



UIC Map of Italy's High-Speed Rail Lines

Italy is located in Southern Europe bordering Austria, France, Slovenia, and Switzerland and is primarily on a peninsula extending into the Mediterranean Sea. It has a population of 61.2 million (ranks 23rd in the world) and is designated as 68 percent urban. The largest city is Rome, the country's capital, with 3.357 million, followed by Milan with 2.962 million people. The GDP of \$1.8 trillion

ranks as the 11th largest economy and the GDP per capita of \$30,100 ranks 45th. Italy currently has almost 925 km (574 miles) of high-speed rail lines, with an additional 400 km (250 miles) planned for future development. The above map displays the International Union of Railways (UIC) map of Italy's current and proposed high-speed rail network.

SYSTEM DESCRIPTION AND HISTORY

Like many European countries, Italy has an extensive passenger rail network stretching across the country with a long history of transporting people by way of conventional train service. Several sources indicate that in 1981, as a result of the poor quality on the conventional line between Rome and Florence, Italy opened the first high-speed line segment in the country. The UIC *High-Speed Lines in the World* indicates that two additional segments between Rome and Florence opened for high-speed service in 1984 and 1992. The following table shows these and other currently operational and planned high-speed line segments, according to the UIC. A major advancement to the Italian high-speed network occurred in 2006 with the opening of the line segment between Rome and Naples. A portion of this segment diverted high-speed operation away from the conventional track onto dedicated high-speed track, which greatly reduced the travel times. With further development of the high-speed network Italy now has 923 km (574 miles) of rail lines designated for high-speed rail operations.

UIC Table of Italy's High-Speed Rail Lines

Stage	Speed		Year Opened	Length	
	km/h	mph		km	miles
In Operation:					
Rome – Florence (First section)	250	155	1981	150	93
Rome – Florence (Second section)	250	155	1984	74	46
Rome – Florence (Third section)	250	155	1992	24	15
Rome – Naples	300	185	2006	220	137
Turin – Novara	300	185	2006	94	58
Milan – Bologna	300	185	2008	182	113
Novara – Milan	300	185	2009	55	34
Florence – Bologna	300	185	2009	77	48
Naples – Salerno	250	155	2009	47	29
TOTAL				923	574
Planned:					
Milan – Venice	–	–	–	245	152
Genoa – Milan	–	–	–	150	93
TOTAL				395	245
GRAND TOTAL				1,318	819

The high-speed rail network crosses several different types of terrain throughout Italy. The following table describes the variety in the types of structures found on each line segment. The high-speed line between Turin and Florence varies greatly between the different segments. The segment between Turin and Milan is largely bridges and

viaducts (80 percent); the segment between Milan and Bologna is largely earthwork (60 percent); while the segment between Bologna and Florence is almost exclusively tunnels (90 percent).

UIC Table of Italy's High-Speed Rail Lines (2010)

Structure Type	Milan-Bologna	Bologna-Florence	Turin-Milan	Rome-Naples
Bridges & Viaducts	39%	5%	80%	40%
Tunnels	1%	90%	1%	30%
Earthwork	60%	5%	19%	20%

Sources: *High-Speed Rail: A Study of International Best Practices and Identification of Opportunities in the U.S.*; *High Speed Rail: International Comparisons*; “*High Speed Rail Operations, Italy*”; *High-Speed Lines in the World*; *Maintenance of High Speed Lines*

ECONOMICS AND FINANCE

The Italian State Railway, Ferrovie dello Stato (FS) controls both passenger and freight rail operations in the country. Following the European Union (EU) directive to separate rail infrastructure ownership and operations, Italy maintained FS as a holding company in government ownership and established the following subsidiaries:

- Rete Ferroviaria (RFI) – Rail infrastructure and management company.
- Treno Alta Velocita (TAV) – High-speed line planning and constructing company.
- Trenitalia – Train operating company, including divisions for both freight and passenger operations.

A concession was awarded to TAV in 1991 to build and operate high-speed lines between Milan and Naples and between Turin and Venice. At that time it was envisioned that the high-speed network would be completely new infrastructure separate of the conventional lines. In 1996 the vision changed to one where the network would be more integrated into the existing network. At the time of the concession, TAV was 60 percent owned by private interests. That 60 percent was acquired in 1998 by FS after private shareholders became disinterested in providing the required capital for high-speed development. As a result, TAV became a full subsidiary of FS.

High-speed rail development has been largely funded and financed through government grants and guaranteed loans from government subsidiary Infrastructure SpA. Thompson and Tanaka (2011) also include EU grants and Euro-



The Italian ETR 500 Frecciarossa, the train running on the Italian high speed rail network.

pean Investment Bank (EIB) loans as sources of funding. The access charges published by RFI are characterized in that same report as non-discriminatory, complex, and distinct from other EU countries. They note that the access charge income is expected to cover approximately 18 percent of the total financial costs.

Italy High-Speed Rail Operators

Trenitalia, the state-owned rail operating company, operates three high-speed rail services in Italy:

- Frecciarossa – The newest service operates between Turin and Salerno at operational speeds up to 300 km/h (185 mph).
- Frecciargento – These tilting trains are capable of operating on both the high-speed rail network and on the conventional rail network. The tilting trains provide high-speed operations up to 250 km/h (155 mph).
- Frecciabianca – Traveling up to 200 km/h (125 mph), these trains travel on traditional rail lines and connect destinations not served by the other two high-speed services.

In addition to Trenitalia, a new private high-speed rail operating company, Nuovo Trasporto Viaggiatori (NTV), began providing high-speed rail service in April 2012 to the major Italian cities, with their Italo service. The following section describes the NTV service in more detail.

Europe's First Private High-Speed Rail Operator

A consortium that includes Ferrari and the French National Railway Corporation (SNCF) began work in 2008 to develop the first privately operated high-speed rail service in Europe. Beginning in April 2012, the company, NTV, offered the Italo service to 9 Italian cities at 12 stations at speeds up to 300 km/h (185 mph). Using updated versions of the French TGV, the Automotrice Grande Vitesse (AGV) trains are advertised for passenger comfort. NTV also describes its trains as being constructed mostly from recycled materials; designed to reduce maintenance costs by 15 percent; and lighter than comparable trains, which reduces energy consumption by 10 percent.

Sources: TGA; Trenitalia Website; Economic Analysis of High-Speed Rail in Europe; NTV Website



NTV Italo high-speed train

RIDERSHIP AND TRANSPORTATION SYSTEM IMPACTS

The high-speed network in Italy has steadily grown in annual passengers since accounting for 2.19 million passengers in 1995, as shown in the table below. The system now carries more than 33.4 million passengers annually.

Chronology of Italy's High-Speed Rail Passenger Traffic

Year	Passengers (thousands)	Passenger-Km (millions)	Passenger-miles (millions)
1995	2,190	1,100	684
1996	3,348	1,300	808
1997	6,916	2,438	1,515
1998	10,897	3,638	2,261
1999	13,050	4,464	2,774
2000	15,510	5,086	3,160
2001	18,785	6,763	4,202
2002	18,010	7,078	4,398
2003	19,092	7,431	4,617
2004	20,712	7,925	4,924
2005	21,906	8,550	5,313
2006	23,236	8,912	5,538
2007	23,430	8,818	5,479
2008	23,882	8,878	5,517
2009	33,377	10,746	6,677

Albalate and Bel (2010) point out that the high-speed rail services are generally in competition with road transportation, since the distances between the city pairs is not significant enough for air service.

Rome 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 in this report is Rome. It notes that the Rome metropolitan area population is approximately 4.1 million people. The population density within the city is calculated as 2,132 people per square kilometer (5,558 people per square mile). Rome was one of the lighter density cities examined. 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).

There are three train stations in Rome servicing high-speed trains, with the Rome Termini station the focus of the UIC *High speed and the City* report. It indicates that high-speed service began at the Rome Termini station in December 2005 with the Rome – Naples link. Listed as under construction in the report but later completed in November 2011, the newly renovated Rome Tiburtina station is designed to be the main high-speed train station in



Trenitalia high-speed train

Rome, relieving the Rome Termini station of some of the congestion there and reducing the high-speed train service time between Rome and Milan to 2 hours 45 minutes, a reduction of 15 minutes for those trains previously served through Rome Termini station. The new private high-speed operator NTV operates the Italo service through the Rome Tiburtina and Ostiense stations, with the Ostiense station serving the south and southwest parts of Rome. Trenitalia timetables show high-speed services out of both Termini and Tiburtina stations.



Main entrance of Roma train station

The Rome Termini station originally opened in 1867 with several expansions and upgrades occurring over the years. The last major renewal occurred for the 2000 Jubilee. Located in central Rome, the Termini station connects high-speed rail with conventional rail, subway, and

bus services. The dead-end type high-speed track alignment handled approximately 28,500 passengers per day on 91 high-speed trains per day according to the September 2010 UIC case study. Finally, the Termini station maintains 23,600 square meters (254,028 square feet) of commercial area. This shopping mall space includes 128 shops and customer-targeted facilities such as car rental establishments.

The Tiburtina station is characterized in reports as a hi-tech railway station, not only conceived as train terminal, but also as a meeting place for shopping, wellness and leisure. The newly redeveloped and expanded station maintains approximately 10,000 square meters (107,639 square feet) of the space for commercial activities. The plan for this station also included 10 hectares (24.7 acres) around the station that is to be “new green areas for cultural, social, recreative and sport services as well as with cycling tracks for the inhabitants of the neighborhood.”

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 Rome and Milan, a distance of 587 km (315 miles). 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 3 hours compared to conventional train 6 hours 34 minutes at approximately half the cost.

UIC Rome Termini Station to Milan Modal Comparison

Travel Mode	Travel Time	Travel Fares
High-Speed Train	3 hr	89 Euro (\$116)
Conventional Train	6 hr 34 min	46 Euro (\$60)
Car	5 hr 30 min	74 Euro (\$96)
Plane	1 hr 10 min*	206 Euro (\$268)
*only includes on-board travel time		

Sources: *High Speed Rail Passenger Services: World Experience and U.S. Applications*; “Ferrari on the Line”; “Ferrari’ train driving high-speed rail renaissance”; *High-Speed Rail: Lessons for Policy Makers from Experiences Abroad*; *HS and the City*; *Economic Analysis of High-Speed Rail in Europe*



Roma Termini railway station and Piazza dei Cinquecento

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