

UIC Map of the United Kingdom's High-Speed Rail Lines

The United Kingdom (UK) is located on an island in Western Europe off the coast of France and Belgium. The country's population of 63 million people ranks 22nd in the world. The capital, London, has a population of 8.6 million, with Birmingham the second largest city with 2.3 million. Overall, the country is considered mostly urban in nature, with 80 percent of the population residing in urban areas. The UK has the 9th largest economy with a

GDP of \$2.25 trillion, and the GDP per capita of \$35,900 ranks 34th in the world. Slightly more than 110 km (70 miles) of high-speed rail line exists in the UK currently, with an additional 200 km (125 miles) planned for future development. The above map displays the United Kingdom's high-speed rail network according to the International Union of Railways (UIC).

## SYSTEM DESCRIPTION AND HISTORY

High-speed rail operations in the UK goes back to 1976, when British Railways commenced operations with a diesel-electric multiple unit train capable of over 200 km/h (125 mph). Amos et al. (2010) indicates this was the first service capable of those speeds after Japan had implemented their high-speed services. Modern high-speed service in the UK began when Section 1 of the Channel Tunnel Rail Link (CTRL), now known as High Speed 1 (HS1), opened in 2003 between the Channel Tunnel and Fawkham Junction (south of London). The Channel Tunnel opened in 1994 with the service between the tunnel and London operating on conventional passenger rail line. The new high-speed link reduced the travel time by 20 minutes. The HS1 segment provides direct international high-speed rail service to Paris and Brussels through the Channel Tunnel. The new link, Section 2, that opened in 2007 fully connects between the Channel Tunnel and London, further reducing the travel time by an additional 20 minutes.

Prior to the completion of the high-speed link into London, the high-speed trains used the Waterloo station, but upon completion of the Southfleet Junction–London link, the high-speed trains transferred to the St Pancras International station, located in central London. The UK is currently planning for the construction of a High Speed 2 (HS2) project to connect London with Birmingham with high-speed train service in the first section. Additional sections are under review to extend HS2 in a ‘Y’ configuration from Birmingham on to Manchester and to Leeds (See map on following page). The following table provides the details of the current and planned high-speed line segments in the UK, which if fully implemented according to table would place over 300 km (almost 200 miles) of high-speed lines in the UK.

**UIC Table of the United Kingdom’s High-Speed Rail Lines**

Stage	Speed		Year Opened	Length	
	km/h	mph		km	miles
<b>In Operation:</b>					
Fawkham Junction – Tunnel	300	185	2003	74	46
London – Southfleet Junction	300	185	2007	39	24
<b>TOTAL</b>				<b>113</b>	<b>70</b>
<b>Planned:</b>					
London – Birmingham (HS2, first section)	360	225	2025	204	127
<b>GRAND TOTAL</b>				<b>317</b>	<b>197</b>

Sources: *High Speed and the City*; *High-Speed Rail: The Fast Track to Economic Development*; *High-Speed Lines in the World*

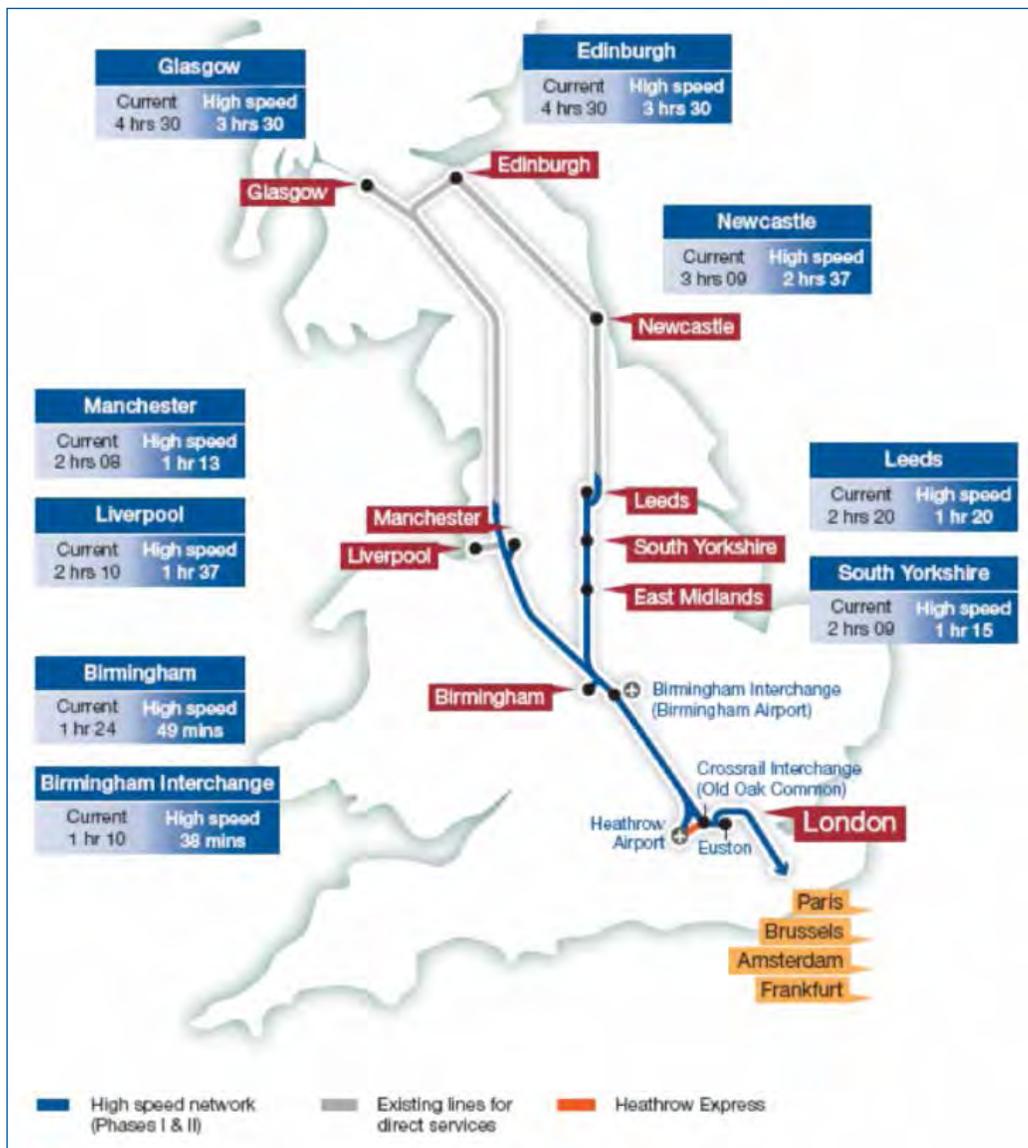


**Eurostar on the HS1 (the Channel Tunnel rail link)**

## ECONOMICS AND FINANCE

The construction and operation of the Channel Tunnel Rail Link (now HS1) between the Channel Tunnel and London has a history of private investment, financial difficulties, and reorganization. Ernst & Young (2009) provide a bulleted list of the history of the HS1 line:

- The design, build, finance, and operate concession contract for the CTRL, the largest of the UK’s private finance initiative (PFI) projects at the time, was awarded to London & Continental Railway Limited (LCR) in 1996 and was originally supposed to last until 2086. The brand name HS1 was adopted in 2006.
- The line was originally planned to be constructed as a single project, however, after running into financial difficulties in 1998, the CTRL project was restructured and divided into two sections:
  - Section 1 runs 46 miles from the Channel Tunnel portal to Fawkham Junction and cost £1.9 billion. Section 1 was opened to passenger traffic on time in 2003 and on budget.
  - Section 2 completed the rail link, feeding a 24-mile HSR from the Southfleet Junction into central London’s St Pancras Station. It was opened on time and on budget in 2007 at a cost of £3.3 billion.
- As part of the 1998 rescue plan it was agreed that, following completion, Section 1 would be purchased by Railtrack, along with an option to purchase Section 2. In return, Railtrack committed to operate the whole route as well as St Pancras railway station that, unlike all other former British Rail stations, was transferred to LCR/Union Railways in 1996.
- In 2001, Railtrack announced that, due to financial problems, it would not purchase Section 2 once it was complete. This triggered a second restructuring. The 2002 restructuring plan agreed that the two sections would have different infrastructure owners (Railtrack for Section 1, LCR for Section 2) but with common management by Railtrack.



HS2 Network Map with Travel Time Savings To and From London by Train

- Following yet further financial problems at Railtrack, its interest in the CTRL was sold back to LCR, who then sold the operating rights for the completed line to Network Rail, Railtrack's successor. Under this arrangement LCR became the sole owner of both sections of the CTRL and the St Pancras property, as per the original 1996 plan.

According to a California High-Speed Rail Authority review of international case studies (2011), following a sale process completed in 2010, a new company named HS1 Limited (HS1 Ltd.) became the infrastructure operator and holds the concession to operate, manage, and maintain the HS1 high-speed railway infrastructure until 2040. HS1 Ltd. is jointly owned by Borealis Infrastructure and Ontario Teachers' Pension Plan, two Canadian pension funds. They further state that Network Rail is a contrac-

tor to HS1 Ltd. for maintaining and operating the railway infrastructure and three stations: St Pancras International, Stratford International, and Ebbsfleet International. Eurostar is the international train operator and maintains and operates the Ashford International Station. Southeastern provides domestic high-speed rail service along the line between London and Ashford.

### High Speed 2 (HS2): Further UK High-Speed Rail Development

In January 2009 the Department of Transport formed a company named HS2 Limited (HS2 Ltd.) to develop plans for a new high-speed network between London and Birmingham. HS2 Ltd. submitted plans to achieve this connection, and in January 2012 the UK government approved the recommended route between London and



**Eurostar at St Pancras railway station**

Birmingham. This approved 140-mile segment represents Section 1 of the HS2 project. Future plans have the high-speed network connecting to Heathrow International Airport and extending from Birmingham into two segments: one to Manchester and the other to Leeds (see the map on the previous page). Altogether, the complete ‘Y’ high-speed rail network extending north of London will be around 330 miles in length. Operating at speeds up to 225 mph, HS2, Ltd. estimates that as many as 4.5 million air trips and 9 million road trips a year will shift onto rail with the ‘Y’ network in place. The government time-line lists the opening for service along the first section as 2026 and the following segments as 2032-33.

*Sources: High Speed 2: International Case Studies on Delivery and Financing – A Report for HS2; California High-Speed Rail Project: International Case Studies; “High Speed Rail”; “Key HS2 Facts”; “High Speed Rail: Investing in Britain’s Future”; The Government’s Decision; Consultation Summary*

### **RIDERSHIP AND TRANSPORTATION SYSTEM IMPACTS**

Travel times were greatly reduced with the opening of the HS1 line, with traveling from London to Paris now taking slightly more than 2 hours and to Brussels in slightly less than 2 hours. The UIC reports that 9.2 million riders utilized the Eurostar international high-speed service along the HS1 route. Amos et al. (2010) reports that a Eurostar survey found that 25–30 percent of the London-Paris ridership consisted of generated trips, that is, trips that would not have occurred without the service.

### **London High-Speed Train Stations**

The UIC report *High Speed and the City* documents how high-speed rail stations relate to city planning and development through a series of case studies. One of the case studies examined is London. The London metropolitan area population is approximately 14 million people, with the city itself having an estimated population of 7.5 million people. The population density within the city is calculated as 4,761 people per square kilometer (12,411 people per square mile). For comparison, other city densities include Paris with 1,971 people per square kilometer (5,138 people per square mile) and Tokyo with a density of 14,254 people per square kilometer (37,158 people per square mile).

With the opening of Section 2 of HS1 in November 2007, St Pancras International became the high-speed rail station in London. This new route into the city reduced the travel time by 20 minutes, compared to the previous route into London using conventional rail lines, and put the service in a more central location with many connections. The St Pancras International station is connected to 6 London Underground (subway) stations, with more than 200 Underground stations reached directly without transfer. Renovated during the 2000s, the case study indicates that the St Pancras station is the engine of two huge urban renewal and development programs in the King’s Cross Area, which will transform the area into a new business, residential, and cultural district.



**Eurostar on the HS1 (the Channel Tunnel rail link), Britain’s first high-speed line**

Eurostar operates the international high-speed services to Lille, Paris, Brussels, Disneyland, and the South of France. Beginning in December 2009, domestic high-speed service along HS1 tracks has been provided by Southeastern to the Ashford and Ebbsfleet International stations. The case study documents 60 daily high speed services (both departure origins and arrivals) at St Pancras International. As part of the case studies, the UIC provides a modal comparison between the focal station and first city. In this case the comparison is between London and Ashford. The following chart provides the estimated travel times and travel cost for the different modes of travel. High-speed train service covers the distance in 40 minutes compared to car in 1 hour 10 minutes. The case study indicates 34 daily

**UIC London St Pancras to Ashford Modal Comparison**

Travel Mode	Travel Time	Travel Fares
High-Speed Train	40 min	30 Euro (\$38)
Conventional Train	–	–
Car	1 hr 10 min	20 Euro (\$25)
Plane	–	–

high speed services (both departure origins and arrivals) occur between London and Ashford.

*Sources: High-Speed Rail: The Fast Track to Economic Development?; Table 50 – Revenue-Earning HS Traffic; High Speed and the City;*

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