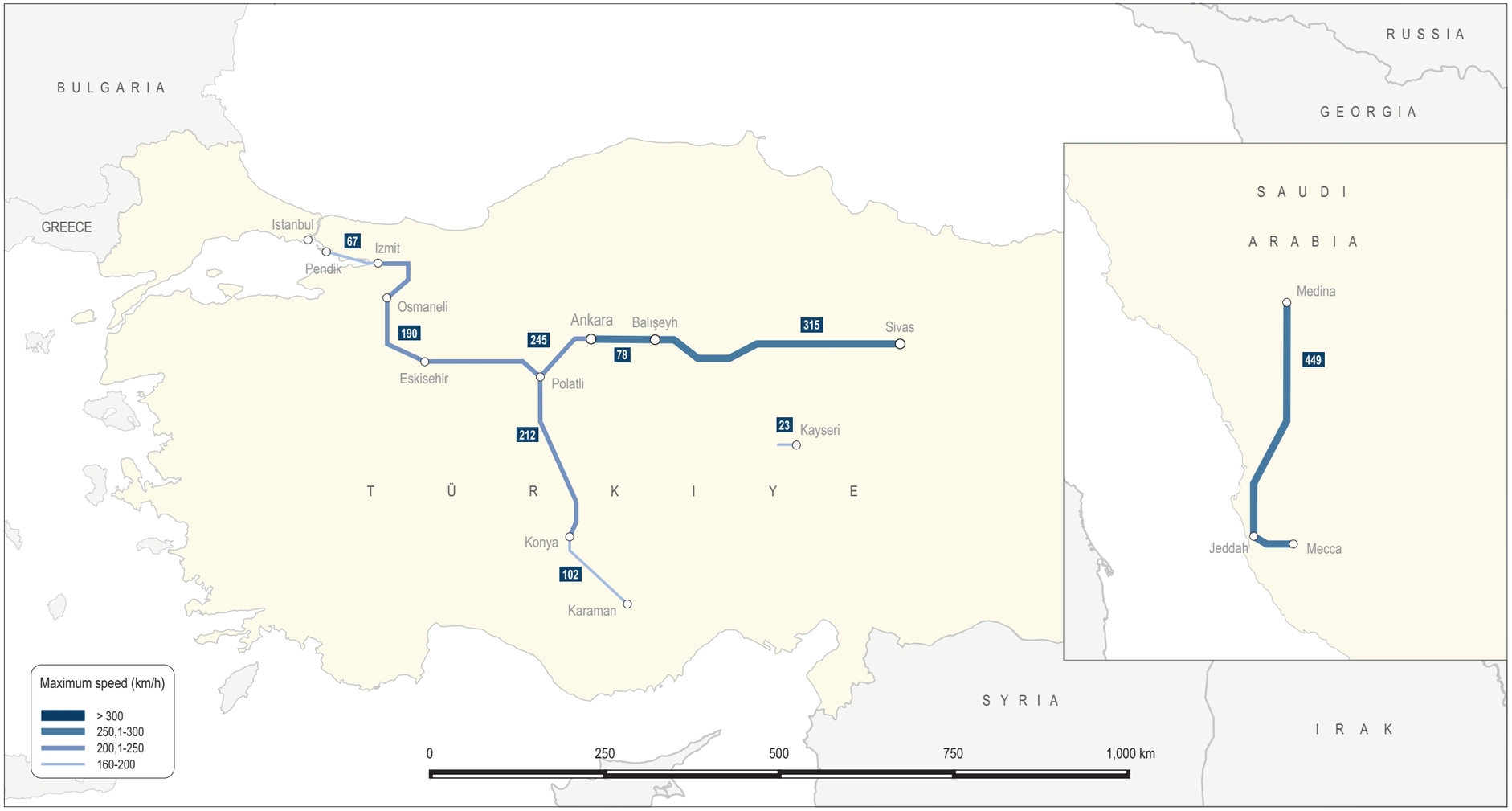
6.1 HIGH-SPEED RAIL NETWORK

High-speed lines in Middle East

Source: compiled by authors based on International Union of Railways

6.2 CHARACTERISTICS AND EQUIPMENT

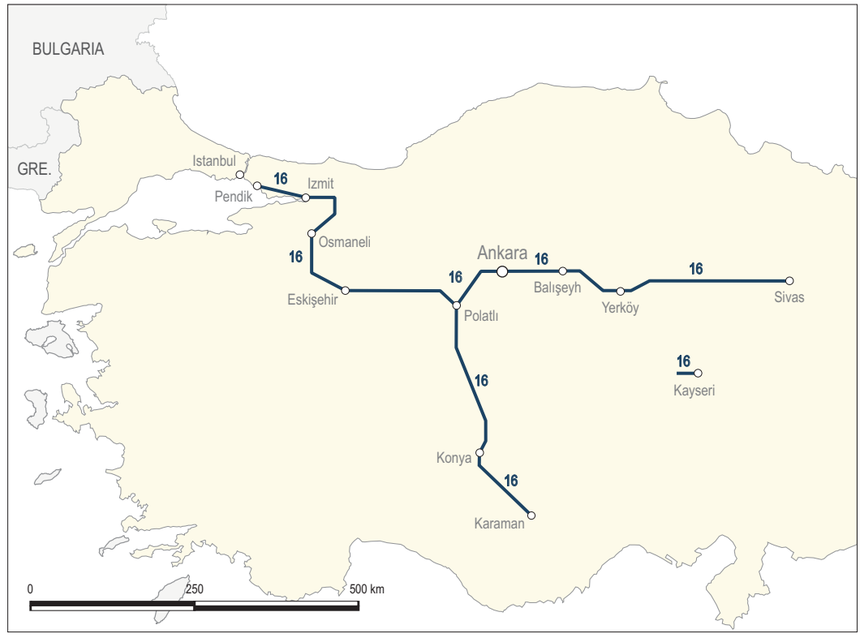
Maximum commercial speed and Distances (km)



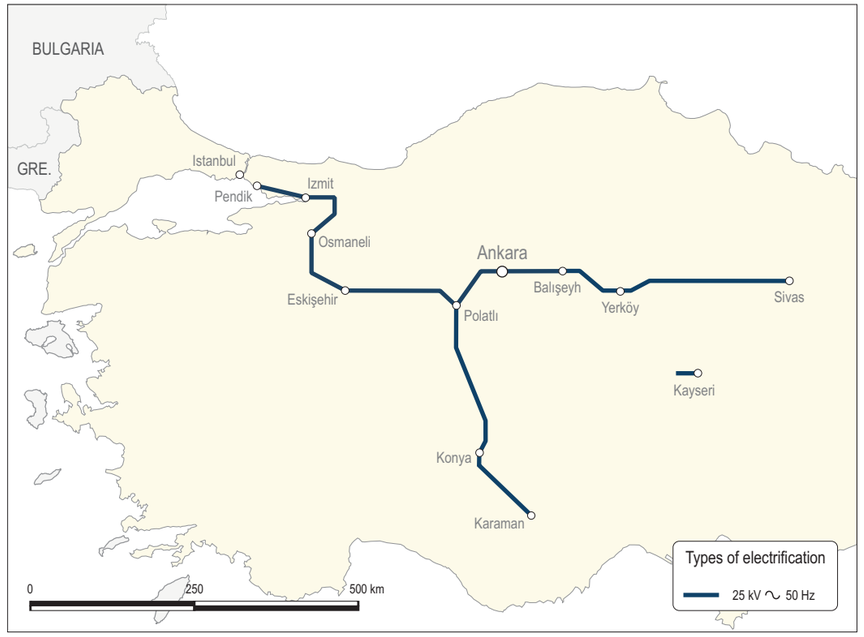
Source: compiled by authors based on International Union of Railways

6.2 CHARACTERISTICS AND EQUIPMENT (Türkiye)

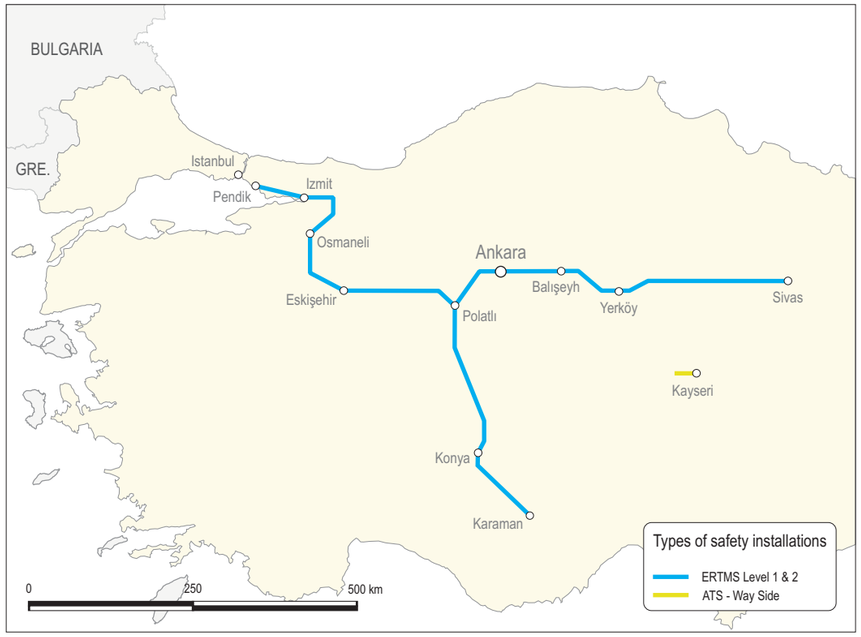
Maximum slope (‰)



Electrification



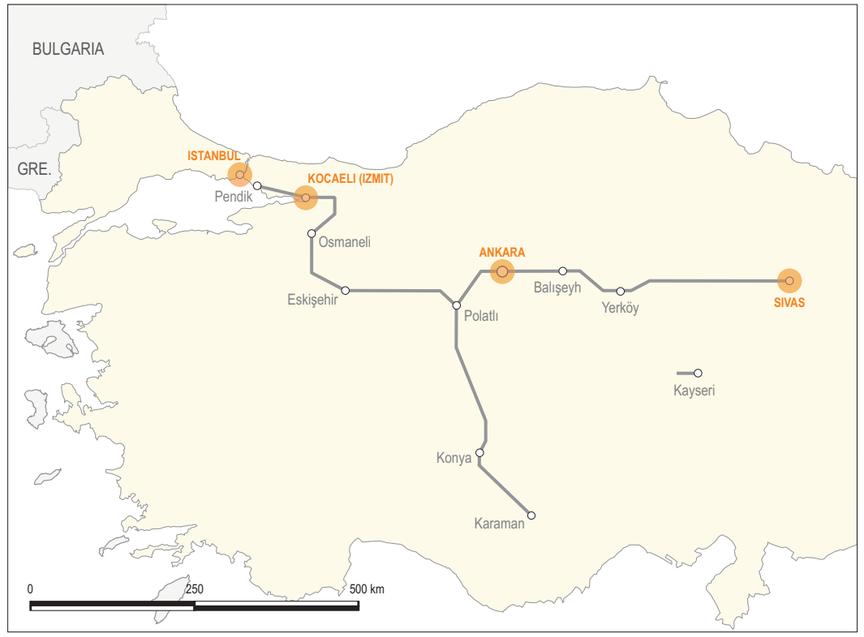
Signalling



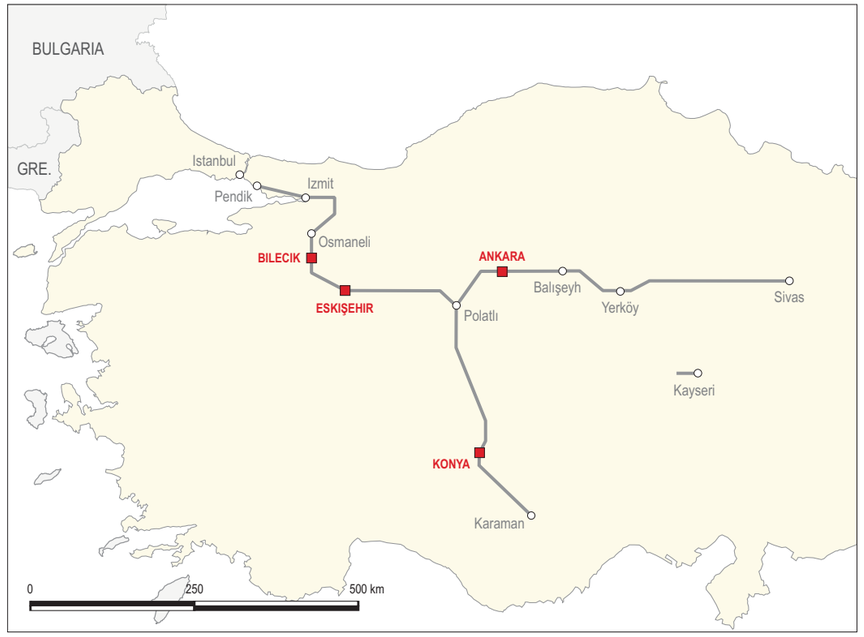
Source: compiled by authors based on International Union of Railways

6.2 CHARACTERISTICS AND EQUIPMENT (Türkiye)

Centralized Traffic Control (CTC)



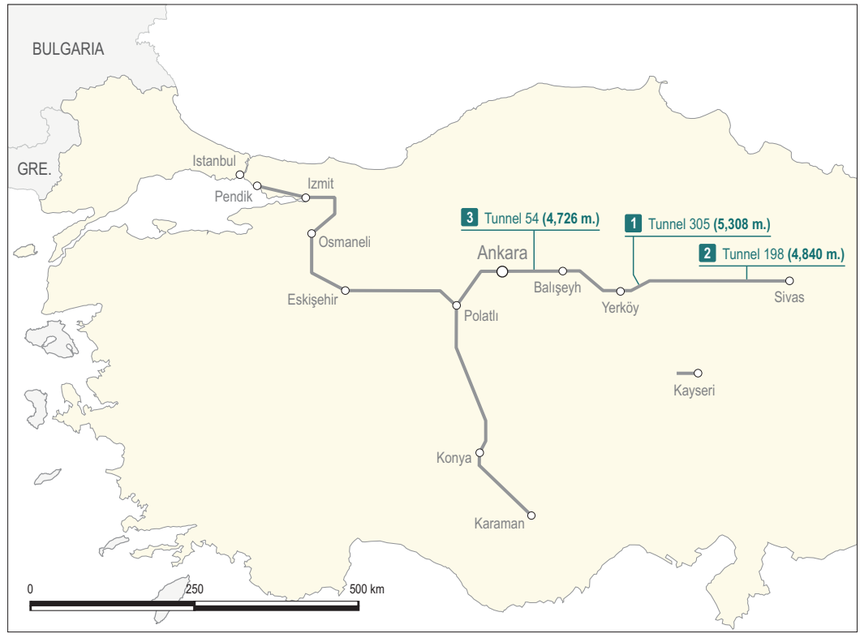
High-speed rolling stock workshops



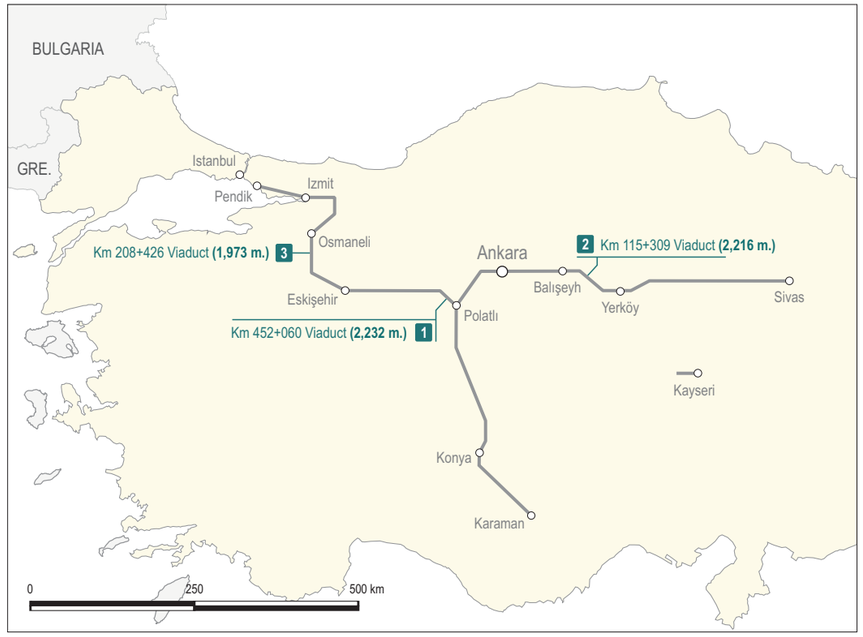
Source: compiled by authors based on International Union of Railways

6.2 CHARACTERISTICS AND EQUIPMENT (Türkiye)

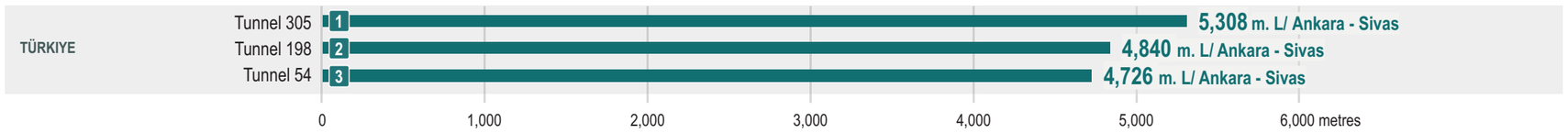
Longest tunnels



Longest viaducts



Longest tunnels of the high-speed rail network in Türkiye

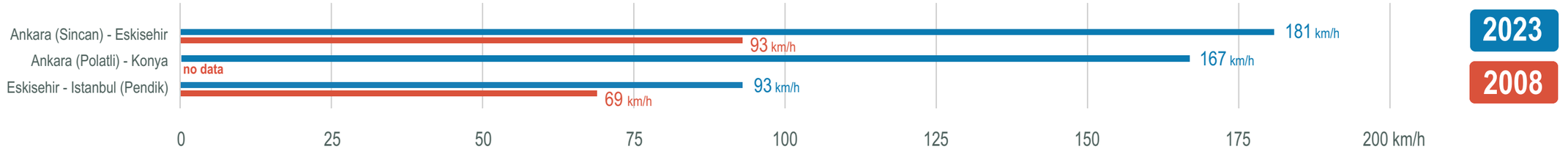


Longest viaducts of the high-speed rail network in Türkiye

Source: compiled by authors based on International Union of Railways

6.3 SPEED AND TRAVEL TIME

Evolution of average speed on Turkish high-speed lines



Source: compiled by authors based on International Union of Railways

6.4 ROLLING STOCK

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

General characteristics	HT65000 *(Türkiye)*	Velaro TR *(Türkiye)*
(1) Composition	T+4M+T	M+T+M+2T+M+T+M
Suppliers	CAF	Siemens
Owners or operators	TCDD Transportation	TCDD Transportation
Year in service	2009	2015
Articulated	No	No
Track gauge (mm)	1,435	1,435
Electrification voltage (kV)	25 kV 50 Hz AC	25 kV 50 Hz AC
Maximum train speed / operation speed (km/h)	250 / 250	320 / 300
Power (kW)	4,800	8,000
Traction	Distributed traction	Distributed traction
Signalling	ETCS / ATS	ETCS / ATS
Train sets currently used / planned	12	19
Weight and dimensions		
Unladen weight in running order (t)	297.25	456.47
Maximum axle load (t)	<17	<17
Power weight ratio (kW/t)	12.7	14.7
Train length (m)	158.9	200.7
Train width (m)	2.920	2.924
Seats		
1st class seats*	55	45
2nd class seats	364 (8 bistro + 2 hp)	462 (28 bistro + 8 hp)
Total seats	419	507
Observations		
		Siemens Velaro D series

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways and miscellaneous data sources

6.4 ROLLING STOCK

Talgo 350
(Saudi Arabia)

General characteristics	
(1) Composition	L+13T+L
Suppliers	Talgo-Alstom
Owners or operators	Haramain HSR
Year in service	2017
Articulated	Yes
Track Gauge (mm)	1,435
Electrification voltage (kV)	25 kV 60 Hz AC
Maximum train speed / operation speed (km/h)	350 / 300
Power (kW)	8,000
Traction	Concentrated traction
Signalling	ETCS
Train sets currently used / planned	8 / 36
Weight and dimensions	
Unladen weight in running order (t)	373,9
Maximum axle load (t)	16.9
Power weight ratio (kW/t)	21.4
Train length (m)	215
Train width (m)	2.960 (locom.) / 2.942 (coach)
Seats	
1st class seats*	100
2nd class seats	304
Total seats	404
Observations	

(1) M-Motor coach • T-Trailer coach• L-Locomotive
MB-Motor Bogie

AC – alternating current
DC – direct current

* For 3 classes train, 1st and 2nd classes are included in 1st class

Source: International Union of Railways


INTERNATIONAL UNION
OF RAILWAYS

1. GLOBAL HIGH - SPEED DATA

2. EUROPE

3. ASIA - PACIFIC

4. AFRICA

5. NORTH AMERICA

6. MIDDLE EAST

7. LATIN AMERICA

INDEX OF COUNTRIES

7.1 HIGH-SPEED RAIL NETWORK

BRAZIL

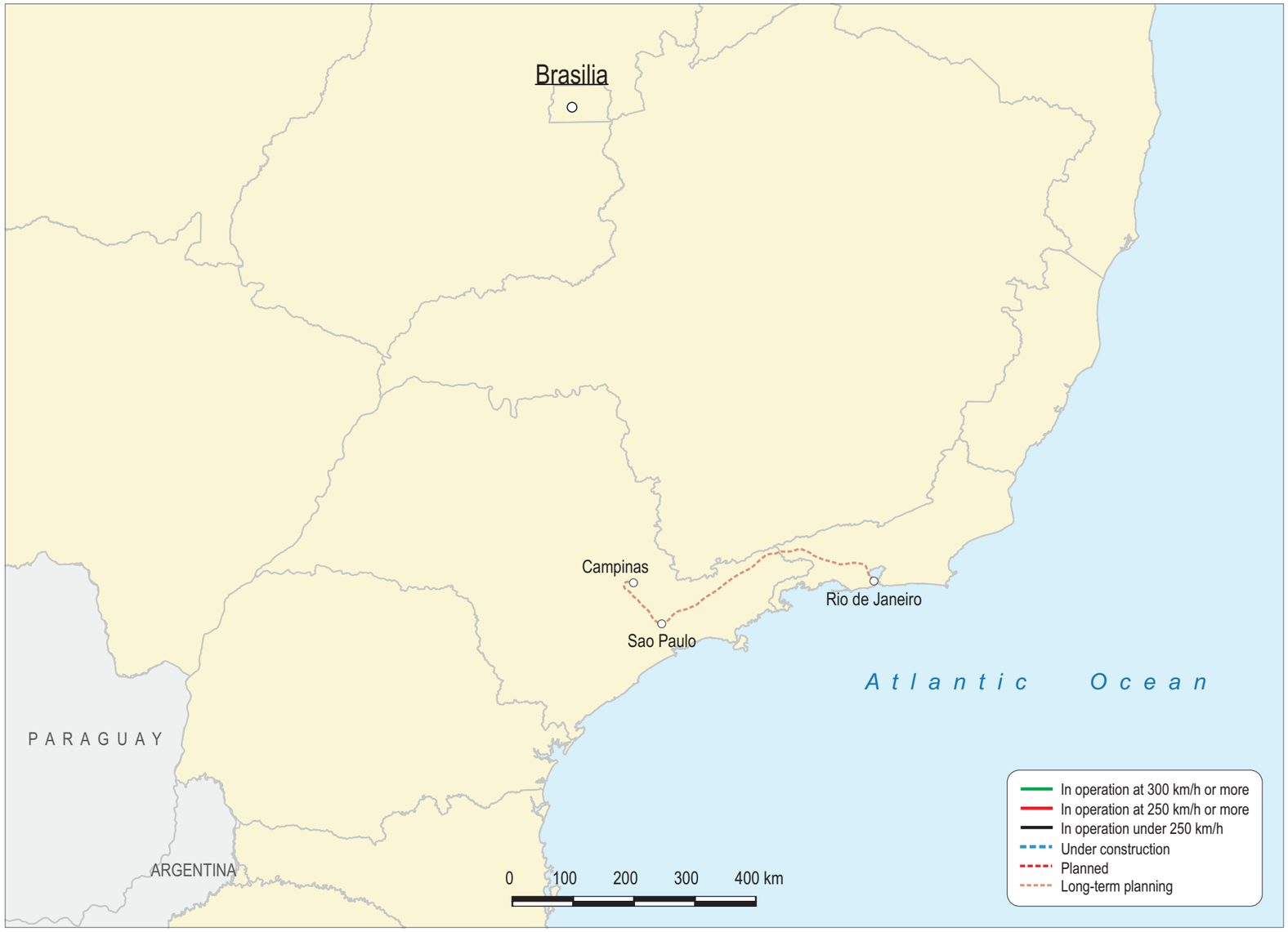
High-speed lines with long-term planning in Brazil

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Rio de Janeiro - São Paulo - Campinas	300	-	511
			Total km = 511

Source: miscellaneous data sources

7.1 HIGH-SPEED RAIL NETWORK

High-speed lines with long-term planning in Brazil



Source: miscellaneous data sources

7.1 HIGH-SPEED RAIL NETWORK

CHILE

High-speed lines with long-term planning in Chile

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Santiago - Valparaíso	220	-	127
			Total km = 127

Source: miscellaneous data sources

7.1 HIGH-SPEED RAIL NETWORK

High-speed lines with long-term planning in Chile

Source: miscellaneous data sources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