High speed and the city

SEPTEMBER 2010

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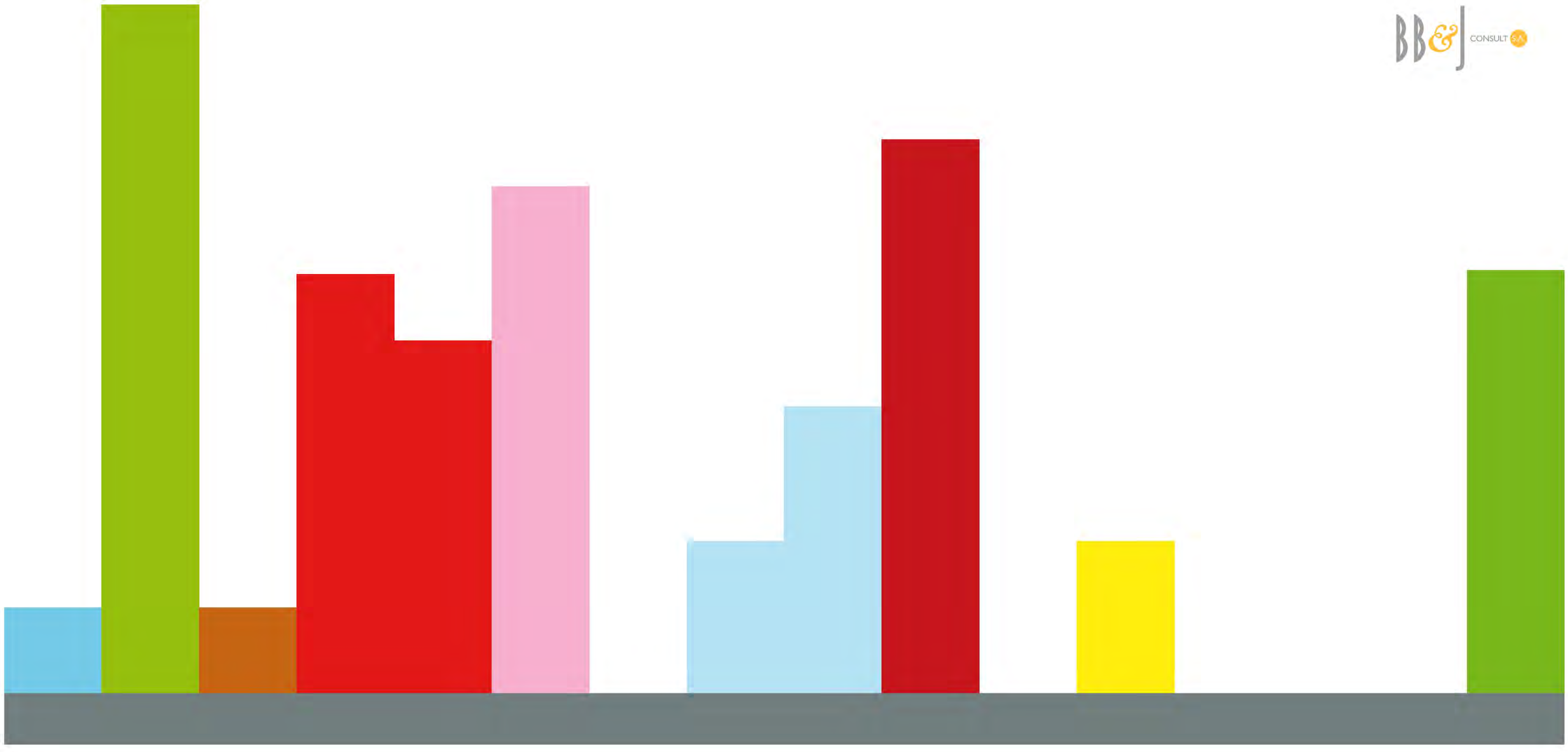

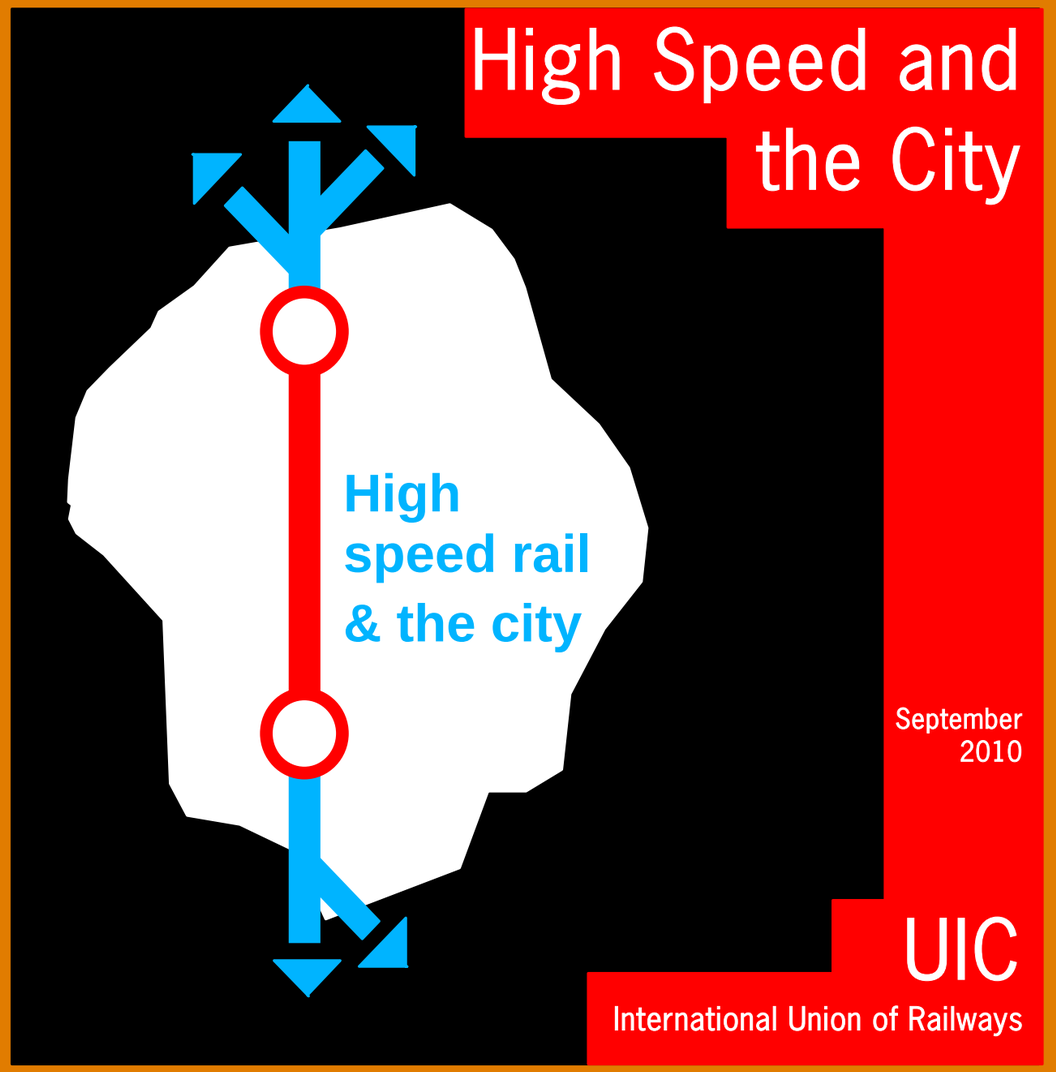

BB&J CONSULT S.A.

High Speed and the city study

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1. Introduction

High speed rail services mean attractive travel times. High speed rail services being less rapid than air still can hold the majority of market shares when the travel time ranges between 2h and 3h30. This finding leads to the conclusion that the door-to-door travel time is the relevant element for modal choice.

The question is consequently, how to reduce the door-to-door travel time when serving large built-up areas?

Another important issue relating with rail is the capacity of the stations. This issue is even more stringent with high speed rail which means bigger volumes of passengers, particularly to and from main cities.

The station, as interface between the city (Society) and high speed rail, is a very important and strategic point for all the actors involved: passengers, railway undertakings, infrastructure managers and the city itself. Very often, there is only one station in a big city. It is generally located in the densely populated core city. The upside of this location is the good intermodality with urban modes and the downside is the strong limitations it lays on traffic development traffic and comfort for passengers.

Very often, the total number of passengers per year amounts to several times the city population and high speed services boosts this ridership producing saturation of terminals. Consequently one of the issues is to analyse which measures are appropriate to relieve this saturation.

The UIC's High Speed Department, taking into account the preoccupations and preconisations coming from its members, launched this study in order to understand the benefits of serving a city with several HS stations. Apparently it will both reduce access and egress travel times and relieves the saturation of the main existing terminal. A strategic issue is to identify the best locations for additional stations along with the correspondent operating plan.

The general objective of the study is to benchmark various cases worldwide so as to understand the pros and cons of various schemes to increase accessibility and capacity for HS stations.

After a call for tenders issued in December 2008, consultant offers were received in January 2009, the decision relied on BB&J Consult, SA, and UIC signed a contract for its development on January 2009.

The study has been directed by Iñaki Barrón de Angoiti, Head of the HS Department of UIC, with the collaboration of Michel Leboeuf, Director of the UIC High Speed Scientific Committee, and Naoto Yanase, UIC Senior Advisor High Speed, and has been developed by BB&J Consult, SA. under the direction of Javier Bustinduy, Civil Engineer by UPM and MSCE by MIT, with the assistance of BBJ members Jose Luis Jordi and Teresa Suquet, Civil engineers by UPM.

2. Objectives of the study

According to the Terms of Reference of the study, the cases analysed identify best practices in solving station saturation and optimizing access and egress times to and from high speed trains, in order to:

- Present a benchmark of examples where dead end stations have been replaced by through stations or where city-shunts with new stations have been built around the city so as to avert the inner city station saturation and give direct access to train to suburbs.

- Establish a typology of the various cases according to the main purpose underlying the change from dead end to through stations, with a city internal or external link.

- Analyse the different cases from the points of view of the passenger, the city, the operator and the infrastructure manager, identitying the benefits of the solution adopted for each one of them.

- Propose a range of criteria in order to identify the favorable context for shifting from deadend to through station or to shunts.

- Explicit the events and the opportunities that may lead to this change, in terms of service for the client.

- Tell to which extend a high speed line in operation boosts this change.

- Explain the benefits drawn from the corresponding investments.

3. Structure of the study

The study presents successively the roles and relationship between the actors, the benchmarking report itself, the conclusions and lessons learned under each one of the points of view of the passengers, the city, the operator and the infrastructure manager. It concludes with a set of recommendations to enlarge or establish new stations at significant metropolitan areas in a high speed line.

The benchmarking report includes 17 stations in 12 cities, based in on-site visits to Barcelone, Berlin, Beijing, Madrid, Paris and Seoul, and answers to specific questionnaires for each point of view filled by the undertakings in the remaining 6 cities.

4. High speed and the city: the actors

We have identified four main actors in the process of planning, building, or operating a High Speed train service in a metropolitan area:

- The passenger: the customer of the operator who actually makes a trip from the origin point to the HS station to board a train or viceversa

- The city (region): responsible for the transport system (public and private) in the area, that allows the passenger to reach the station, land use planning, and urban operations over or around the station.

- The operator, railway undertaking contracted by the passenger for the HS trip, responsible for delivery of service at a given level of quality and maintenance of trains at a depot and/or at the station.

- The railway infrastructure management, responsible for infrastructure of the lines and stations, and their maintenance, as well as traffic control. In some cases operator and infrastructure manager are the same.

Graph A1 identifies the relationships between these four actors, that take place in some cases through the HS station, and in others outside the station.

Relationship **between passenger and operator** related to information on services, schedules, fares, frequencies, travel times, reservations, and even sales of tickets uses mainly phone, internet, or travel agents, only a small portion of tickets being sold at the operators offices at the station.

Relationship **between passenger and the city** is related to the trip between the origin point, at the city (or metropolitan area) and the HS station. It can be made by private car or public transport (commuter rail, metro, bus, tram, taxi, bycicle) or just walking. The degree of coverage and quality of the public transport scheme in the city or region, direct lines to the station, its capacity, level of congestion, quality of service and fares are some of the issues involved. The key factor is access time to the station from the different areas of the city or metropolitan area.

Relationship **between the city (or region) and the railway infrastructure manager** relies on the land use planning scheme which must accommodate the HS lines and stations, and its relationship with urban renewal or developments either in the city centre or in the metropolitan area, as well as uses allowed at the HS station itself.

Relationship **between operator and infrastructure manager** relies on the contract of service between them, the operator being the client of the infrastructure manager, which provides the service requested on a toll basis for use of lines and station spaces. Issues here are the quality of service, in terms of capacity and level of congestion of the tracks, and punctuality of services. It also involves the train maintenance or service operations that might be performed at the station, such as cleaning, catering, personnel…

Relationships **through the HS station** involves the connection between the access modes of the passenger and the platforms where are located the trains. The city and the infrastructure manager have to provide commuter and metro lines and stations, bus lanes and stops, road access and parking spaces, taxi stands and holding lines, bike lanes and bicycle parking, as well as pedestrian access to the station. The key factor is the transfer time from the access mode to the HS train that has to consider security and access control to the platforms.

accesibility: transport systems

passenger (customer)

city (region)

region

public transport system (rail & bus)

private transport system (highways)

city

urban transport system

citizens not travelling

access time

information & HS sales

HS service info
- travel time
- frequency
- cost

reservations
sales
ticketing

mobile phone
internet
travel agents

transfer time

offices

shops & service

concourse

access control

HS tracks and platforms

urban renewal

land use planning

new regional developments

travel time

information
customer service
ticketing control
sales
lounges
waiting rooms

depot
workshop

on station train operations
cleaning
catering...

operator

rail infrastructure manager

HS train operation and maintenance

traffic regulation and control

accesibility: transport systems

passenger (customer)

city (region)

region

public transport system (rail & bus)

private transport system (highways)

city

urban transport system

citizens not travelling

access time

transfer time

travel time

information & HS sales

HS service info
- travel time
- frequency
- cost

reservations
sales
ticketing

mobile phone
internet
travel agents

offices

shops & service

concourse

access control

HS tracks and platforms

information
customer service
ticketing control
sales
lounges
waiting rooms

on station train operations
cleaning
catering...

depot
workshop

land use planning

urban renewal

new regional developments

operator

rail infrastructure manager

HS train operation and maintenance

traffic regulation and control

accesibility: transport systems

passenger (customer)

city (region)

region

public transport system (rail & bus)

private transport system (highways)

city

urban transport system

citizens not travelling

information & HS sales

HS service info
- travel time
- frequency
- cost

reservations
sales
ticketing

mobile phone
internet
travel agents

access time

transfer time

travel time

offices

shops & service

concourse

access control

HS tracks and platforms

information
customer service
ticketing control
sales
lounges
waiting rooms

on station train operations
cleaning
catering...

depot
workshop

land use planning

urban renewal

new regional developments

operator

HS train operation and maintenance

traffic regulation and control

rail infrastructure manager

perceived / provided

accesibility: transport systems

passenger (customer)

city (region)

city / region transportation scheme

region

public transport system (rail & bus)

private transport system (highways)

city

urban transport system

HS travel choice

access time

information & HS sales

HS service info
- travel time
- frequency
- cost

reservations
sales
ticketing

mobile phone
internet
travel agent

transfer time

travel time

offices

shops & service

concourse

access control

HS tracks and platforms

information
customer service
ticketing control
sales
lounges
waiting rooms

on station train operations
cleaning
catering...

depot workshop

citizens not travelling

HS rail network & stations scheme

land use planning

urban renewal

new regional developments

operator

services to be provided

HS train operation and maintenance

traffic regulation and control

rail infrastructure manager

Other services provided **at the HS station**, normally owned by the infrastructure rail manager are either subcontracted to third parties, such as commercial centres (eating, restaurants, shops) or office spaces, or provided by the operator (information, reservation, sales, ticketing) as well as waiting areas and other services. Some of them may be used not just by HS passengers, but also for other train services passengers or by citizens which are not travellers. The station is also an urban equipment in the neighbourhood.

These activities involve monetary transactions schematised on graph A2, the costs of each one of them relying strongly on the efficiency of the procedures followed for their provision. Monetary flows involved are not limited to the passenger paying the ticket fare to the operator. They continue to make a counterclockwise flow in the scheme presented, considering the city or region is subsidizing access modes (both public and private) to the station. (Taxes paid by citizens are not considered in the scheme)

At the same time, there is a level of quality of service produced in each one of them, reflected on graph A3, which is relevant for the key decisions taken by the different actors reflected in graph A4:

- choice of HS or not by the passenger
- type of services demanded by the operator to the infrastructure manager
- rail schemes developped by the infrastructure manager in the city/region
- transport system networks (public and private) provided by the city or region

5. The key issues

We have identified three key issues of the HS stations

The importance of access and transfer times

The **HS travel choice by the passenger,** in which is based the demand and feasibility of the whole HS system**,** involves a trade-off that considers on the one side the cost and convenience of schedule, and on the other side the total travel time from door to door.

Door to door travel time is composed by the access time toor from the station, the transfer time at the stations and the onboard time on the train.

The onboard time is almost an invariant of the HS system, much shorter than the conventional train, but much higher, for instance than the air travel between origin and destination.

The importance of the access and transfer times, which occur both at origin and destination of the trip, will never be sufficiently magnified. A 2h 30min on-vehicle trip on a HS train comes to a 3h30 door to door trip if access time at origin or destination is just 20 minutes, and transfer time, including security and access to platform control is only 10 minutes, which is about the best we can achieve.

Air travel passengers for a standard one hour flight, comparatively, even if airports are usually far less centric than HS stations, can use up to 45 minutes to reach the airport, 45 minutes for security, control and proceeding to the gate at the origin airport, still leaving 45 minutes to reach its destination point on arrival, for the same 3h30 door to door time.

Integration of the HS station in the regional and urban transportation system, and optimisation of the interchange between access modes and HS at the station are essential. The city and the infrastructure manager are responsible for a successful solution.

The importance of efficiency on the different systems involved

The other variable relevant for the choice of HS by the passenger is cost. Rail has an advantage, if the station is well deserved by regional or urban transit modes, of having a smaller access cost. Even taxis within the city area are more affordable for the HS station when compared to airports.

But the main part of the travel cost, which reflects the cost for the operator in providing the service, depends on the efficiency of the different activities needed to provide it. More or less efficiency at the stations, or on trips to and from the depot, implies the need of more or less rolling stock, tracks, switches, urban space, station building surface, and its associated maintenance costs, in a chain that finally is transferred to the potential customer.

On the other hand, the cost of enlarging a station to increase its capacity, in an urban environment, is enormous. The conception of an efficient HS rail scheme should involve rail managers, operators and city planners.

Urban revitalization: urban renewal and new developments at HS stations

HS stations are a landmark in the urban environment. An important asset for the city, they are not only equipments to be enjoyed by the neighbourhood. They are also a magnet to attract activity in the surrounding area, based in the vicinity of the station, both for generated trips to connect it with other cities along the HS lines, and for attracted trips from this large hinterland.

This opportunity can be used both within the city itself, and in a new location in the metropolitan area. Again, land use planning and rail scheme must be integrated, in order to take advantages of potential passenger demand and possible contributions to the huge costs of HS stations.

6. The benchmarking study

The study has followed a methodology that consisted in a selection of the cases to be included in two steps, combining geographic and cultural differences, different ways of coping with the main problems identified in cases where HS is already in operation or construction. Two sets of questionnaires referring to rail city scheme and actors points of view have been sent to the different undertakings.

The cities finally selected and analysed are:

Europe and North America:

- Barcelona
- Berlin
- London
- Madrid
- New York City
- Paris
- Roma

Asia:

- Ankara
- Beijing
- Seoul
- Taipei
- Tokyo

Data for each city and station included in the benchmarking study have been obtained from the answers to the questionnaires specifically designed for the study and sent to the different undertakings, meetings and on-site visits performed, and bibliography search by the consultant,

In order to increase data accuracy, preliminary versions of the graph formats and data have been sent to the undertakings for corrections, that have been included in the present version.

The study is presented in two sections:

- Analysed stations forms with data and graphic information, one form for the point of view of each actor
    - Passenger
    - City
    - Operator
    - Infrastructure manager
- Cross -Comparison of different items and indicators for the analysed stations

Followed by a set of conclusions and recommendations.

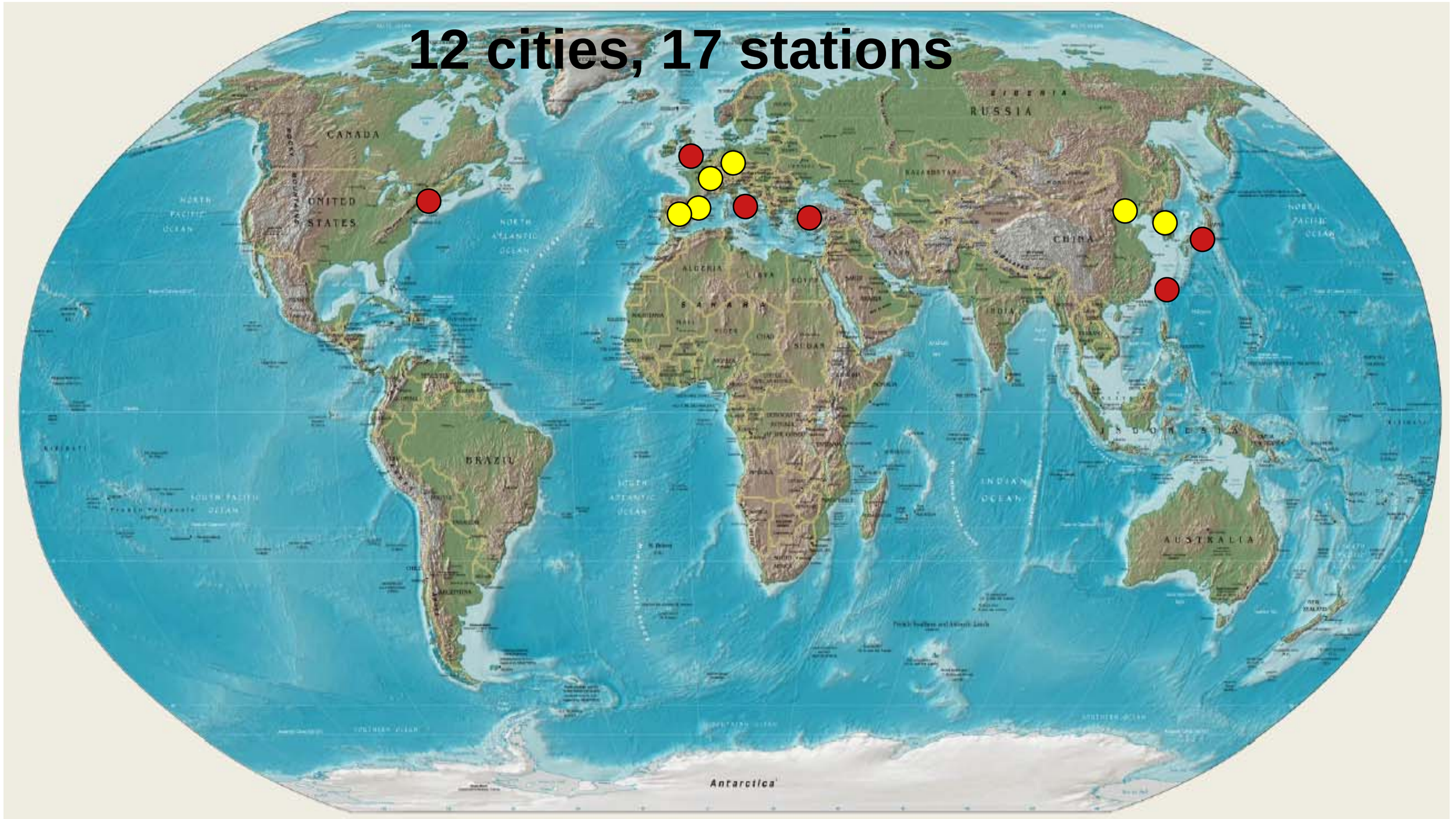
6.1 Cities and stations analysed

For each city, a short description is made of the key factors concerning the city and the region surface and population, the HS rail network and stations, date of HS operation start, and effects of HS arrival under the point of view of the actors identified: the passenger, the city, the operator, and the infrastructure manager.

The solution adopted for HS location, number of stations, integration in the regional and urban transportation systems, interchange at the station, urban developments associated, and future enlargements considered are presented.

For each station, one graph is presented for each one of the actors, including pictures, schemes, and values obtained from the questionnaires, on-site visits, and search from the consultant.

12 cities, 17 stations



Cities selected				On site visit			
• Ankara	• N.Y	• Taipei		• Barcelona	• Berlin	• Paris	
• London	• Roma	• Tokyo		• Beijing	• Madrid	• Seoul	

Barcelona

1. The city and the region

Barcelona city population is 1.673.000 inhabitants, with a surface of 101 km2, being one of the most densely populated European cities. Its density of 16.500 hab/km2 results from the constriction of the mountains, the coast, and the two rivers, Llobregat and Besós, that limit the city.

The metropolitan area population is 5,8 million inhabitants, the city population being therefore just 28% of the metropolitan area.

2. The rail network and stations

The region rail network is formed by mainly two cross lines, a coastal one and an interior one, that intersect each other at both ends of the city, forming four commuter corridors.

Although not completely separated, the coast line is mainly dedicated to commuter traffic, while the interior line shares both commuter and regional and long distance traffic. A fifth commuter line links the city to the north. The main long distance train station is SANTS, located on the western part of the city.

Presently there are two underground city tunnels, one used by both commuter and long distance lines, and the second one only for commuters. A third tunnel for HS services is under construction, to convert the present dead end scheme to a through scheme also for high speed services.

The cercanias commuter network has 5 lines and 108 stations, and transports 390.000 pax a day. Ferrocarrils de la Generalitat has a second commuter network composed of two lines, that transports 81 million passengers in 2008, around 220.000 a day

A metro network, composed of 5 lines transports 1, 2 million passengers daily.

3. The HS arrival

HS operations started in Barcelona on February 20, 2008, with the arrival of the AVE (Alta Velocidad Española) Madrid line, which was operative from Madrid to Tarragona since 2006.

The HS line is independent of the previous rail network (being UIC gage), and its arrival to SANTS station required extensive changes in yard and platform area, to provide 6 dedicated tracks with 3 platforms for HS service.

Nevertheless, two more stations were planned, and are now under construction in the Barcelona metropolitan area. One is SAGRERA, on the eastern part of the city, and the other is PRAT DE LLOBREGAT, in the vicinity of the airport, in the west part of the metropolitan area.

4. Effects of HS arrival

a. Passenger point of view

Although huge works were needed for insertion of the new line through the rail corridor into SANTS station, which is underground, accessibility for the passenger keeps being the same, which was pretty good, because no new public transport lines were created.

Transfer time is short and fast to commuter rail (adjacent tracks) deserving all the five commuter lines at the station. No transfer is needed to reach any of the 108 commuter stations of RODALIES. Interchange with metro lines 3 and 5 which deserves the station is somehow longer and not so convenient, but affordable (300 meters).

Station concourse was redesigned for the HS arrival, and new security and ticketing controls (simultaneous) were established in the concourse at street level. Before HS arrival, only commuter lines had access control by turnstiles with magnetic tickets, and long distance railway lines had direct access from the platform with no security or ticket control, that was made on board.

The new Sagrera station and through services stopping at Sants and Sagrera will increase accessibility and decrease access times, since both of them are connected to all commuter lines, but Sagrera will provide direct access to metro

line 9. Roughly half of the passengers of the city will save 5 min when travelling in the Madrid direction (15 min savings in arriving to the station, but 10 minutes extra time on HS line, allowing for the stop at Sants). The real advantage is when travelling on the Gerona and France direction, where they save the 15 min in arriving plus the 10 min on the HS line, therefore saving 25 min on access time.

The third Prat station, in the region, will provide airport access, as well as direct accesibility to the line for residents of the southern metropolitan area.

Graphs B1.1 and B.2.1 present the values of relevant parameters under the passenger point of view, and provides graphic information for Sants and Sagrera.

b. City point of view

Although an important extension of Barcelona metro network is under construction, no new lines were built to the SANTS station, taking advantage of the good previous accessibility.

The plaza around the station was remodelled, mainly because HS arrival required extensive civil works. No new urban developments took place, SANTS being a central location on a densely built city, as shown in graph B1.2.

The case is different for the new station under construction at SAGRERA, in the eastern part of the city, which is a big interchange in three levels with HS platforms on one, Commuter rail lines (all of them in another) and a bus station in the third, along with a new circular metro line. A depot for first level maintenance is also included. Extensive urban renewal and redevelopment around the station is undertaken, as shown in graph B2.2.

c. Operator point of view

The arrival of HS to SANTS implied a completely new and independent operation on the station, as well as the construction of a new depot for first level maintenance of the rolling stock. AVE rolling stock in Spain HS uses 3 different technologies, Talgo, Alstom and Siemens. RENFE, HS operator of the AVE system in Spain, operates also the commuter services (RODALIES) from SANTS station.

At the HS arrival the station hall was redesigned, and security and ticketing controls for platform access were implanted that did not exist before.

The extension to Sagrera station, under construction, will give the opportunity to establish through services, with two stops at Barcelona (and even a third at PRAT), as well as direct international services to Gerona and France.

One advantage of the through scheme is the possibility of not servicing the train at the station platform, as it is done now at Sants for cleaning and catering. The stop will acquire in the future the status of an intermediate stop.

This implies another advantage of the through scheme: being able to overcome the capacity constraints given by the dead end scheme. The six tracks dead end present configuration may allow for a 10 min interval between trains, assuming 30 minutes stop at the terminal, whereas the through scheme with the same 6 tracks, will allow train intervals of 5 or less minutes, needed for the important passenger growth expected with HS regional and international services.

Graphs B.1.3 and B.2.3 present the values of relevant paramenters under the operator point of view, and provides graphic information.

d. Rail infrastructure manager point of view

The new independent (by gage reasons) HS line, has required also a connection in UIC gage to the new depot, built by ADIF, the Spanish rail infrastructure manager.

The option for station choice is a mixed one. In the first phase, it uses the pre-existing SANTS station, as dead end station, with restructuration of the tracks to allocate 6 for HS, in UIC gage. In the second phase, after conclusion of the works of the underground city tunnel and the new SAGRERA station, the scheme will become a through system with two stations within the city and a third one in the metropolitan area, in the vicinity of the airport.

All three stations will be interchanges with the commuter network and the metro system, and a bus station will be included as well in SAGRERA interchange.

There was no need of a new traffic control centre, the line being regulated from the HS Zaragoza traffic control centre.

Graphs B.1.4 and B.2.4 summarize the relevant parameters under the railway infrastructure manager point of view, and provides graphic information.

Security control and info panels

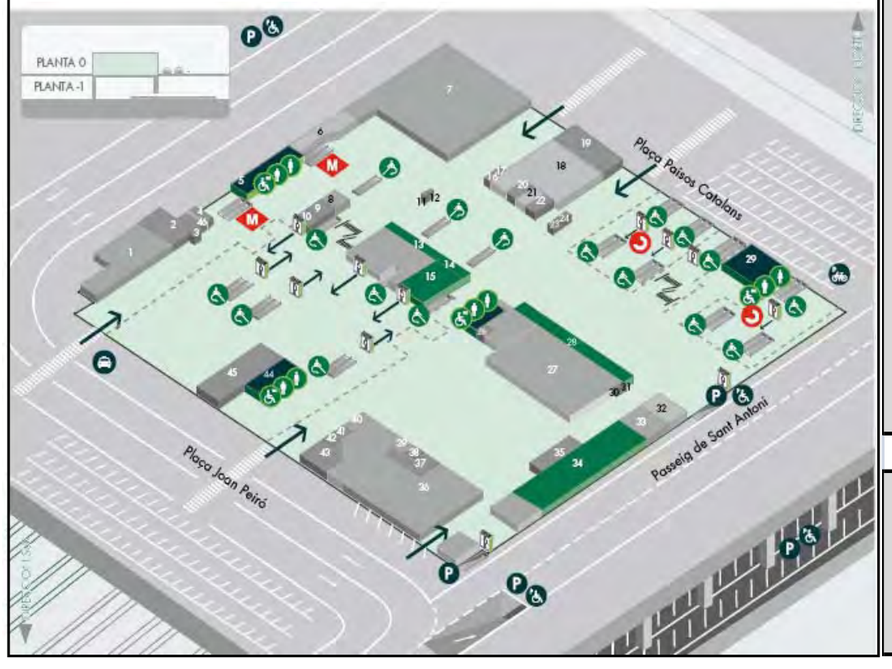
Access gates to the platforms

passenger

- Same accesibility to HS, the station keeping its location
- Station hall redesigned
- Easy/fast transfer to commuter rail, not so good to metro
- New additional services appeared with HS arrival: vip lounge, new boarding area for HS (60 sq m), new services center, 12 autochecking machines...
- Access mode of HS passengers: 23.7% taxi, 19.7% metro, 13.2% commuter, 11% walking.

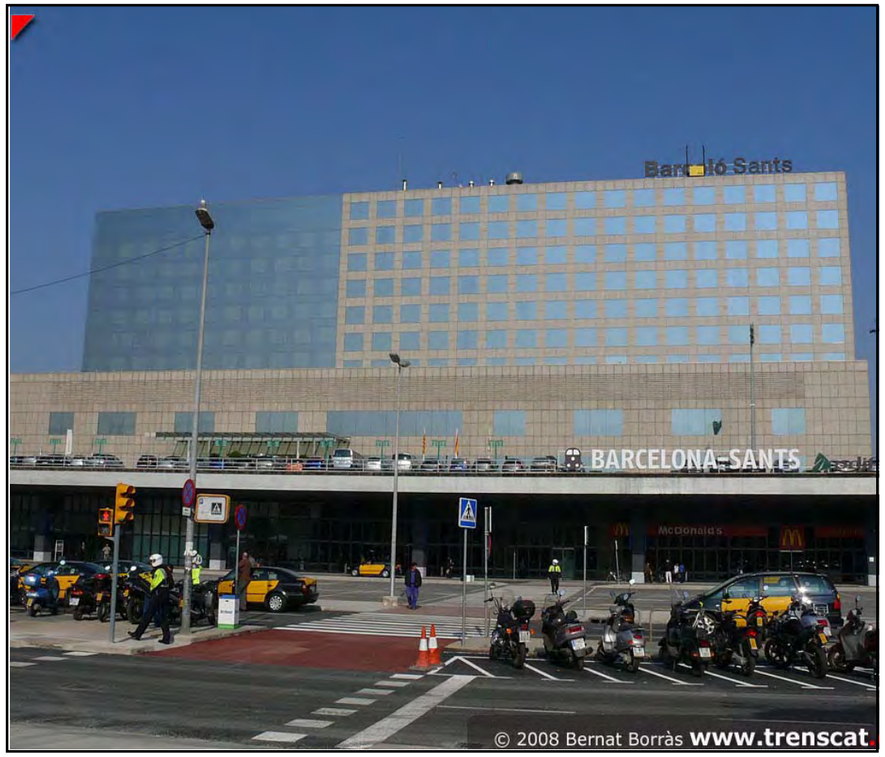
Parking at the station

Station accessibility



Accessibility	High Speed stations in the city	2
	Total Region High Speed stations	3
	Nr of subway lines at the station	2
	Nr of commuter lines at the station	7
	Nr of bus routes at the station	9
	Subway st reached without transfer	47
	Commuter st reached without transfer	108
	Nr of public parking lot spaces	1.345
	Car parking fare (€/day)	25,25
	Bike renting fare (€/day)	30 €/year
	Rent a car companies	3
	Security Control?	yes
	Ticket control?	yes

Travel fares	First city	Madrid
	travel fare by High Speed train (€)	54
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	83
	travel fare by plane (€)	41



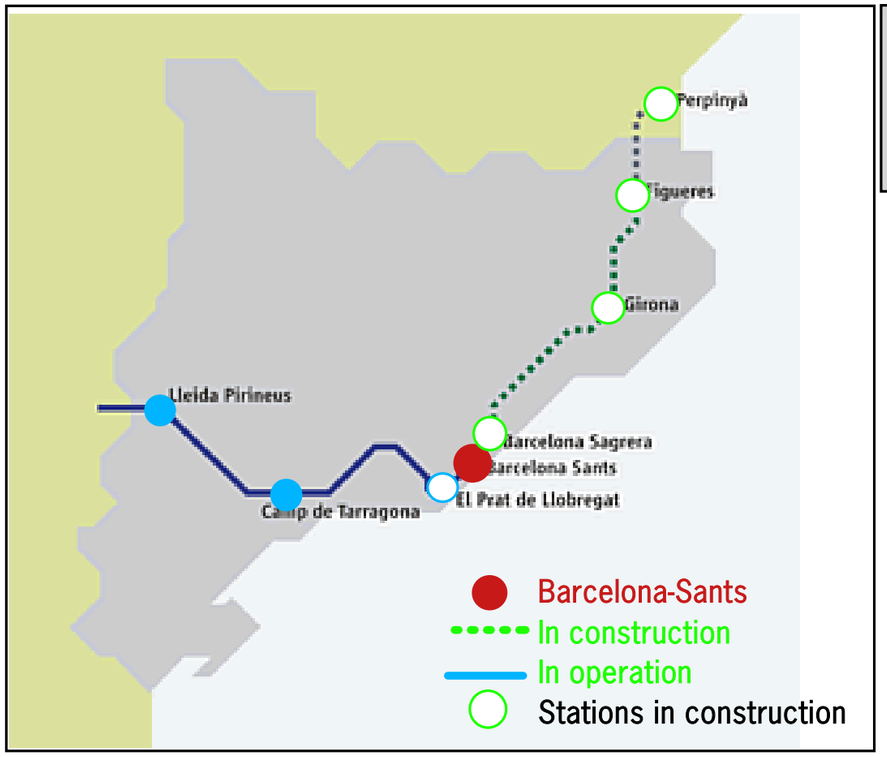
Barcelona subway

city

- Arrival of HS contributed to new development of the city, with more shopping/restaurant areas
- Urban landscaping of Sants Plaza
- Plans for huge urban renewal on Sagrera station
- Through tunnel under construction

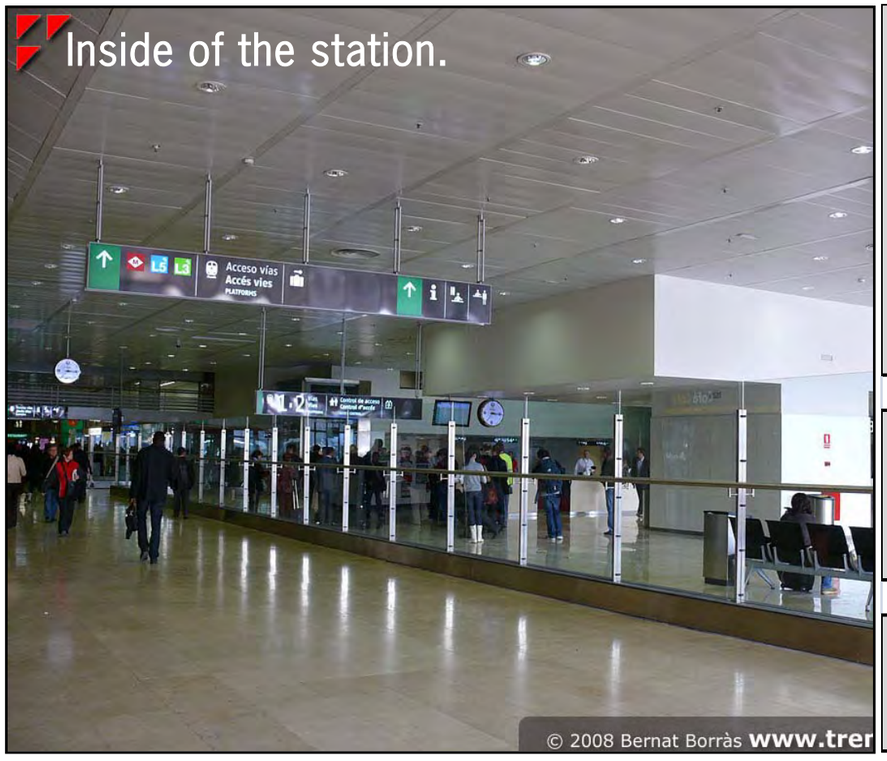
Barcelona Commuter Rail

City numbers	City population	1.673.075
	City area (Km2)	101,4
	City density (hab/Km2)	16.499,80
	Region population	4.150.000
	Region area (Km2)	636
	Distance City Hall-Station (Km)	4
	International visitors a year	6.455.000
	Domestic visitors a year	
PU T	Metro ridership in the city area (pax/day)	1.266.000
	Comm ridership in the city area (pax/day)	610.000
	Bus ridership in the city area (pax/day)	748.333
	Tram ridership in the city area (pax/day)	80.000
Travel time	First destination	Madrid
	travel time by High Speed train	2hr40min
	travel time by Conventional train	9hr(bef HS)
	travel time by Car	6hr30min
	travel time by plane*	1hr15min
	*only travel time	
	Urban develop. Total area planned (Ha)	-



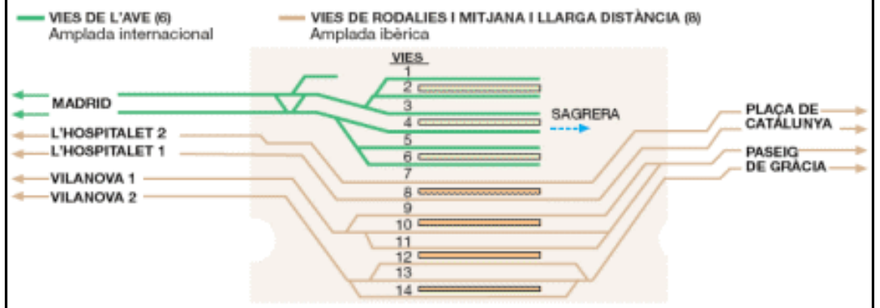
operator

- High Speed services started in 2008
- Rearrangment of station hall and platforms to dedicate 6 for HS (UIC gage)
- New tunnel to Sagrera will change operation
- Operator must paid a toll of 0.83 € per traveller to infrastructure manager for use of the station



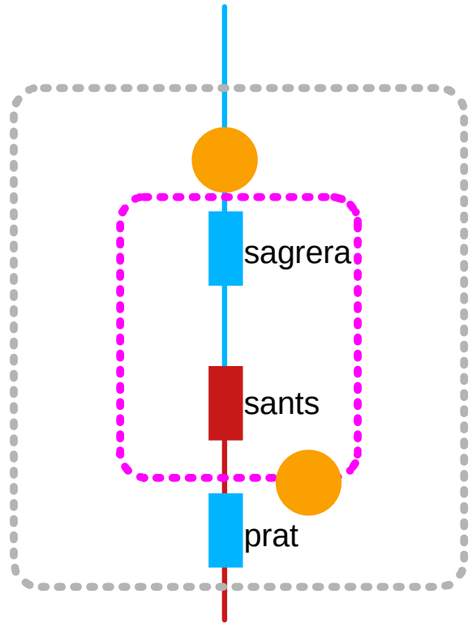
Line	Operator	RENFE
	Services type	Dead End
	Opening date	20-feb-08
	High Speed lines from/to station	1
	High speed total length (Km, country)	1.599
	HS Services a day (both ways)	76
	Passengers a day	7.224
	% city HS trains going through this station	100
	First destination	Madrid
	HS Services a day (both ways)	54
	% city trains going to this destination	71,05%
Trains	Maximum speed (Km/hour)	300
	Length (m)	200
	Cars per train	8
	Total seats	404
	Platform ocupancy time (min)	46
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	-

Platform level: 6 HS tracks



infra manager

- High Speed arrival required exclusive dedication of 6 tracks (UIC gage)
- Capacity increase supoused two more tracks for travellers
- Ticket hall and security: control rearranged
- New Sagrera and Prat stations under construction
- There will be a commercial/offices surfaces increase to 72.800 sq m.



in operation under construction

Commercial area

Tracks	Railway Infra manager	ADIF
	HS tracks yard	Through
	Station location	Underground
	Number of tracks	14
	Tracks used for High speed	6
	High Speed trains/day both ways	76
	Length of platforms	442

Areas	Station footprint (sq mt)	39.728
	Total area (sq mts)	108.900
	Platforms area (sq mt)	16.304
	Commercial area (sq mt)	3.685
	Number of Shops	22
	Offices area (sq mt)	15.276
	waiting area+pax services (sq mt)	13.000
	Parking area (sq mt)	29.612

Depots	Depot footprint (sq mts)	695.000
	Daily movements st-depot	102
	Depot-station distance (Km)	5,5

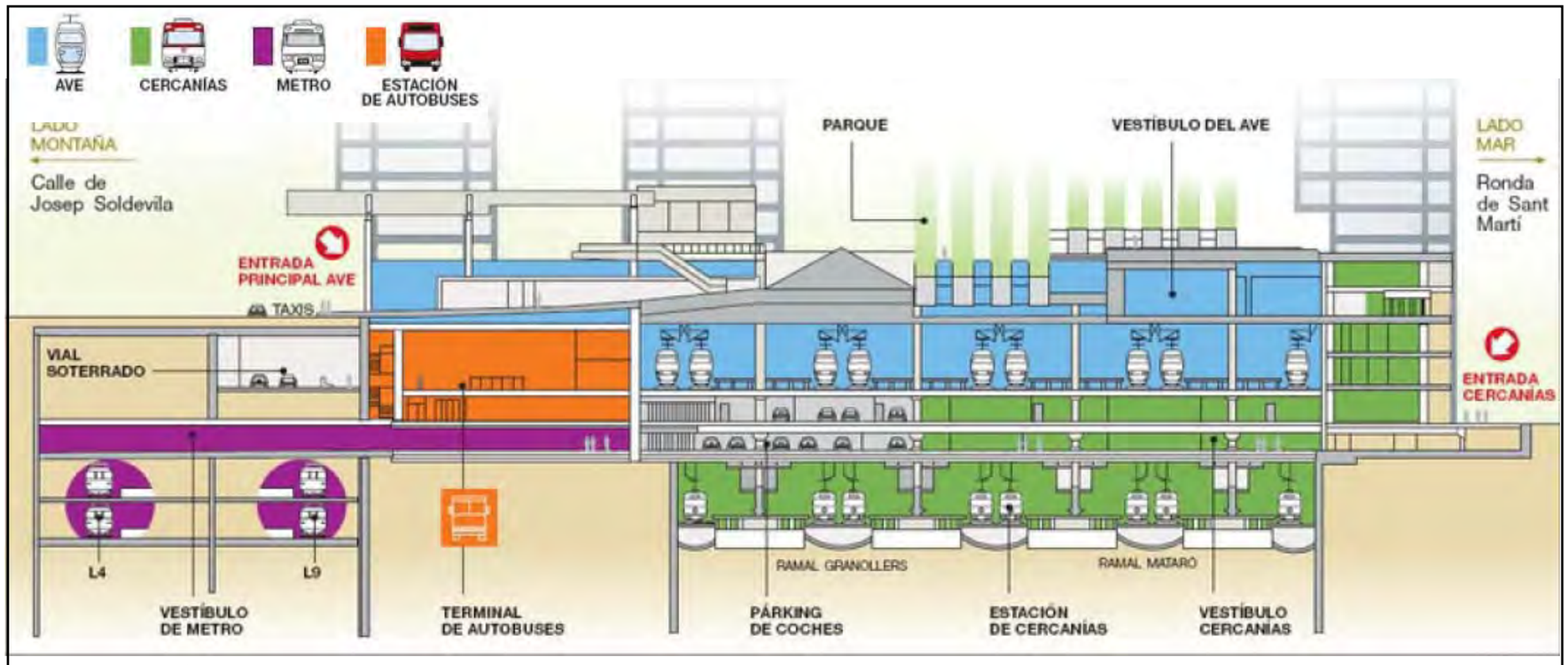
€	Station construction costs (mill €)	264

Future subway connections

passenger

- Station under construction
- Vertical services will provide easier movements and transfers
- Subway line L4 and future L9
- Station expected passenger volume:

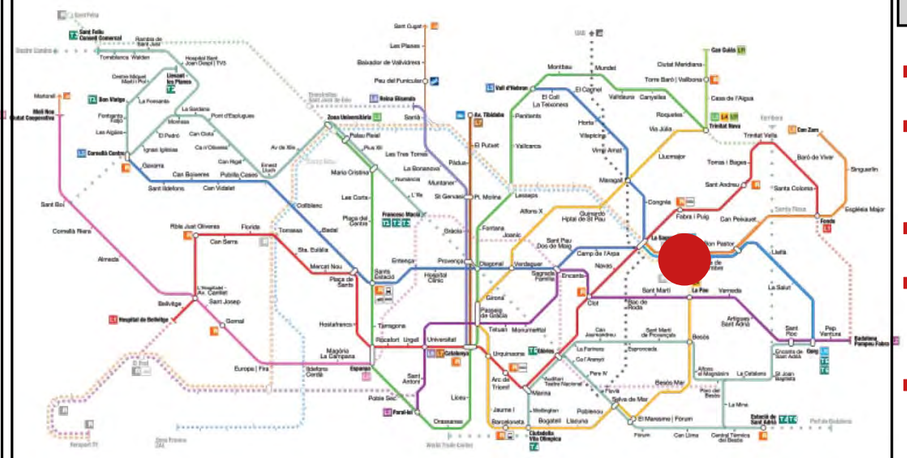
	ENTRADAS
CERCANÍAS	39.000.000
AVE	22.500.000
METRO	15.500.000
BUS	9.200.000
TAXI	5.000.000
COCHES	500.000
MOTOS	200.000



Accessibility	High Speed stations in the city	2
	Total Region High Speed stations	3
	Nr of subway lines at the station	3
	Nr of commuter lines at the station	2
	Nr of bus routes at the station	2
	Subway st reached without transfer	70
	Commuter st reached without transfer	62
	Nr of public parking lot spaces	2.500
	Car parking fare (€/day)	-
	Bike renting fare (€/day)	30 €/year
	Rent a car companies	-
	Security Control?	yes
	Ticket control?	yes

Travel fares	First city	Madrid
	travel fare by High Speed train (€)	54
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	83
	travel fare by plane (€)	41

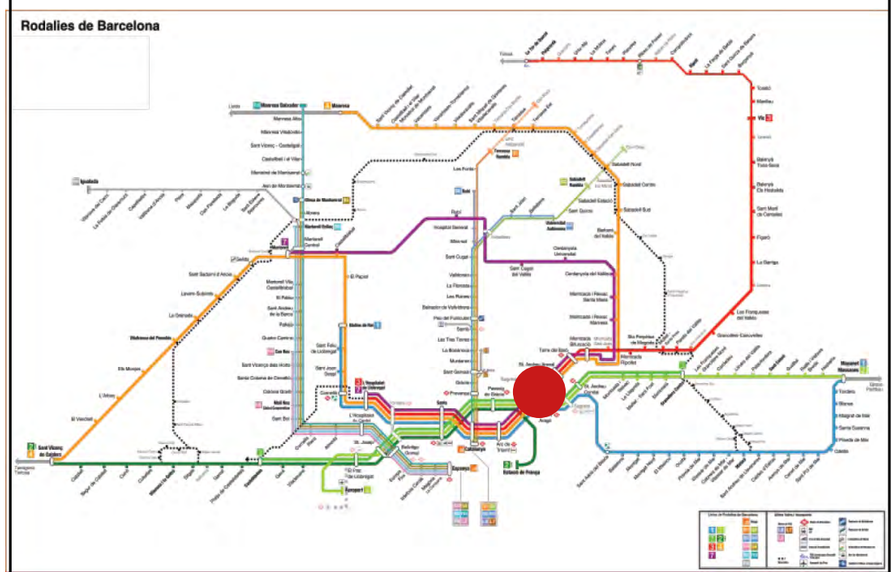
Barcelona future subway network

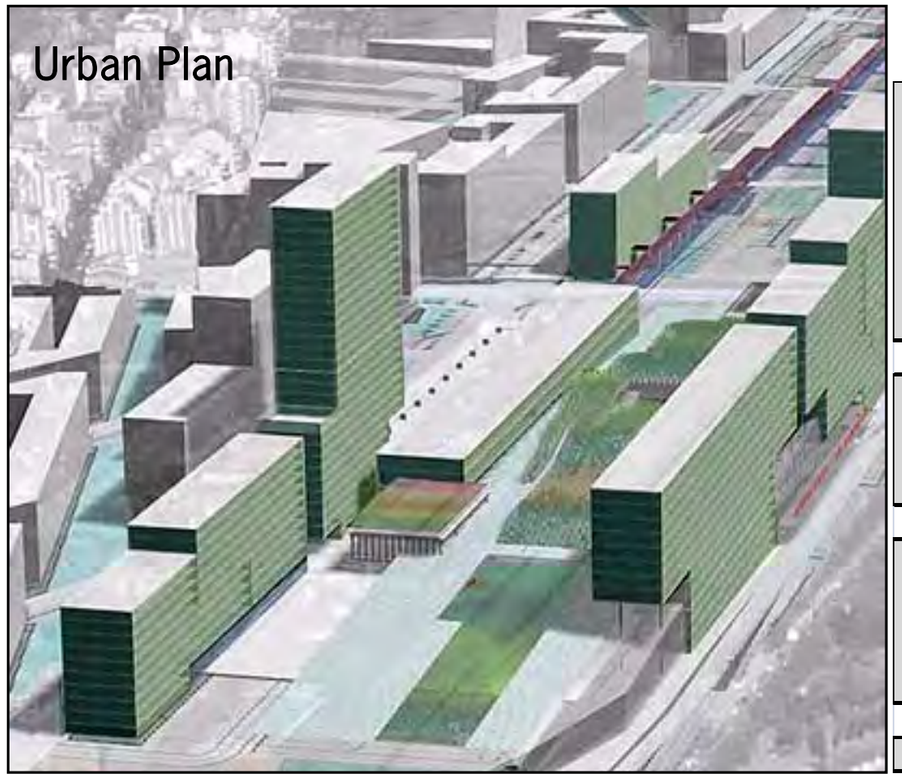


city

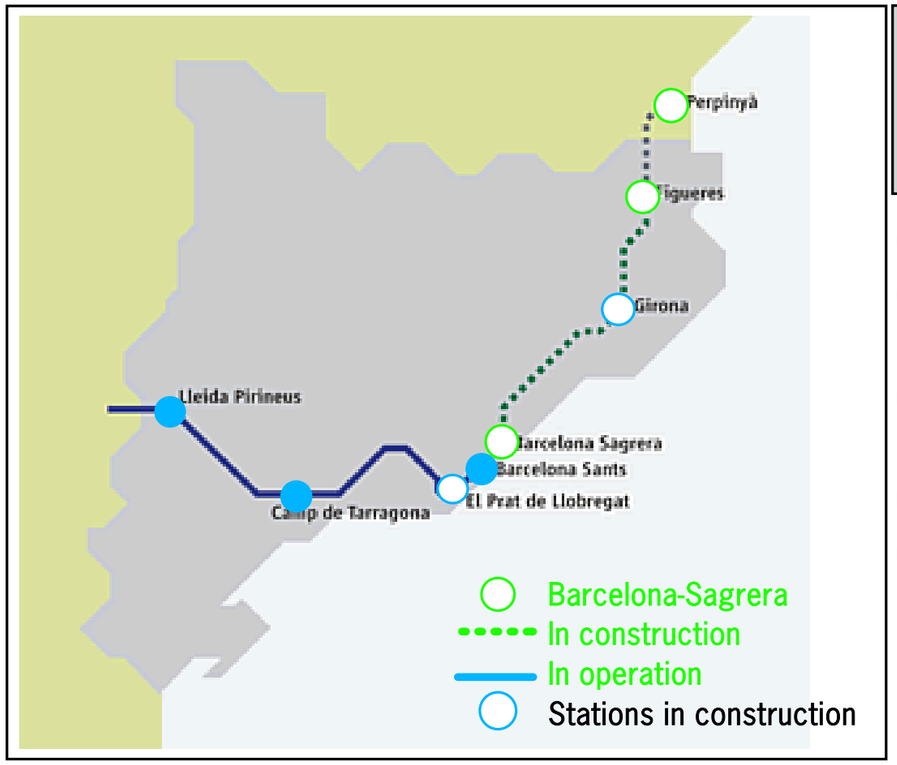
- Station under construction
- Excellent connections with commuter, subway and bus
- Will be the biggest building in the city
- Huge urban development Sant Andreu-la Sagrera
- Rail infrastructure will be covered by a big park (40 Ha)
- City will have two HS stations:
  - ✓Better accessibility
  - ✓Lower number of car movements
  - ✓Better connections with bus and subway networks

Future Commuter Network





City numbers	City population	1.673.075
	City area (Km2)	101,4
	City density (hab/Km2)	16.499,80
	Region population	4.150.000
	Region area (Km2)	636
	Distance City Hall-Station (Km)	5
	International visitors a year	6.455.000
	Domestic visitors a year	
PU T	Metro ridership in the city area (pax/day)	1.266.000
	Comm ridership in the city area (pax/day)	610.000
	Bus ridership in the city area (pax/day)	748.333
	Tram ridership in the city area (pax/day)	80.000
Travel time	First destination	Madrid
	travel time by High Speed train	2hr40min
	travel time by Conventional train	
	travel time by Car	6hr30min
	travel time by plane*	1hr15min
	*only travel time	
	Urban develop. Total area planned (Ha)	164



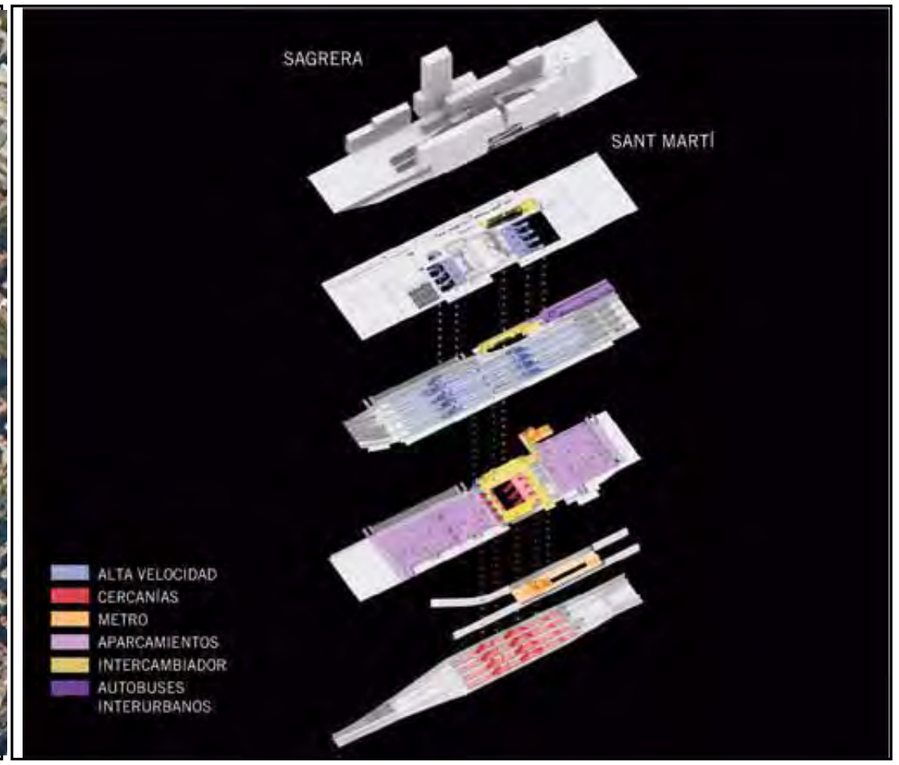
operator

- Station under construction
- Future high speed line through Figueres to France
- Termini station for all trains comming from the peninsula
- All trains will stop at both stations
- New tunnel linking both stations will increase capacity considerably, with more trains a day

Train at the station

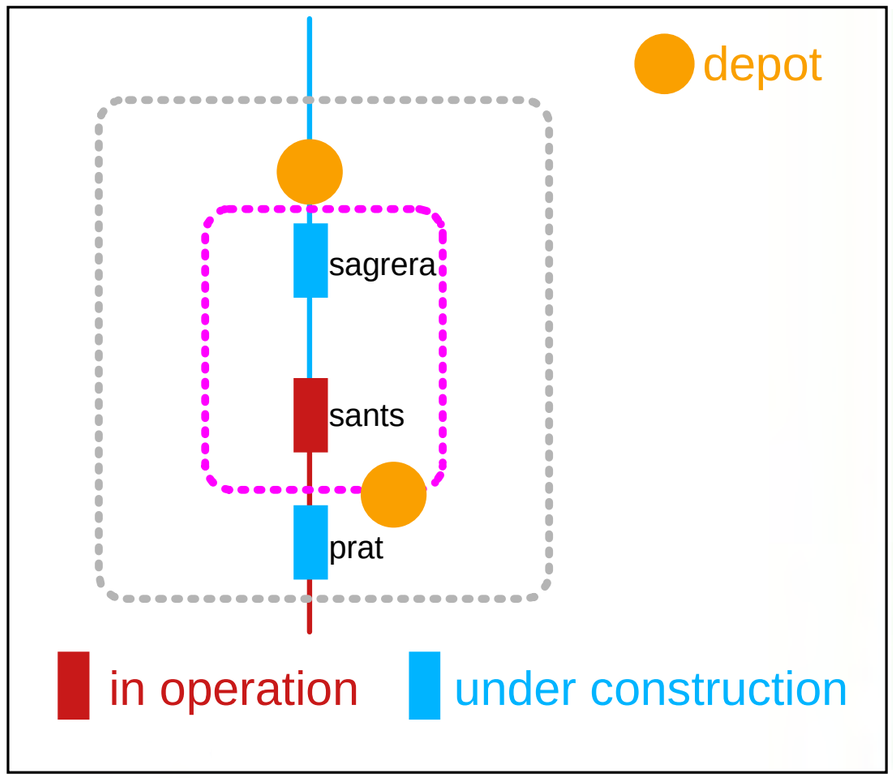
Inside the station

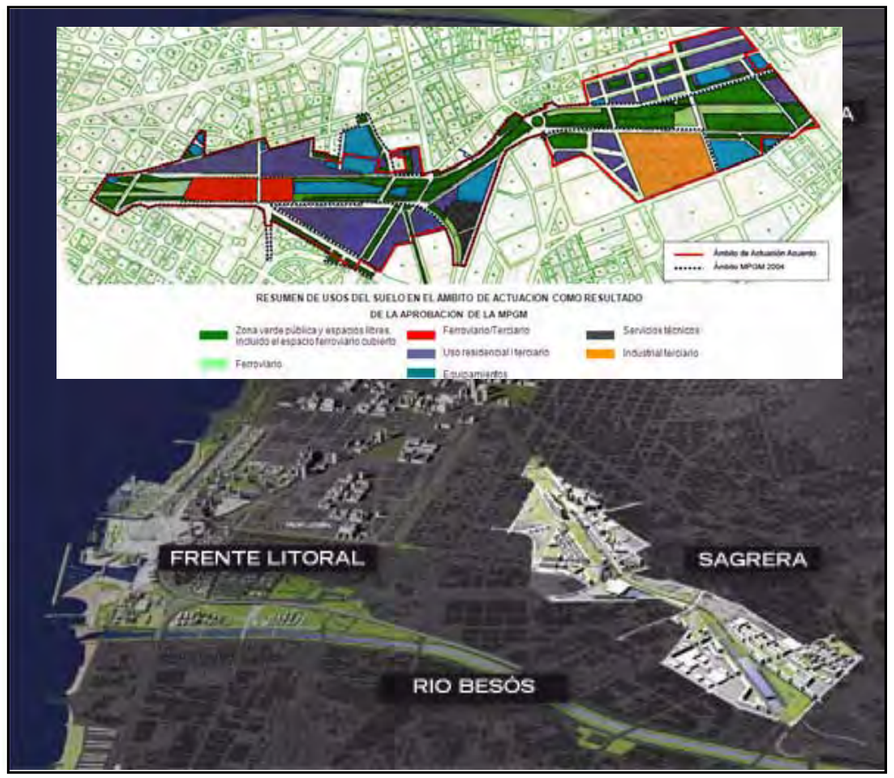
Line	Operator	RENFE
	Services type	Through
	Opening date	-
	High Speed lines from/to station	2
	High speed total length (Km, country)	1.599
	HS Services a day (both ways)	76
	Passengers a day	62.500*
	% city HS trains going through this station	100
	First destination	Madrid
	HS Services a day (both ways)	54
	% city trains going to this destination	71,05%
		*expected val
Trains	Maximum speed (Km/hour)	300
	Length (m)	200
	Cars per train	8
	Total seats	404
	Platform ocupancy time (min)	-
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	-



infra manager

- Station under construction
- 10 tracks for high speed lines
- total project area: 164 Ha
- future city business center:
  - ✓ 150.000 sq m offices and commerce
  - ✓ 30.000 sq hotels
- Sants and Sagrera stations linked by a 5.6 Km tunnel through the city
- Old tunnel only for Cercanias services





Tracks	Railway Infra manager	ADIF
	HS tracks yard	Through
	Station location	At grade
	Number of tracks	18
	Tracks used for High speed	10
	High Speed trains/day both ways	76
	Length of platforms	400
Areas	Station footprint (sq mt)	180.000
	Total area (sq mts)	320.000
	Platforms area (sq mt)	36.920
	Commercial area (sq mt)	10.607
	Number of Shops	50
	Offices area (sq mt)	6.422
	waiting area+pax services (sq mt)	24.373
	Parking area (sq mt)	75.000
Depots	Depot footprint (sq mts)	218.700
	Daily movements st-depot	102
	Depot-station distance (Km)	5
€	Station construction costs (mill €)	677

Berlin

1. The city and the region

The city of Berlin has a population of 3,431,700 registered inhabitants in an area of 892 sq km. The city's population density is 3,848 inhab/sq km.

Berlin urban area stretches beyond the city limits and comprises about 3.7 million people while the metropolitan area of the Berlin-Brandenburg region is home to about 4.3 million in an area of 5,370 sq km.

The city population is 81% of the population of the metropolitan area.

2. The rail network and stations

Berlin rail network has been modified over the years, but has maintened his famous old S-Bahn distribution called “dog head", with a 4 track ring rail all over Berlin City, and two lines crossing it north-south and west-east.

This scheme was initially shared by three different types of services: commuter (S-Bahn), regional and long distance trains. Long distance lines ended in 7 cul-de-sac termini stations dedicated to the different lines.

During the period of the Berlin wall, the previously so well connected network lost its significance.

After reunification, and between 1991 and 2005, a new rail concept for Berlin was decided, “the pfilzkonzept”, (mushroom) recovering old S-Bahn network, and using a similar concept for the ICE trains, to become also through services in all directions. While it was being built, Berlin two main long distance stations were Zoologischer Garten and Berlin Ostbahnhof.

A second four track north-south line was constructed, 3.5 Km tunnels under the Spree River and the Tiergarten, that intersected west-east existing four tracks with S-Bahn line at the new Hauptbahnhof station, finished in 2006. Deutsche Bahn decided to run all regional and long distance trains through these tunnels and Hauptbahnhof became Berlin main station. linking up all the long-distance lines with S-Bahn and regional trains.

Presentlyy, Berlin rail network consists of 6 subnetworks: S-Bahn (commuter), U-Bahn (subway), Tram system, Regional and Long distance trains (ICE), with the characteristics shown in the table below:

System	Lines	Lenght (km)	Stations	Pax/day
S-Bahn	15	331	165	1.300.000
U-Bahn	9	144,2	170	1.600.000
Tram	22	189,4	377	560.000
Regional	23	> region	>region	150.000
Long distance	5	>region	7	39.000

3. The HS arrival

HS operations started in Berlin on December 12, 2004, with the arrival of the first ICE high speed train at Zoologischer Garten station coming from Hamburg.

The journey time Hamburg- Berlin decreased from 3:55 h to 1:30 h.

Berlin ICE Hamburg-Berlin stops were Zoologischer and Ostbahnhof in the city area, both with 146 trains a day, and Spandau in the metropolitan area, with 66 trains a day.

Hauptbahnhof Central Station and the new tunnels started operation on may 2006. Strong operational changes rerouted all lines, and included two new high speed lines comming from Hannover and Frankfurt/Nurnberg. Berlin city ICE stations became Hauptbahnhof, Gesundbrunnen, Ostbahnhof and Sudkreuz. Spandau continued being the metropolitan HS station.

4. Effects of HS arrival

a. Passenger point of view

The arrival of high speed to Berlin had two different phases. First when ICE trains coming from Hamburg started operation in Zoo Station in 2004. Second when all ICE trains could use the new terminal and tunnels.

Accesibility in the first phase was already pretty good. Trains stopped at Zoo and at Ostabanhnof stations in Berlin City. No changes were made in these stations in the first phase, when high speed arrived. Zoologischer Garten maintened its good public transport connections (4 S-Bahn lines, 3 U-Bahn lines, direct airport connection, most of the regional lines, and several bus routes) and so did Ostbahnhof (4 S-Bahn lines, direct airport connection, most of regional trains and several bus routes).

When HS services started going through the Tiergarten tunnel and Berlin Hbf station opened in 2006, accessibility for the passengers changed. High speed network was reestructurated, new ICE lines started operation and Zoo was not a stop of these lines any more.

Berlin Hauptbahnhof had perfect and convenient transfer with the S-Bahn and with regional trains. Access and transfer times were significantly reduced; the station has better accessibility than Zoo with all means except U-Bahn, (only one short 3 stop line U55, not yet connected to the rest of the network).

Presently, ICE trains stop at least in three of the 5 Berlin high speed stations: Spandau, Hauptbahnhof, Gesundbrunnen, Ostbahnhof and Sudkreuz. This has increased passenger's accessibility and reduced transfer times to S-Bahn. Each passenger can select which one of the three stations is closer, no matter which is the destination wanted. Transfer is always possible at Hautpbahnhof.

The 5 stations seen together are connected to 14 of the 15 total S-Bahn lines and all network stations but three are connected without transfer with at least one ICE station. This is not the case with subway. Only Berlin Hauptbahnhof, Spandau and Gesundbrunnen have direct connexion with the U-Bahn network. Parking spaces are not intensely used, the 860 spaces being used mainly by car rental services.

Besides accesibility, passengers enjoy the aesthetics, natural light, additional services and efficiency of the new station, as shown in graph B.3.1

b. City point of view

Berlin Hauptbahnhof is the main railway station in Berlin. Since its construction in 2006, it has become an emblematic building of the city. It is situated in a strategic central position, near the Reichgstag, the Spree River, and Government buildings.

A public urban development plan is being built around Hauptbahnhof station, as shown in graph B.3.2. The first phase includes at the station itself 40.000 square meters in two towers for DB offices, and a hotel adjacent to the station.

Remaining areas are planned to be built in the next 20 years. Construction of the connection of U-Bahn U 55 to line U5 is scheduled to start by 2013.

c. Operator point of view

The construction of the new terminal Berlin Hauptbahnhof and the decision of running all regional and ICE trains through Tiergarten tunnel implied a completely new and independent operation on the high speed network and a reestructuration of all the services that are now through services, not serviced at stations.

Three ICE lines with through services stopping at three of the five DB stations in Berlin, allowed operator to offer more services, carry more passengers using less number of trainsets, and give the passengers the option of getting off/on the train in more city points, making the transfer shorter and more convenient.

The new rail concept for Berlin and the Greater Berlin Area that was launched on 28 may 2006 offers improved services, shorter journey times, more convenience and reliability. With the inauguration of Berlin Hauptbahnhof, changing HS trains, regional or commuters, has become much easier.

Berlin Hauptbahnhof is Europe's largest crossing station. DB is anticipating a six million increase in long-distance passengers to 19 million by the year 2010. A single depot in Rummelsburg is connected to all HS lines using the doghead ring.

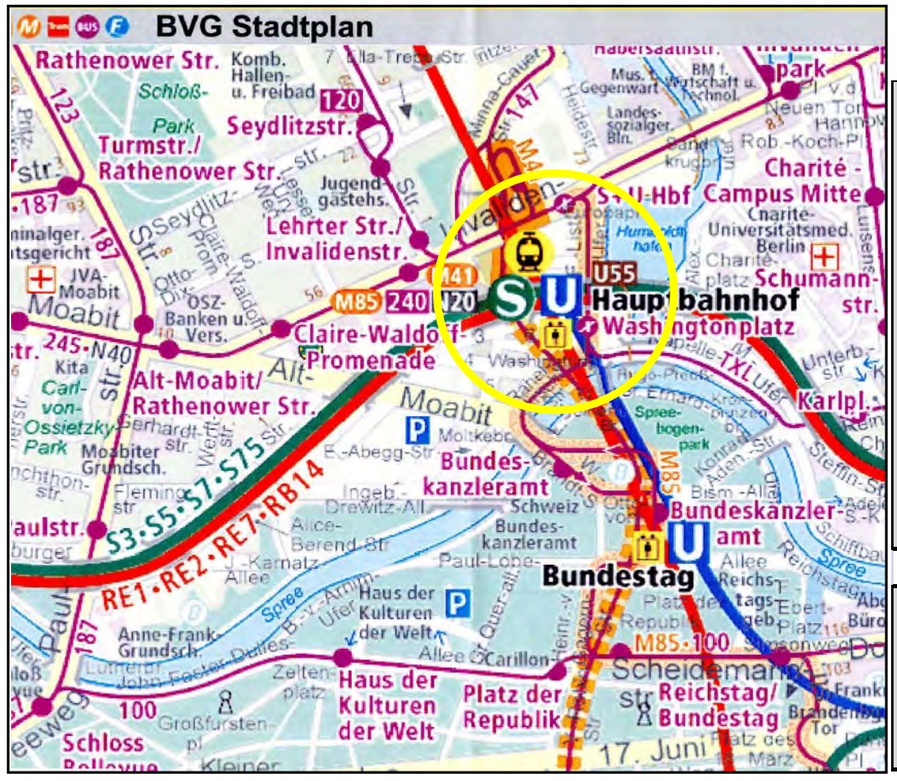
d. Infrastructure manager point of view

Covering a total area of 15,000 square metres, commercial space was created in the New Berlin Hauptbahnhof for a business mix of 80 shops, catering outlets and service facilities. Rental premises are available for a wide variety of services - ranging from car rental and hair stylists to postal services and travel agents.

Direct integration of the shopping and catering areas ensures a high level of attention and demand at the 3 intermediate levels, as shown in graph B.3.4.

passenger

- Better accessibility from S-Bahn and Regional trains
- Only one short metro line U55
- Perfect and convenient transfer
- Reduced access and transfer time



Accessibility	High Speed stations in the city	4
	Total Region High Speed stations	5
	Nr of subway lines at the station	1
	Nr of commuter lines at the station	11
	Nr of bus routes at the station	7
	Subway st reached without transfer	2
	Commuter st reached without transfer	143
	Nr of public parking lot spaces	860
	Car parking fare (€/day)	20
	Bike renting fare (€/day)	9
	Rent a car companies	4
	Security Control?	no
	Ticket control?	no

Travel fares	First city	Hannover
	travel fare by High Speed train (€)	61
	travel fare by Conventional train (€)	41
	travel fare by Car (€)	65
	travel fare by plane (€)	-

Berlin subway. U-Bahn

Hauptbahnhoh station
Other HS stations in the city

city

- Urban renewal around the station area and Spree river
- Only a hotel building built yet
- One short metro line U55 to be connected to line U5 by 2013

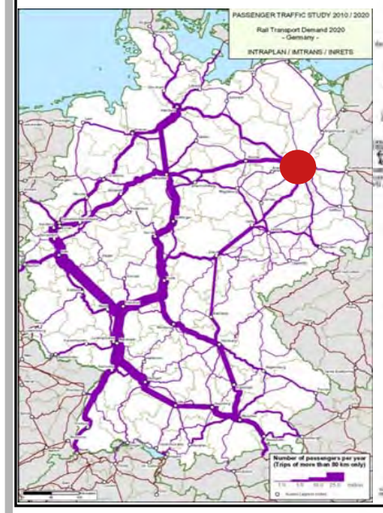
Berlin S-Bahn

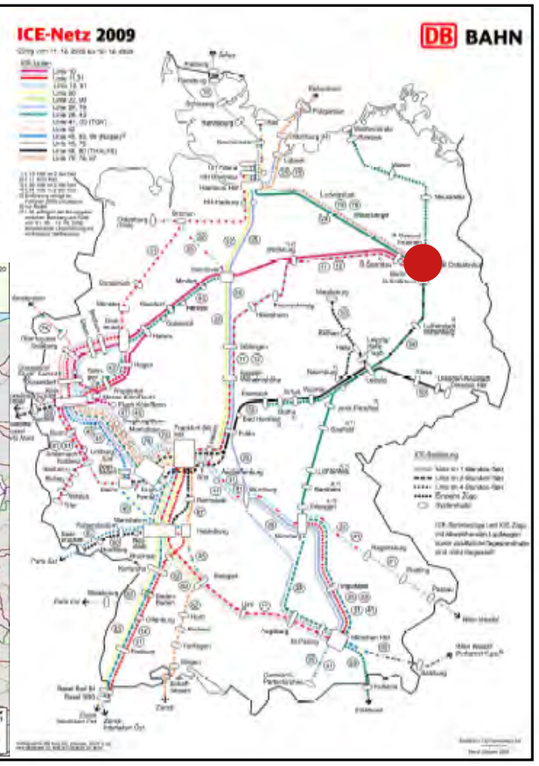
Hauptbahnhoh station
Other HS stations in the city

Urban plans in the station area

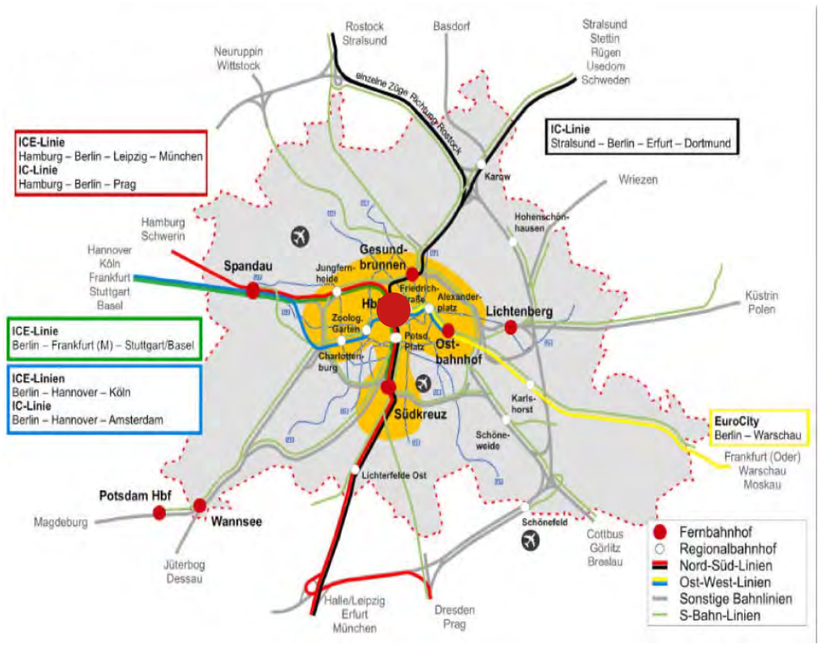
City numbers	City population	3.431.700
	City area (Km2)	892
	City density (hab/Km2)	3.848
	Region population	4.300.000
	Region area (Km2)	5.370
	Distance City Hall-Station (Km)	3
	International visitors a year	2.750.000
	Domestic visitors a year	5.150.000
PU T	Metro ridership in the city area (pax/day)	1.600.000
	Comm ridership in the city area (pax/day)	1.300.000
	Bus ridership in the city area (pax/day)	1.300.000
	Tram ridership in the city area (pax/day)	560.000
Travel time	First destination	Hannover
	travel time by High Speed train	1hr30min
	travel time by Conventional train	5hr
	travel time by Car	2hr30min
	travel time by plane*	-
	*only travel time	
	Urban develop. Total area planned (Ha)	27

Germany HS Network



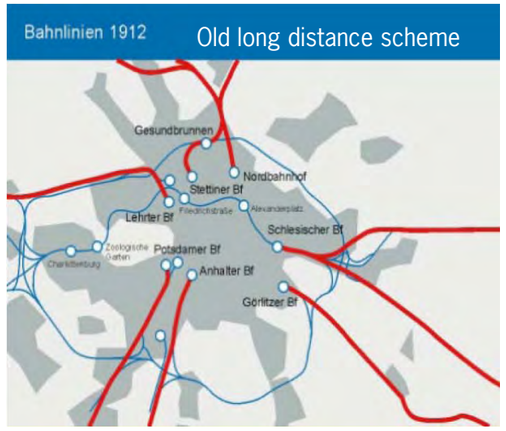


Berlin HS Network



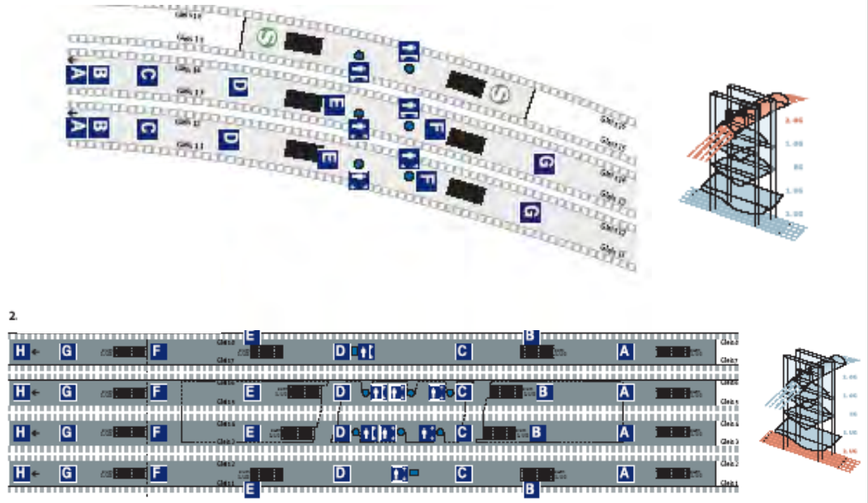
operator

- Complete services change after new station built (2006)
- Through HS services with three stops in Berlin



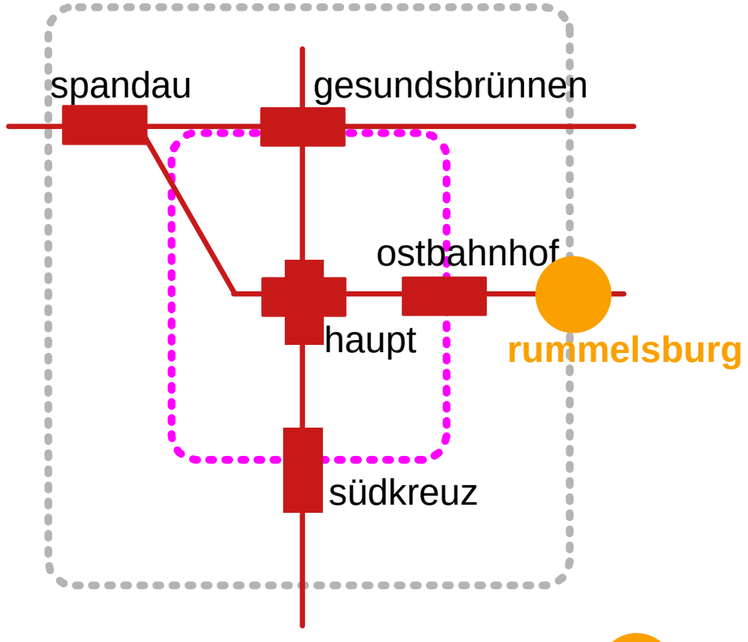
Line	Operator	DB
	Services type	Through
	Opening date	12-dec-04
	High Speed lines from/to station	3
	High speed total length (Km, country)	1.285
	HS Services a day (both ways)	232
	Passengers a day	39.000
	% city HS trains going through this station	100
	First destination	Hannover
	HS Services a day (both ways)	100
	% city trains going to this destination	43,10%
Trains	Maximum speed (Km/hour)	300
	Length (m)	200
	Cars per train	8
	Total seats	415
	Platform ocupancy time (min)	15
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	no

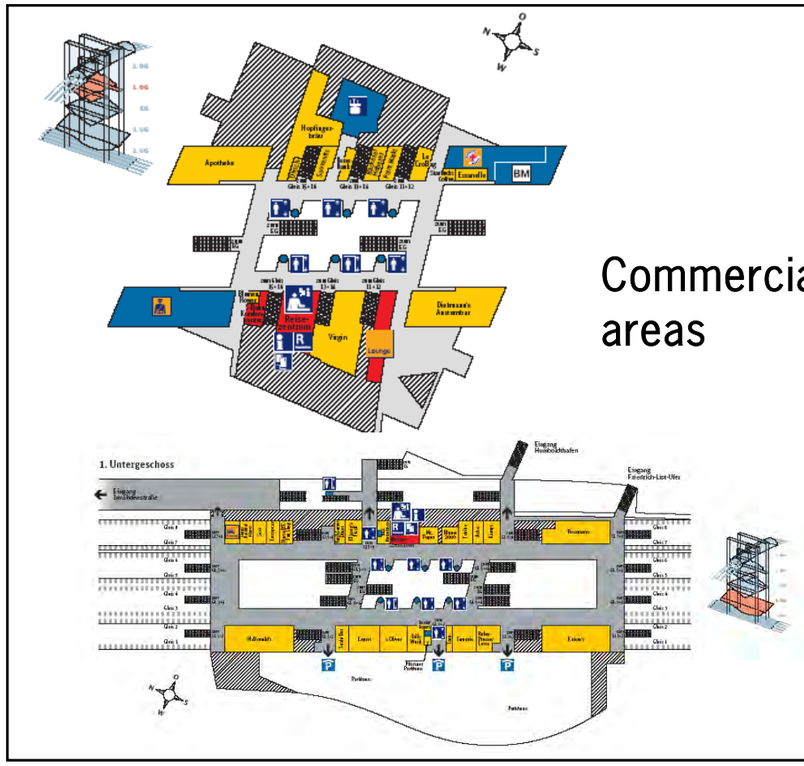
Two platform levels:
100 ICE trains/day in 12 tracks



infra manager

- Change of rail network scheme moving to more efficient through Pfilzconcept
- New office buildings and shops





Commercial areas

Tracks	Railway Infra manager	DB
	HS tracks yard	Through
	Station location	Elev/underg
	Number of tracks	18
	Tracks used for High speed	12
	High Speed trains/day both ways	100
	Length of platforms	430

Areas	Station footprint (sq mt)	27.500
	Total area (sq mts)	70.000
	Platforms area (sq mt)	27.000
	Commercial area (sq mt)	16.000
	Number of Shops	80
	Offices area (sq mt)	40.000
	waiting area+pax services (sq mt)	15.000
	Parking area (sq mt)	

Depots	Depot footprint (sq mts)	370.000
	Daily movements st-depot	75
	Depot-station distance (Km)	10

€	Station construction costs (mill €)	1.000

London

1. The city and the region

It is the UK's largest and most populous metropolitan area and the largest urban zone in the European Union by most measures

London city covers an area of 1,579 sq km, and it has a population over 7.500.000 inhabitants. The population density, 4,761 inhab/sq km, is more than ten times that of any other British region.

The metropolitan area population is almost 14 million inhabitants, the city populations being therefore just 54% of the metropolitan area.

2. The rail network and stations

London rail network consists of 11 lines leaving central London City from 11 main stations: St Pancras International, King's Cross/Moorgate, Liverpool Street, Fenchurch Street, Cannon Street/Charing Cross, London Bridge, Waterloo, Victoria, Paddington, Marylebone and Euston.

The network is used by both commuter and long distance trains. High Speed One, London high speed line (the only one existing presently in UK), is shared by international services to Paris/Brussels and domestic services to the Meadway Towns.

Commuter trains transport 2.100.000 pax a day. Besides, London underground, composed of 13 lines, transports 2.900.000 pax daily, and the Tramlink, with 38 stations, transports 100.000 passengers a day.

3. The HS arrival

Although Channel tunnel started services in 1994. The new infrastructure "Section 1" of the Channel Tunnel Rail Link opened on 28 September 2003. It was a 74 km section of high-speed track from the Channel Tunnel to Fawkham Junction in north Kent. The section's completion cut the London–Paris journey time by around 21 minutes. In safety testing on the section prior to opening, a new UK rail speed record of 334.7 km/h was set.

After Fawkham Junction, Eurostar trains continued their route using suburban lines to enter London, arriving at Waterloo International.

Section 2 of the project opened on 14 November 2007. It was a 39.4 km stretch of track from the newly built Ebbsfleet station in Kent to London city, cutting journey times by a further 20 minutes.

St Pancras station was renovated durind the 2000's and became the dead end terminus station for Eurostar trains going through the completed "Channel Tunnel Rail link". Services changed from Waterloo station to St Pancras International.

4. Effects of HS arrival

a. Passenger point of view

Access and transfer time were significally reduced when Eurostar services changed their location. Waterloo station was situated in the southern part of London, across the Thames, further away from the city and bussines center than St Pancras.

Waterloo station had connection with 4 underground and 2 commuter lines, with a rather long transfer distance between the Eurostar tracks and most of these lines. St Pancras station is well connected to 6 underground lines, and transfer times are shorter. More than 200 underground stations are reached directly, without transfer from St Pancras.

A pedestrian underground connection links St Pancras station to King's Cross St. Pancras tube station (opened November 2009), and a future new concourse for King's Cross railway station is planned, providing further easier transfers.

A security-sealed terminal area was constructed for Eurostar services to Continental Europe. Passengers transfer time has increased because Eurostar check-in must be done at least 30 minutes before train departure, which is not needed in other trains.

Besides accesibility and transfers, more services are available for the passenger at St Pancras, as shown on graph B.4.1

Ebbsfleet station, 10 miles outside Greater London, close to M-25, provides 6.000 parking spaces (9,000 planned) 20 times more than the 322 spaces at St Pancras.

b. City point of view

Besides the renovation of the old station building, St Pancras station is the "engine" of two huge urban renewal and development programs in the King's Cross Area, intended to provide intensive urban regeneration.

As shown on graph B.4.2 to the north of St Pancras International Station is the 27 hectare site of the King's Cross Central development site which will be transformed over the next five to ten years into a new business, residential and cultural district.

To the east of King's Cross Station, the regeneration has already commenced at 'Regents Quarter', a £150 m redevelopment of 70,000 sq m of homes, offices, shops, bars, and restaurants. Network Rail is proposing to refurbish and provide a new western concourse for King's Cross Station.

c. Operator point of view

There are two main high speed train operators at St. Pancras station: Eurostar, for international services, and Southeastern for domestic services, both with a dead end scheme, while Thameslink conventional services run a through scheme.

Eurostar operates HS international services to Lille, Paris, Brussels, Disneyland and the South of France, as shown in graph B.4.3, some of them stopping at Ashford, but not at Stratford or Ebbsfleet.

Both new HS sectors in the main line, and change from Waterloo to St. Pancras station, have reduced travel times by 40 minutes, and increased Eurostar ridership by 50%, from 6.3 M pax in 2003 to 9.2 M pax in 2009.

The full Eurostar timetable came into operation on 9 December 2007. The basic service provides 17 pairs of trains to and from Paris Gare du Nord every day, 10 pairs of trains to and from Bruxelles-Midi/Brussel-Zuid, and 1 train to and from Marne-la-Vallée for Disneyland Paris.

Southeastern runs high speed domestic services on High Speed 1 tracks since 13 December 2009, allowing passengers from Ashford International to travel to London in 36 minutes. High speed services network is presented in graph B.4.3 90% of services stop at Ashford and Ebbsfleet International.

Both operators have different depots, Eurostar depot being located at Templemiles, close to Stratford International, 10 miles away from St Pancras.

Ebbsfleet station provides huge park & ride installations.

d. Rail infrastructure manager point of view

Changing terminal for HS services from Waterloo to St Pancras has involved important investments, the rebuilding cost being in the region of £800 million.

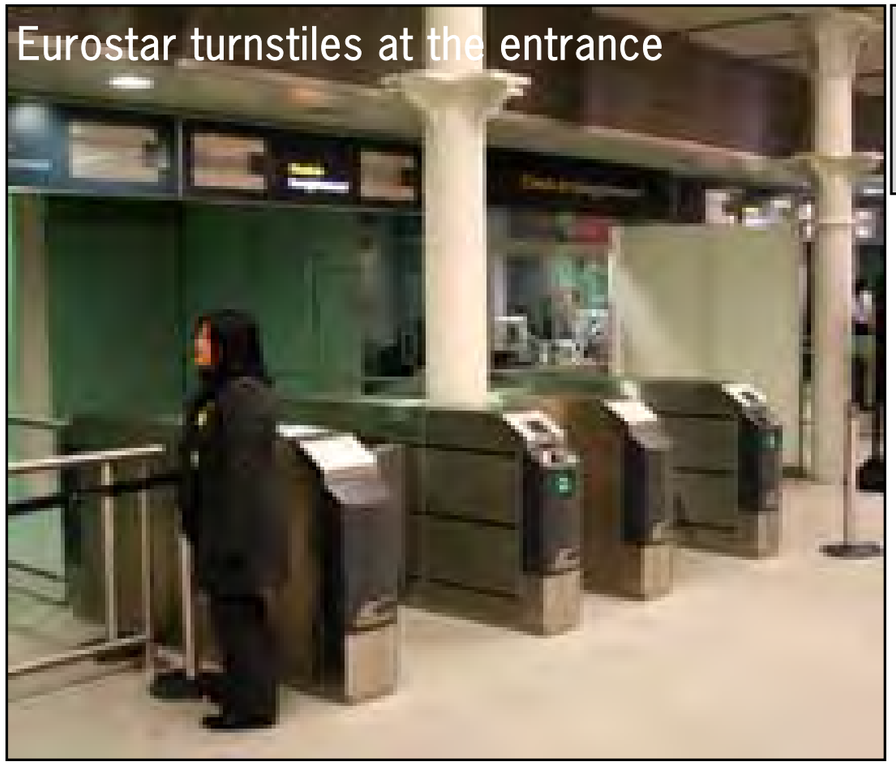
An extremely delicate work plan has been needed to accommodate previous services from Thameslink and Midland trains while works were in progress, requiring the construction of an interim station.

Some services have to be moved temporarily to Kings Cross station.

There has also been a change in the franchise of services, and now Thameslink trains are operated by First Capital Connect.

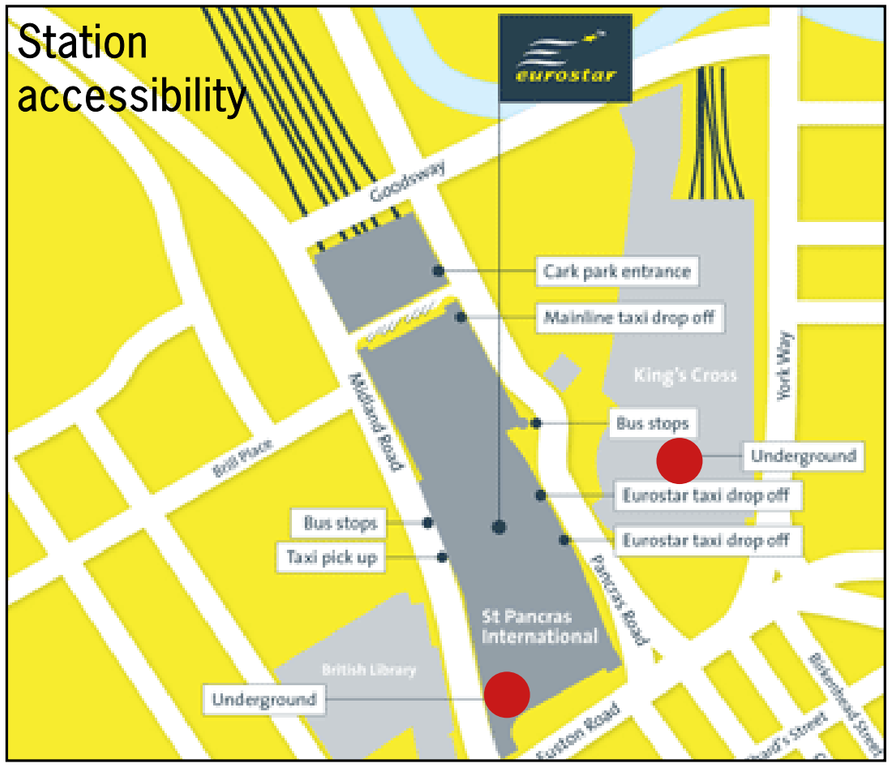
Almost 9,000 sq meters of commercial areas have been provided at the new St Pancras International station concourse, where more than 50 shops provide additional services for passengers.

Plans for HS2 services to Birmingham, Manchester, Sheffield and Leeds, are considering dead end schemes from Euston station, close to St Pancras International station, with a pedestrian connection between both stations.



passenger

- Better accessibility by underground in St Pancras than Waterloo: connection with 6 subway lines instead of 4 in Waterloo.
- Shorter transfer time
- More services and shops
- Eurostar check-in must be done at least 30 minutes before train departure



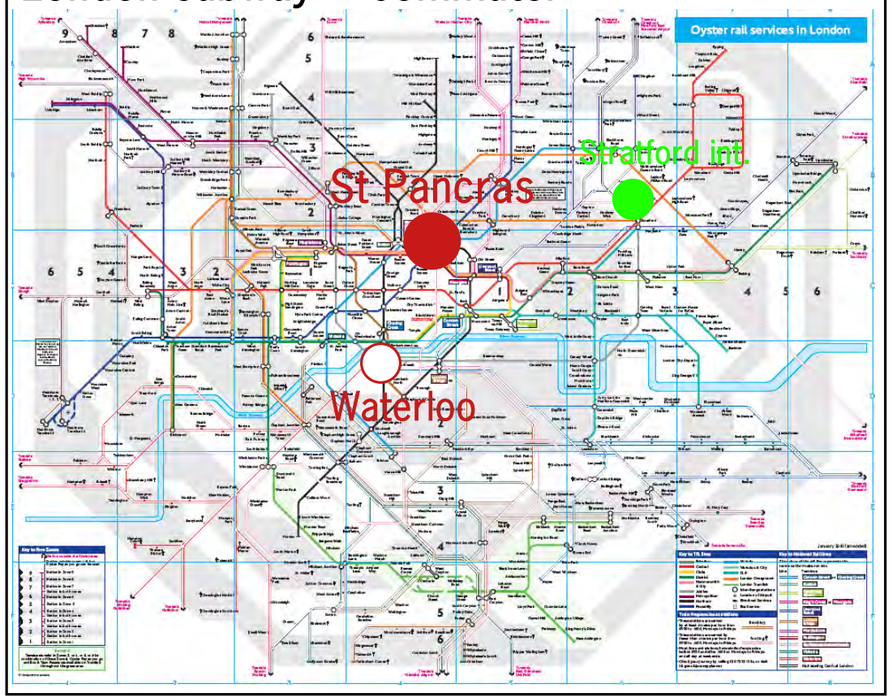
Accessibility	High Speed stations in the city	1
	Total Region High Speed stations	3
	Nr of subway lines at the station	6
	Nr of commuter lines at the station	2
	Nr of bus routes at the station	13
	Subway st reached without transfer	204
	Commuter st reached without transfer	149
	Nr of public parking lot spaces	322
	Car parking fare (€/day)	6,84/hour
	Bike renting fare (€/day)	-
	Rent a car companies	no
	Security Control?	yes
	Ticket control?	yes

Travel fares	First city	Ashford
	travel fare by High Speed train (€)	30
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	20
	travel fare by plane (€)	-

city

- Two huge urban renewal and development operation (34 Ha)
- Revitalization of the station quarter
- Ebbsfleet development for P&R

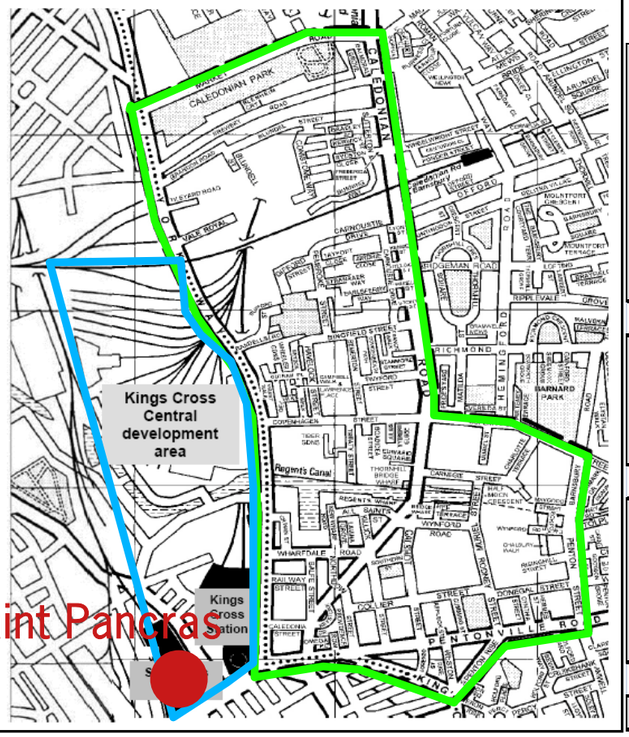
London subway + commuter



Urban Plans

A.Kings Cross central development area

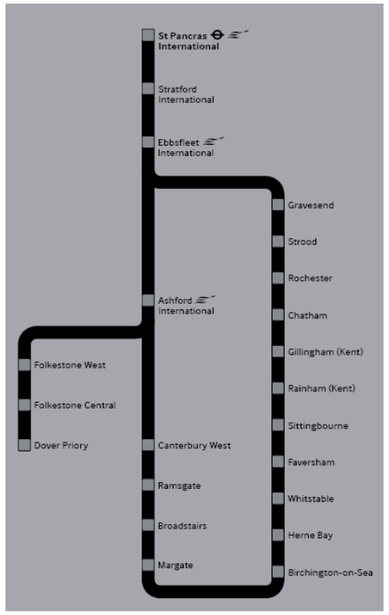
B. Regents quarter



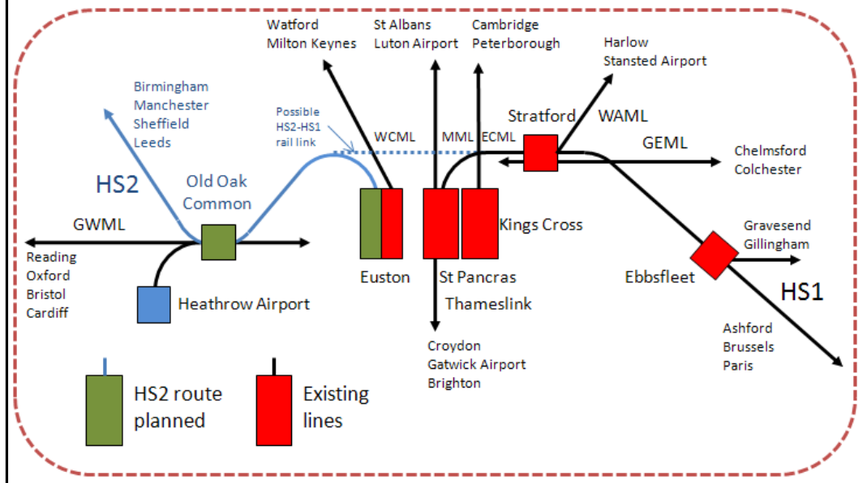
City numbers	City population	7.556.900
	City area (Km2)	1.579
	City density (hab/Km2)	4.761
	Region population	13.945.000
	Region area (Km2)	16.043
	Distance City Hall-Station (Km)	2,5
	International visitors a year	26.100.000
	Domestic visitors a year	
PUT	Metro ridership in the city area (pax/day)	2.900.000
	Comm ridership in the city area (pax/day)	2.100.000
	Bus ridership in the city area (pax/day)	5.100.000
	Tram ridership in the city area (pax/day)	100.000
Travel time	First destination	Ashford
	travel time by High Speed train	40min
	travel time by Conventional train	
	travel time by Car	1hr10min
	travel time by plane*	-
	*only travel time	
	Urban develop. Total area planned (Ha)	34

Eurostar services

Southeastern services



London High Speed Rail and connections to domestic main lines



operator

- Initial HS services from Waterloo station
- Change to St Pancras in 2007
- Better quality of service (punctuality increased)
- New domestic HS services started in Dec 2009, going from St Pancras to the medway towns, stopping at Strattford and Ebbsfleet international
- Eurostar operates international HS services and Southeastern operates domestic HS services

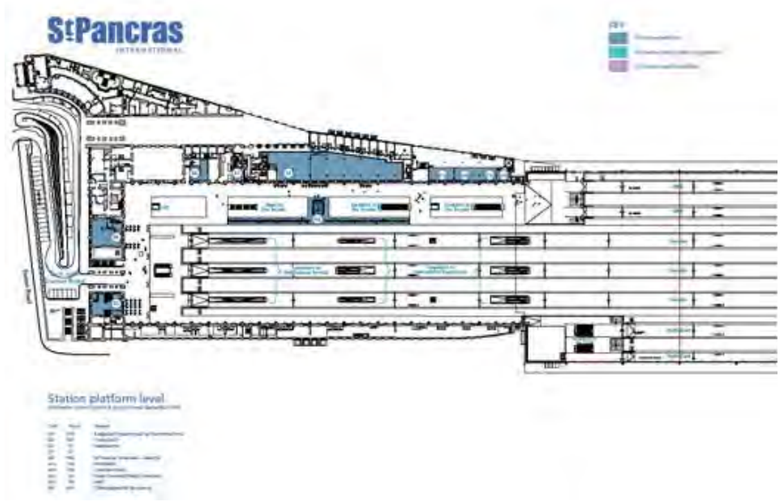
Eurostar Train at St Pancras

Inside of the station

Line	Operator	Eurost&Southeast
	Station type (services)	Dead End
	Opened date	14-nov-07
	High Speed lines from/to station	4
	High speed total length (Km, country)	113
	HS Services a day (both ways)	60
	Passengers a day	17.778
	% city HS trains going through this station	100
	First destination	Ashford
	HS Services a day (both ways)	34
	% city trains going to this destination	56,67%
Trains	Maximum speed (Km/hour)	300
	Length (m)	394
	Cars per train	18
	Total seats	750
	Platform ocupancy time (min)	22
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	
	Turnstile/entrance	yes

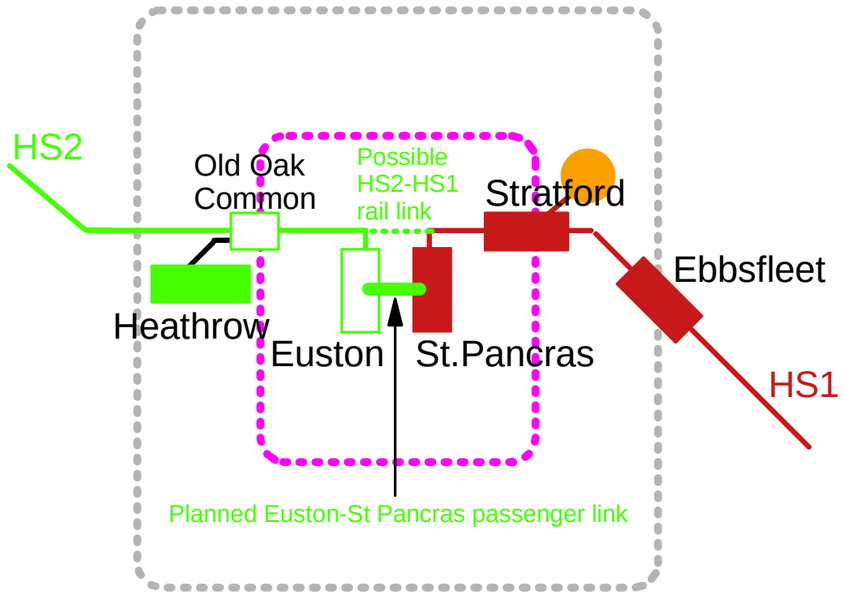
Platform level

- 9 HS platforms: 6 international+3 domestic
- 4 domestic intercity platforms
- 2 domestic commuter platforms



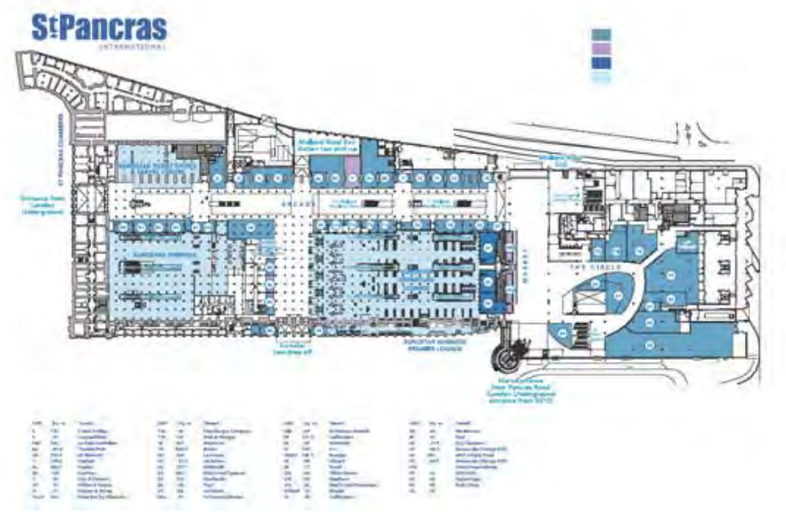
infra manager

- Terminal station owned and managed by HS1 Ltd, railway infrastructure operated, controlled and maintained by Network Rail
- Station used by international HS, domestic HS, domestic intercity and commuter trains
- Different depots for international and domestic HS trains
- Passenger link with Kings Cross station
- Passenger link between HS1 and HS2 terminals in study



Street Level

8.634 sq mt of commercial areas



Tracks	Railway Infra manager	Network Rail
	HS tracks yard	Dead End
	Station location	At grade
	Number of tracks	15
	Tracks used for High speed	9
	High Speed trains/day both ways	106
	Length of platforms	433-295
Areas	Station footprint (sq mt)	58.144
	Total area (sq mts)	98.788
	Platforms area (sq mt)	17.500
	Commercial area (sq mt)	8.634
	Number of Shops	50
	Offices area (sq mt)	-
	waiting area+pax services (sq mt)	22.700
	Parking area (sq mt)	8.000
Depots	Depot footprint (sq mts)	101.690-71.747
	Daily movements st-depot	8
	Depot-station distance (Km)	120-9
€	Station construction costs (mill €)	920

Madrid

1. The city and the region

Madrid City has a population of 3.260.000 inhabitants, with a surface of 607 km2 and a density of 5.364 inhab/sq km.

Madrid is the third most populatedmetropolitan area in the European Union, after Paris and London, with 6.4 million inhabitants, the city population being 51% of the metropolitan area.

2. The rail network and stations

The railway network of Madrid consists of several radial lines deserving the country for the long distance services, and the region for commuter and regional services.

Cercanías commuter network has 7 lines, 87 stations and transports 940.000 passengers every day, running in independent tracks in 50% of the lines.

Regional and long distance services share tracks departing from the two main railway stations, Atocha and Chamartin, located respectively in the southern and northern part of the city

HS lines, with UIC gage, (iberic gage is 1.668 mm), have therefore independent tracks, arriving as well at the two main train stations, Atocha and Chamartín.

Both stations are linked by two tunnels, for commuter and regional lines allowing for the provision of through services. A third tunnel is under construction to provide also through services for HS trains.

HS network follows a radial pattern, and presently consists of 4 lines:

- Madrid - Seville/Málaga,
- Madrid - Barcelona
- Madrid - Valladolid.
- Madrid – Toledo

Other lines as Madrid-Valencia, (in service 2010) are under construction

Besides, Madrid metro, with 15 lines, transports 1.917.000 passengers every day.

3. The HS arrival

Madrid-Seville, first Spanish HS line (472 km) started operation 21 April 1992 from Atocha station. Travel time between the two end points was reduced from 5h to 2h30. At Cordoba Station, a branch deserves Malaga since 2007.

Madrid-Valladolid (193 km) started commercial service on 23 December 2007. The line starts at Madrid-Chamartin station.

The Madrid–Barcelona HS line (621 km) from Madrid-Atocha started operation on 20 February 2008, after precedent parcial services from Madrid to Lleida and Tarragona.

Therefore, Atocha station is deserving Seville, Malaga, and Barcelona lines (and soon in 2010 Valencia line), while Chamartin station is deserving Valladolid line (and its services extended to Galicia, Asturias, Santander, and Basque Country)

4. Effects of HS arrival

a. Passenger point of view

Atocha station new buildings were built between 1985 and 1992, adjacent to the old station from 1892. The purpose was to increase station's capacity, creating a big transport interchange connecting commuters, subway, buses, car parking and long distance trains (both high speed and conventional services).

A new Metro Station, Atocha Renfe, was built in line 1 and integrated at the building in order to save 300 m transfer distance to metro passengers, as shown in B.5.1.

Pedestrian access to the new HS terminal is made through the old historical station, were a botanic garden and commercial area was built. HS arrival implied better access and shorter transfer from metro and commuter trains, with all commuter lines providing through services and 100% stations reached without transfer.

HS passenger's arrival is made at the platform level; meanwhile passenger's departures, waiting areas and security control are located on the upper floor.

An extension of the HS station is presently being built to cope with demand increases after inclusion of Barcelona and Valencia HS services, changing to a linear scheme with departures on both levels at one end of the platforms, and arrivals at the other end. It includes also new taxis stands and 3,500 parking spaces.

Chamartin station in the north city area is providing presently a smaller number of HS services than Atocha, being the terminal only for Madrid-Valladolid line since its opening in2006. Graph B.6.1 presents some of its features.

In a near future it will deserve HS lines to Galicia, Asturias, Santander and the Basque Country, trains that now use the 25 km long north HS tunnel and then change gage to continue to their destinations using the conventional tracks.

Madrid Chamartin has also a metro station and interchange connected with 2 lines and prepared to deserve two more lines. 50 metro stations are reached without transfer, and stations from 6 out of 7 commuter lines. A new Cercanías line is in construction linking Chamartin station with T-4 Barajas airport that will continue to Atocha station.

HS services arrival in 1992 meant a radical change in the quality of spanish long distance rail services for the passenger: 99% punctuality, money back guarantee for 5 minute delays, travel times halving the previous ones, personnel attention at trains and stations, started a new long distance rail travel era.

b. City point of view

Since Jun 2009, a renewal of **Puerta de Atocha** terminal is taking place, to improve capacity of the station and avoid congestion for passengers, cars and taxis.

Upper level station existing road network will be reorganized to increase taxi, bike and motorcycle parking areas, as shown in graph B.5.2

Puerta de Atocha station will double its present capacity and will be a basic high speed interconnection point to all places located both north and south of Spain peninsula. Total Project estimated investment is 520 mills €.

There is a huge urban development project at **Chamartin** station area named *Operación Chamartín.* It consists of a 312 Ha plan, which includes an extension of the *Paseo de la Castellana*, covering the rail yards, the construction of more than 17.000 residences, new infrastructures, equipments and green areas, an extension of 4,2 Km of the metro line number 10 and 5 more stations along it. The project has an estimated budget of 11.000 mills. €. It is shown in graph B.6.2

c. Operator point of view

Besides providing a radical change in modal split for rail (from 16% to 51% of total modes, 83% when compared with air) the HS line Madrid-Sevilla in 1992 radically changed the operation of long distance Spanish rail, and the quality of service level.

Dedicated tracks, installations, rolling stock and personnel, managed from an independent AVE business unit, allowed for an excellence of service policy. This policy has been continued with the new line extensions, and the only problems arising for the operator are related with congestion at Atocha station, coexistence of service and enlargement works. Extension and conversion to a through scheme with a new underground tunnel linking Atocha and Chamartin stations are progressing to solve these capacity problems.

d. Rail infrastructure manager point of view

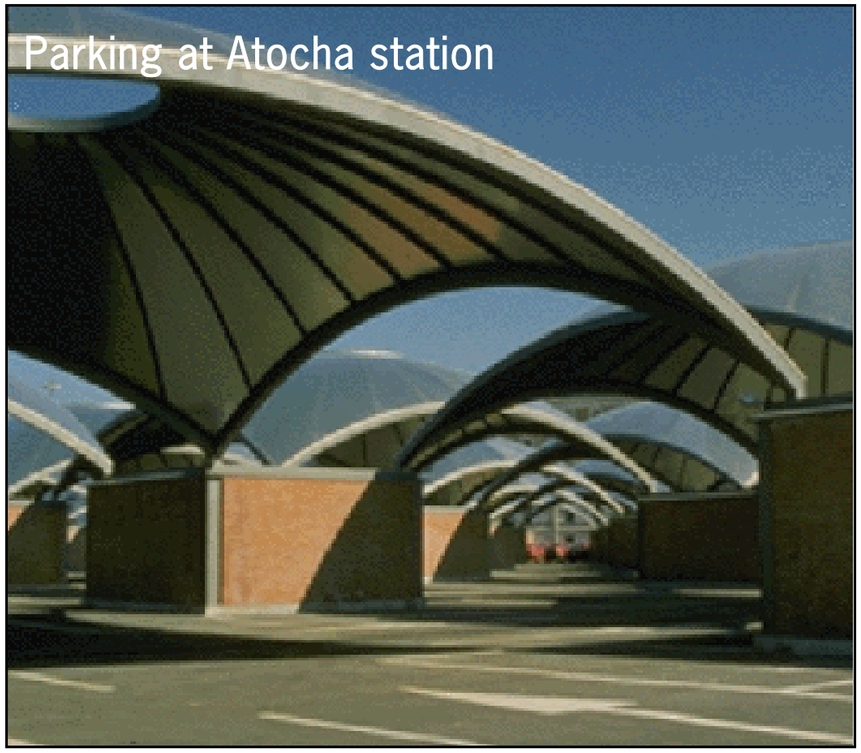
The modern **Atocha station** designed by architect Moneo in 1992 had adjacent buildings, one for HS and long distance trains and another for commuter lines.

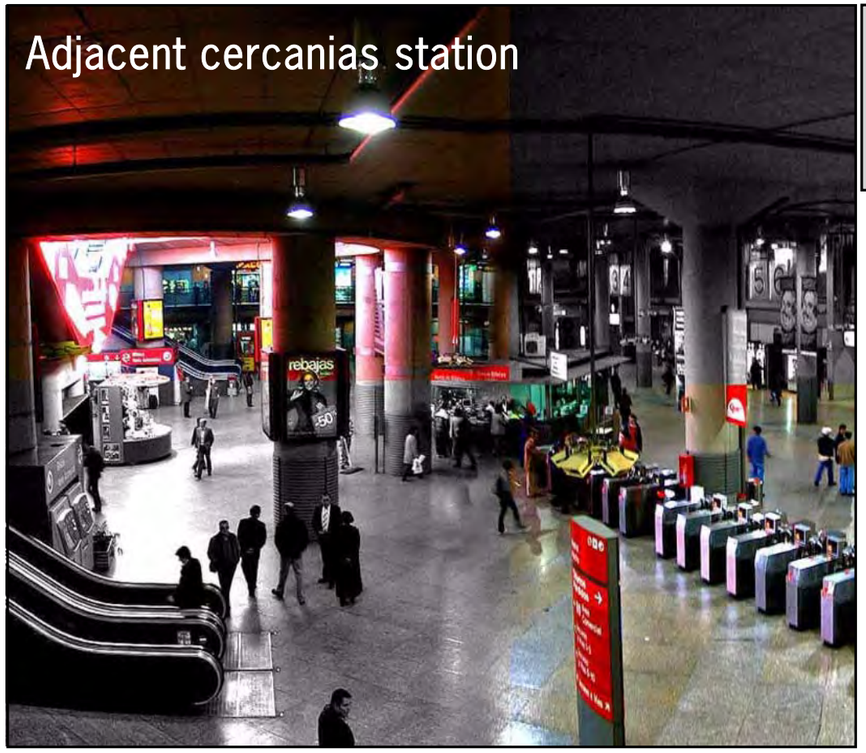
The main lines platforms were at ground level on a dead-end scheme, whereas the commuter train platforms were underground, to allow access to through tunnels (initially two, now three, for commuter services).

Initially four of the total 15 tracks were UIC gage, while the other 11 changed progresively to acccomodate HS new services. 4 new underground tracks are being built to allow through HS traffic connecting to Chamartin station by a new tunnel that will increase capacity substantially.

Chamartin station started the HS line Madrid-Valladolid on December 2007. Platforms were adapted to new services and to the UIC gage that will progress on a similar way after arrival of HS new urban tunnel.

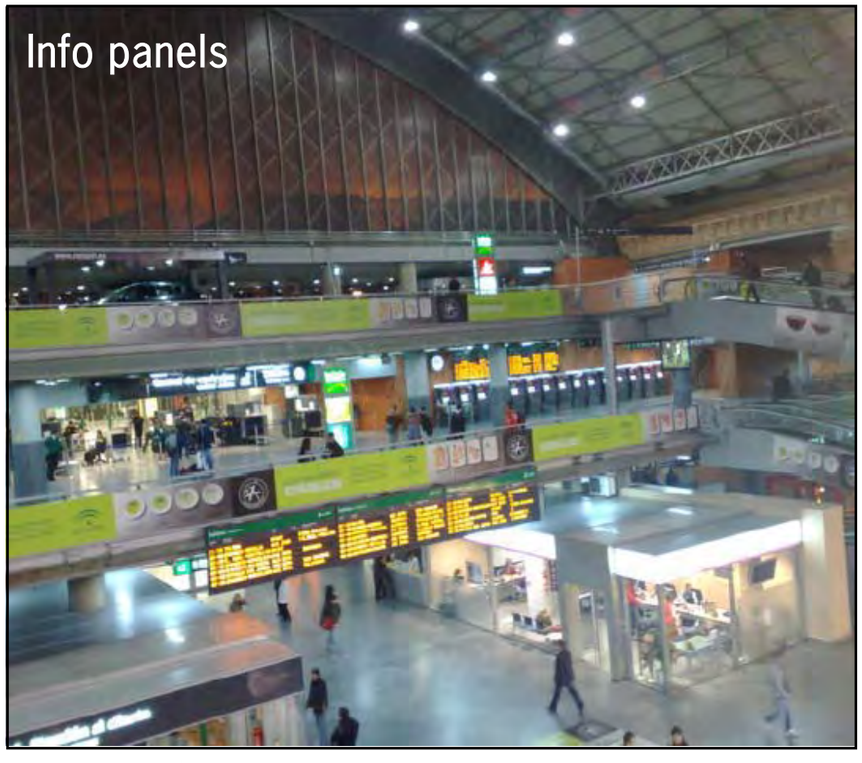
A possible third HS station location is being studied at Barajas airport.





passenger

- Excellent accessibility from commuter rail (all stations without transfer)
- Not so good from metro (only 1 line)
- Good transfer time (5 min)
- Crowded exit hall, station being enlarged
- New additional services appeared with HS arrival: vip lounge, HS boarding area, services center, autocheck-in machines...
- Access mode of HS passengers: 26.9% taxi, 13.6% metro, 12% commuter, 8.9% walking.



Station accessibility

Accessibility	High Speed stations in the city	2
	Total Region High Speed stations	2
	Nr of subway lines at the station	1
	Nr of commuter lines at the station	7
	Nr of bus routes at the station	9
	Subway st reached without transfer	32
	Commuter st reached without transfer	99
	Nr of public parking lot spaces	615
	Car parking fare (€/day)	27,95
	Bike renting fare (€/day)	-
	Rent a car companies	4
	Security Control?	yes
	Ticket control?	yes

Travel fares	First city	Barcelona
	travel fare by High Speed train (€)	54
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	83
	travel fare by plane (€)	41

Madrid subway

city

- Atocha area revitalization
- No real estate proyects
- All surfaces commercial, parking... within station footprint
- Station being enlarged and parking lot extended

Commuter lines

Urban plans

Extension project for rail uses

Station extension project for tertiary uses, 3.500 parking spaces and other uses

City numbers	City population	3.255.944
	City area (Km2)	607
	City density (hab/Km2)	5.364
	Region population	6.386.932
	Region area (Km2)	10.506
	Distance City Hall-Station (Km)	2
	International visitors a year	7.193.179
	Domestic visitors a year	
PUT	Metro ridership in the city area (pax/day)	1.916.667
	Comm ridership in the city area (pax/day)	940.000
	Bus ridership in the city area (pax/day)	1.277.778
	Tram ridership in the city area (pax/day)	
Travel time	First destination	Barcelona
	travel time by High Speed train	2hr40min
	travel time by Conventional train	9hr(bef HS)
	travel time by Car	6hr30min
	travel time by plane*	1hr15min
	*only travel time	
	Urban develop. Total area planned (Ha)	25,05

Spain HS rail Network

Madrid HS rail Network

operator

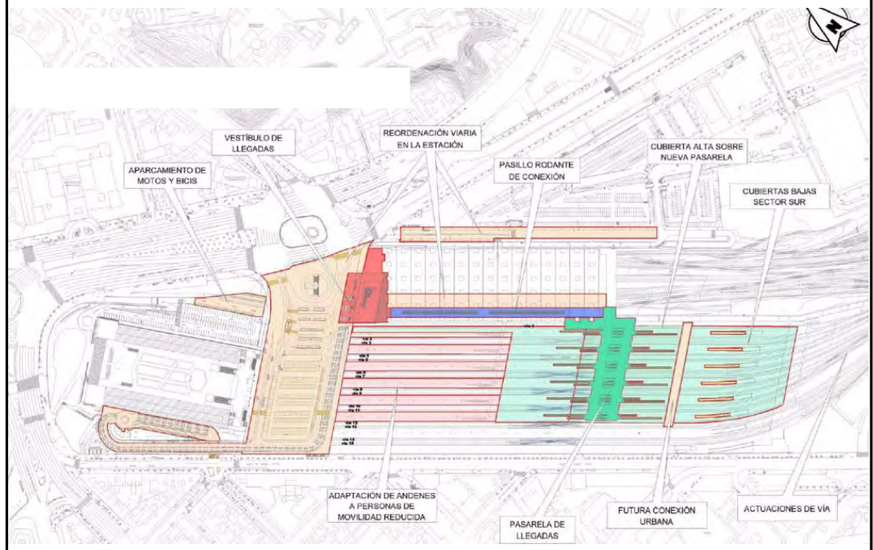
- Started HS 1992
- Increased services to Málaga, Toledo, Barcelona 2009
- Valencia starts 2010
- Through services planned 2013
- Big increase in quality of service and efficiency
- Operator must paid a toll of 0.83 € per traveller to infrastructure manager for use of the station

AVE at Atocha Station

Inside of the station

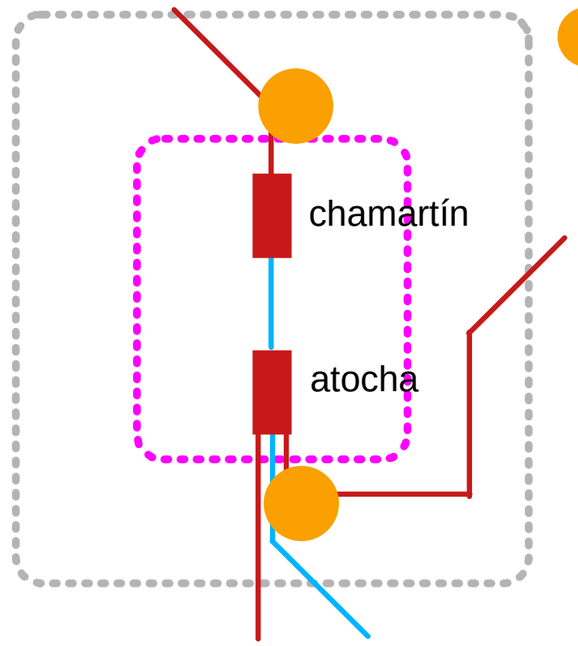
Line	Operator	RENFE
	Services type	Dead End
	Opening date	21-apr-92
	High Speed lines from/to station	2
	High speed total length (Km, country)	1.599
	HS Services a day (both ways)	209
	Passengers a day	38.000
	% city HS trains going through this station	85,66%
	First destination	Barcelona
	HS Services a day (both ways)	54
	% city trains going to this destination	25,84%
Trains	Maximum speed (Km/hour)	300
	Length (m)	200
	Cars per train	8
	Total seats	404
	Platform ocupancy time (min)	30
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	-

Platform level: 11 High Speed Tracks



infra manager

- Change rail scheme 1992 (new UIC gage)
- Subsequent HS lines Barcelona and Valencia required change gage of tracks
- Station enlargment and conversion to through scheme in progress



Commercial area: 38 shops at the station

Tracks	Railway Infra manager	ADIF
	HS tracks yard	Dead End
	Station location	At grade
	Number of tracks	15
	Tracks used for High speed	11
	High Speed trains/day both ways	209
	Length of platforms	410

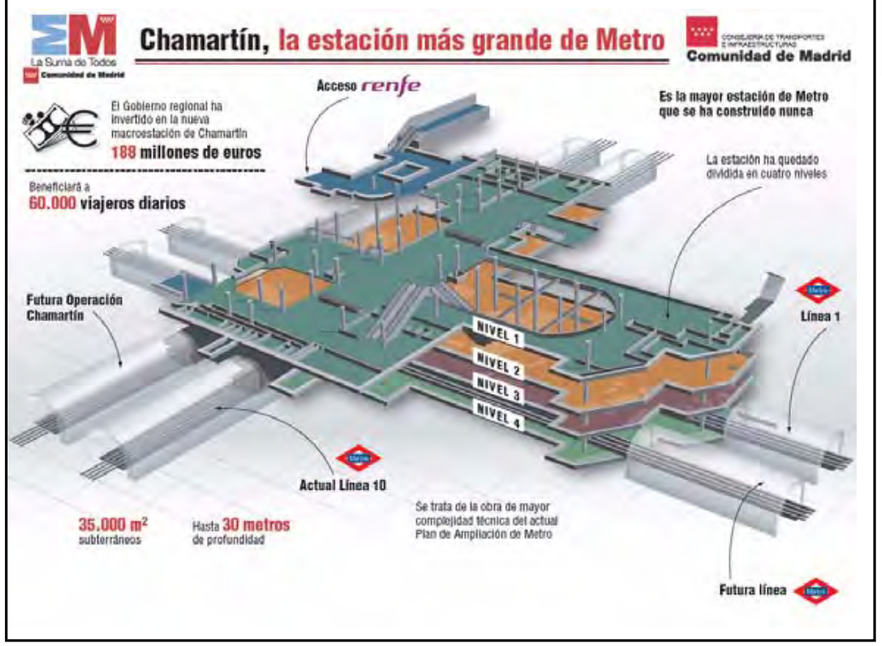
Areas	Station footprint (sq mt)	150.000
	Total area (sq mts)	156.375
	Platforms area (sq mt)	35.625
	Commercial area (sq mt)	7.044
	Number of Shops	38
	Offices area (sq mt)	3.950
	waiting area+pax services (sq mt)	10.762
	Parking area (sq mt)	18.750

Depots	Depot footprint (sq mts)	29.463
	Daily movements st-depot	50
	Depot-station distance (Km)	3

€	Station construction costs (mill €)	-

Parking at Chamartín station

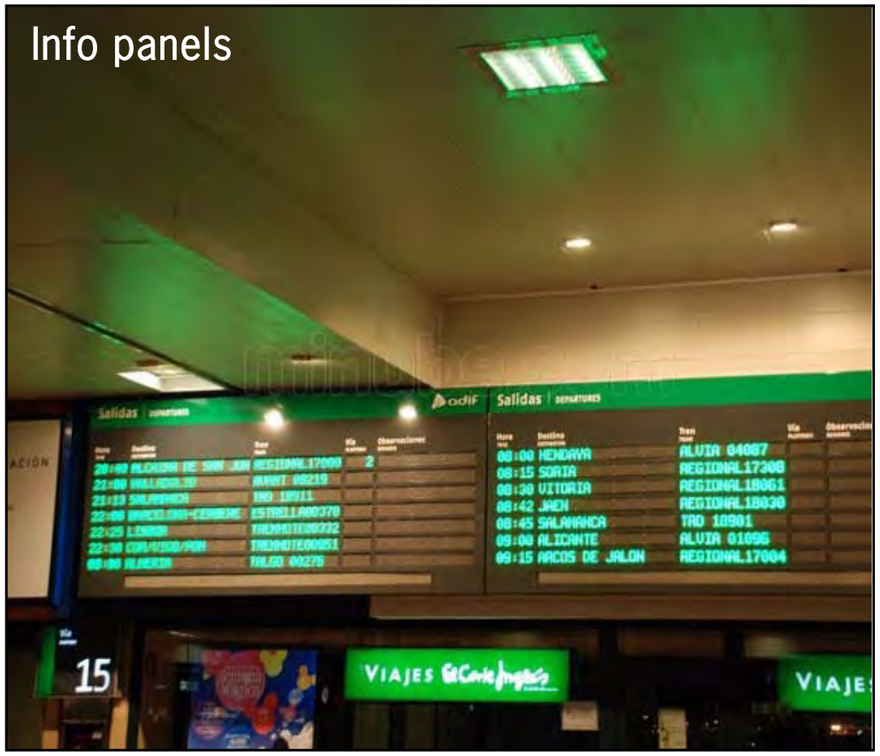
Adjacent subway station



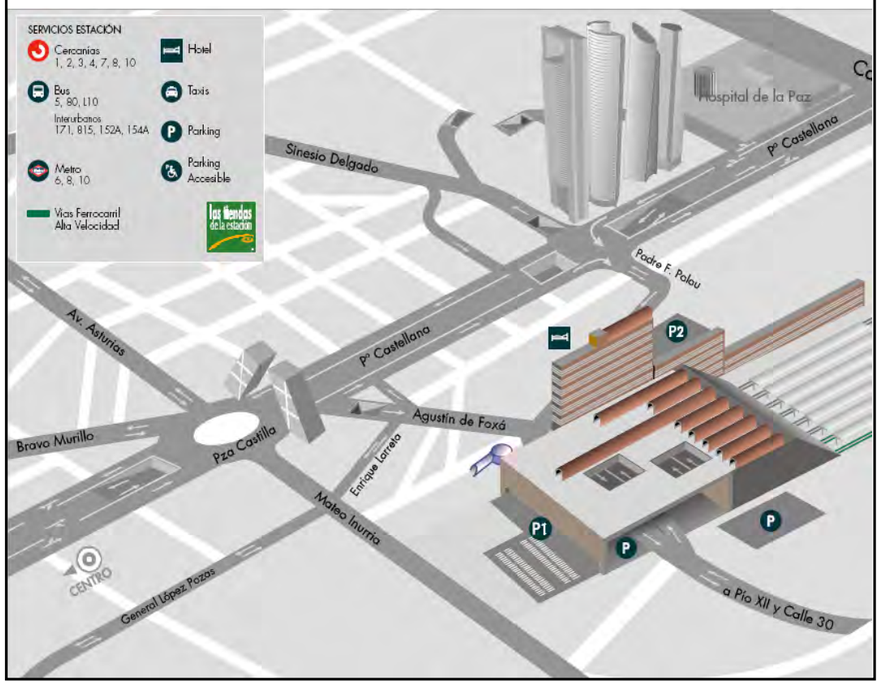
passenger

- Good accessibility to commuter rail and metro (2 lines)
- Big interchange buses-metro adjacent (4 levels)
- Short transfer time
- Access mode of HS passengers: 21.2% taxi, 22.3% metro, 10.2% commuter, 12.4% walking, 5% bus
- Not many changes took place in the station building when the HS arrived

Info panels



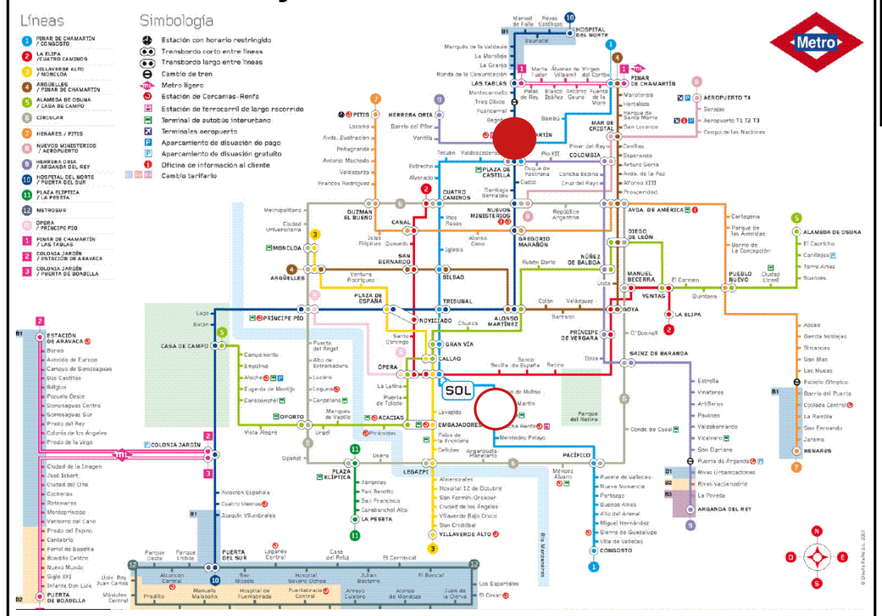
Station accessibility



Accessibility	High Speed stations in the city	2
	Total Region High Speed stations	2
	Nr of subway lines at the station	2
	Nr of commuter lines at the station	6
	Nr of bus routes at the station	3
	Subway st reached without transfer	62
	Commuter st reached without transfer	77
	Nr of public parking lot spaces	658
	Car parking fare (€/day)	27,15
	Bike renting fare (€/day)	-
	Rent a car companies	4
	Security Control?	yes
	Ticket control?	yes

Travel fares	First city	Valladolid
	travel fare by High Speed train (€)	20
	travel fare by Conventional train (€)	16
	travel fare by Car (€)	29
	travel fare by plane (€)	-

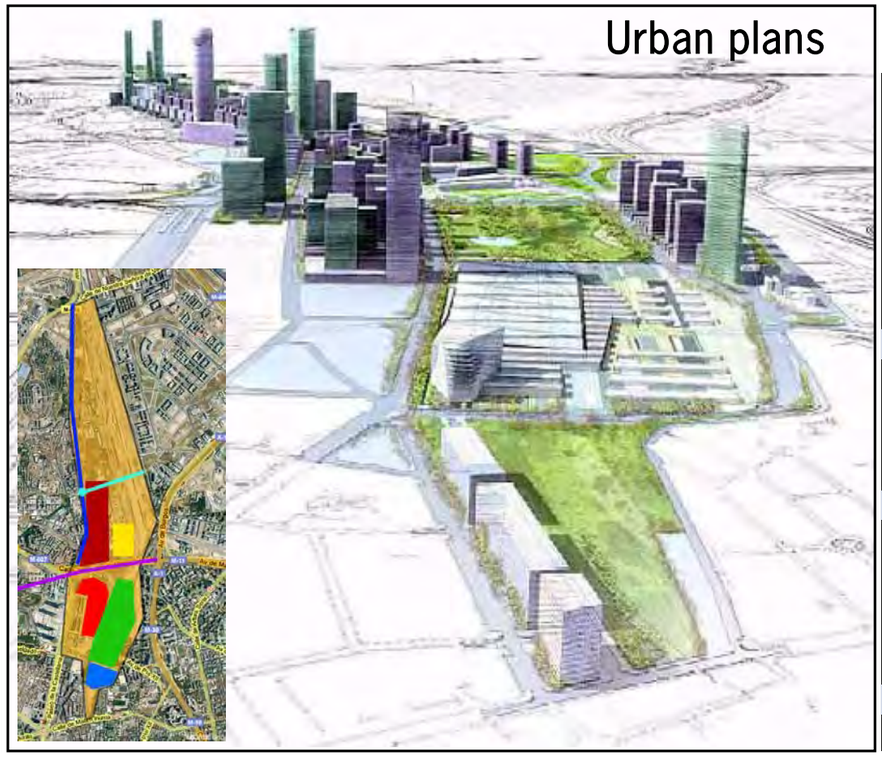
Madrid subway



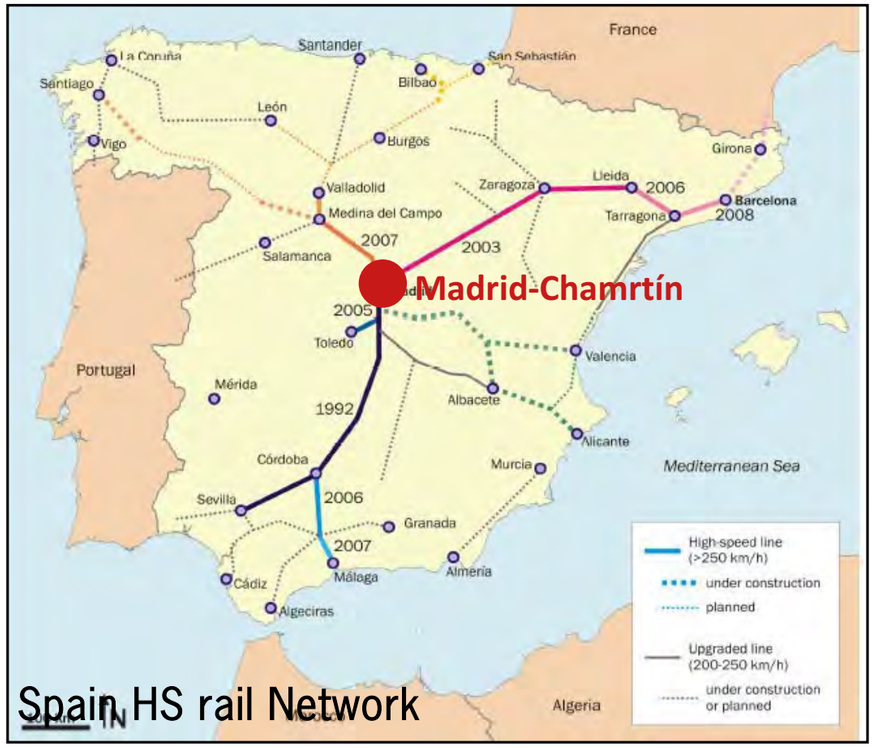
city

- Big Urban development project over rail footprint (station yard and depot)
- Nearby 4 towers (outside rail land) 250 m high
- New metro lines to station and interchange

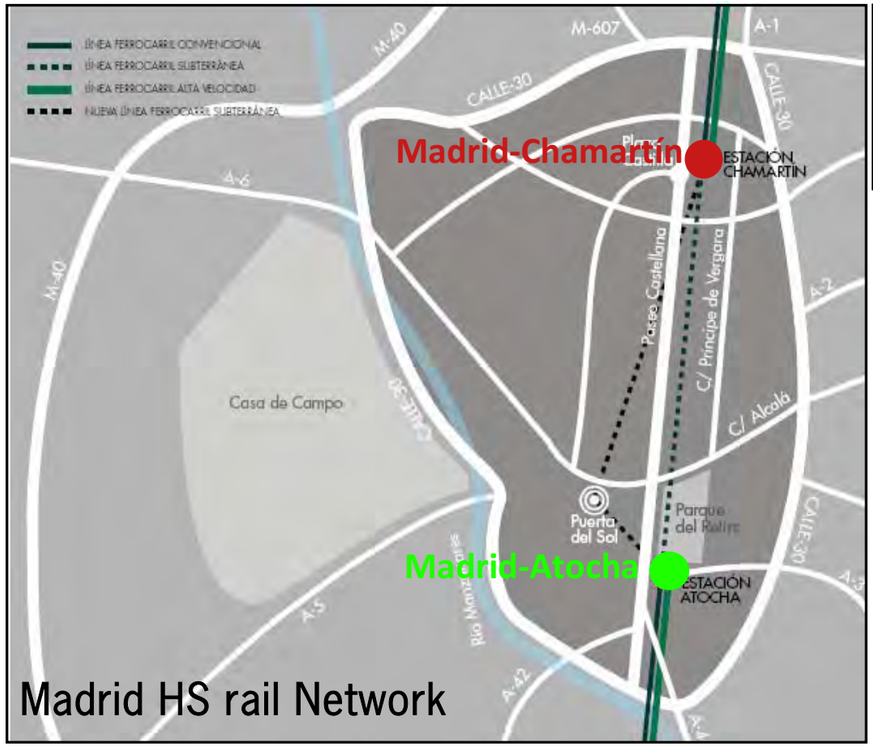
Urban plans



City numbers	City population	3.255.944
	City area (Km2)	607
	City density (hab/Km2)	5.364
	Region population	6.386.932
	Region area (Km2)	10.506
	Distance City Hall-Station (Km)	6
	International visitors a year	7.193.179
	Domestic visitors a year	
PUT	Metro ridership in the city area (pax/day)	1.916.667
	Comm ridership in the city area (pax/day)	940.000
	Bus ridership in the city area (pax/day)	1.277.778
	Tram ridership in the city area (pax/day)	
Travel time	First destination	Valladolid
	travel time by High Speed train	1hr
	travel time by Conventional train	2hr40min
	travel time by Car	2hr15min
	travel time by plane*	-
	*only travel time	
	Urban develop. Total area planned (Ha)	312



Spain HS rail Network

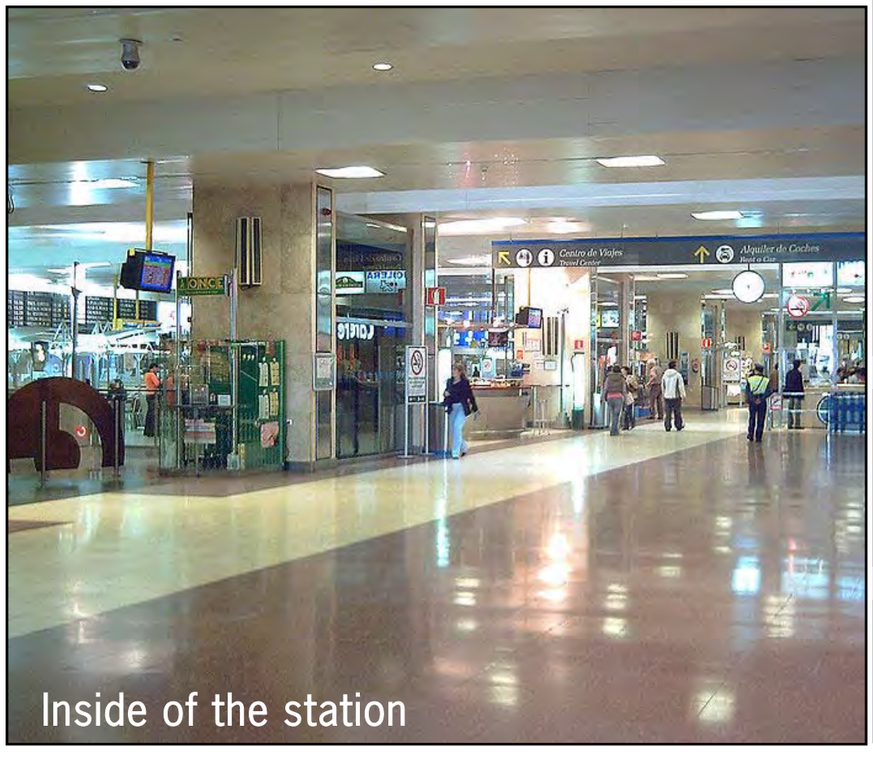


Madrid HS rail Network

operator

- Services on HS north line started 2008
- Dedicated HS tracks (UIC gage)
- Security control of platforms
- Short distance to depot (2 Km)

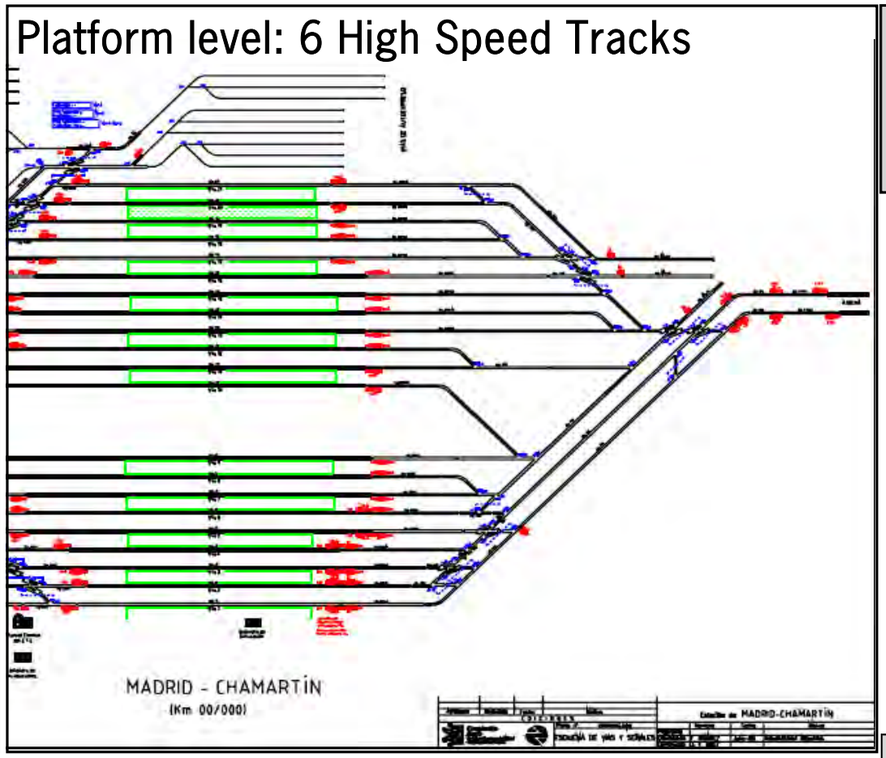
AVE at Chamartín Station



Inside of the station

Line	Operator	RENFE
	Services type	Dead End
	Opening date	23-dec-07
	High Speed lines from/to station	1
	High speed total length (Km, country)	1.599
	HS Services a day (both ways)	35
	Passengers a day	3.200
	% city HS trains going through this station	14,34%
	First destination	Valladolid
	HS Services a day (both ways)	32
	% city trains going to this destination	91,43%
Trains	Maximum speed (Km/hour)	300
	Length (m)	200
	Cars per train	12
	Total seats	318
	Platform ocupancy time (min)	60
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	-

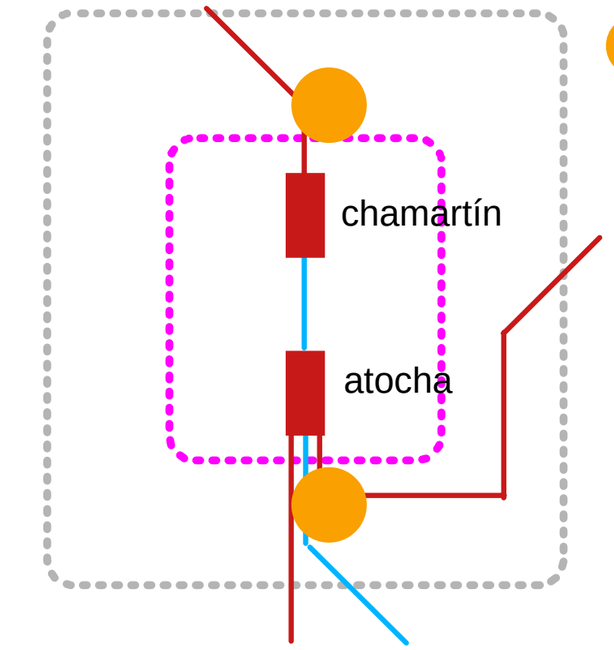
Platform level: 6 High Speed Tracks



infra manager

- Dedicated HS tracks (UIC gage) connecting to new north line
- No specific commercial area for HS, sharing station area

Tracks	Railway Infra manager	ADIF
	HS tracks yard	Dead End
	Station location	At grade
	Number of tracks	21
	Tracks used for High speed	6
	High Speed trains/day both ways	16
	Length of platforms	480-510
Areas	Station footprint (sq mt)	134.000
	Total area (sq mts)	231.500
	Platforms area (sq mt)	87.500
	Commercial area (sq mt)	8.400
	Number of Shops	42
	Offices area (sq mt)	17.833
	waiting area+pax services (sq mt)	31.673
	Parking area (sq mt)	24.000
Depots	Depot footprint (sq mts)	550.000
	Daily movements st-depot	2
	Depot-station distance (Km)	2
€	Station construction costs (mill €)	-



Commercial area: 42 shops at the station

New York

1. The city and the region

The city consists of five boroughs: The Bronx, Brooklyn, Manhattan, Queens and Staten Island. The population exceeds 8.3 million, and with a land area of 790 km2, New York City is the most densely populated major city in the United States (10.600 hab/Km2). Only Manhattan (1, 6 M hab) is deserved by HS railway services.

The New York metropolitan area's population is also the nation's largest, estimated at 19.75 million people over 17,884 km2. City population is 42% of metropolitan area, deserved by 6 HS stations.

2. The rail network and stations

New York rail network shares commuter and long distance services.

Amtrak Company operates long distance services from NY Penn station, presently New York only long distance station, and shares two lines to the north with Metro-North Railroad, one line to the northeast with Shore Line East and one to the south with the New Jersey Transit.

Lines to the northeast and to the south make up the Northeast Corridor, used by the Acela Express, the high speed line that links Washington DC and Boston via Baltimore, Philadelphia and through New York, carring over 3 million pax annually.

Commuter services are divided in four systems, operating in four different areas:

- Metro-North Railroad, in the New York – New Haven – Poughkeepsie metropolitan area, transporting 280.000 pax/day
- Shore Line East, around New Haven – New London, a testimonial line transporting 2.000 passengers a day.
- New Jersey transit, New York– North Jersey/Philadelphia – Atlantic City metropolitan area. Transports 276.000 passengers daily.
- Long Island railroad, in New York-Long Island metropolitan area, transporting 347.600 pax a day.

The subway network consists of 26 lines and 468 stations, transporting 4.5 million passengers daily, and operating 24h a day / 7 days a week.

3. The HS arrival

Acela Express HS service started 11 December 2000 and till now is the only high speed service in the United States.

Twenty new trains operate on the busy Northeast Corridor. It is not a new dedicated line, but an upgraded existing line, that shares traffic with other rail services. Engineering changes were made to the corridor to make it suitable for HS trains operation. Electrification along the entire route was needed. Grade crossings were also upgraded or removed.

Preparation for the train itself had begun in October 1994; at which point Amtrak had requested bids from train manufacturers to design a trainset that could negotiate the crowded Northeastern Corridor at up to 240 km/h.

An inaugural VIP run of the Acela came on November 17, 2000 followed by the first revenue run on December 11.

4. Effects of HS arrival

a. Passenger point of view

Since its first opening in 1906, NY Penn station has suffered extensive demolitions and reconstruction, including the 1962 one that included the Madison Square Garden above its premises.

In the 1990s Amtrak, the Metropolitan Transportation Authority, and New Jersey Transit, improved the appearance of the waiting and concession areas, and renewed the station information systems.

Its 21 tracks deserve "Amtrak", "NJ Transit" and "LIRR" trains, and its respective concourses. Each one is maintained and styled differently by its respective operator.

The NJ Transit concourse near Seventh Avenue is the newest (2002). A new entrance to this concourse from West 31st Street opened in September 2009. Before that date, NJ Transit passengers reached the commuter trains across the Amtrak concourse.

LIRR has two concourses: one below West 33rd Street between Seventh and Eighth Avenues. Significant renovations were made to this concourse over a three year period ending in 1994. A second West End Concourse, located west of Eighth Avenue, dates back to 1986.

The Amtrak concourse (in particular, the shopping areas) maintain the original 1960s styling and have not been renovated since the new Penn Station was built; however, there have been renovations to other parts as the waiting rooms for HS services, as shown in graph B.7.1

The Acela service has been a success; it has captured more than 50% of air or train travelers between Washington and New York, especially business travellers. By 2005 Amtrak's share between New York and Boston was over 40% from the 18% before Acela services.

From the passenger point of view HS arrival and ACELA services have not meant changes in the excellent accesibility of Penn Station. Travel time reduction and some extra features, as waiting areas and first class ACELA lounges are the big changes.

b. City point of view

Arrival of the Acela Express did not involve specific new urban developments of the surrouding areas. The reason is that New York Penn Station has always been the center of different urban development projects, since its creation in 1906, independently of the kind of railway services it provided. Besides, HS and long distance traffic are much smaller than commuter traffic at Penn Station.

Nevertheless, Penn Station, because of its through services, is the only long distance train station in NYC, Grand Central Terminal being now just for commuters.

Across Eighth Avenue from Penn Station sits New York's General Post Office, a strong constraint for any station remodeling or extension.

A new plan was started in 1999 to move entrances and concourses of Penn Station under this building, which fills an entire city block. It is named Moynihan Station West, in honor of the Senator who promoted the project, and involves 40 blocks, as shown in graph B.7.2.

The 1999's new Moynihan station development proposal included one first phase extending existing Penn Station to better vertical circulation, including access to Moynihan Station.

c. Operator point of view

Acela Express, even if not a true HS service, running in several sections of the route at 160 km/h, has been a success for Amtrak, even more than the Metroliner service operated until October 2006.

Only two dedicated tracks for HS services at Penn Station, allow, with the through scheme for the 30 HS services a day, besides the 64 conventional long distance trains operated.

Amtrak is not the main operator of the station, much more imposing on the needs of NJT or LIRR, which use the depot on the ground level of the station.

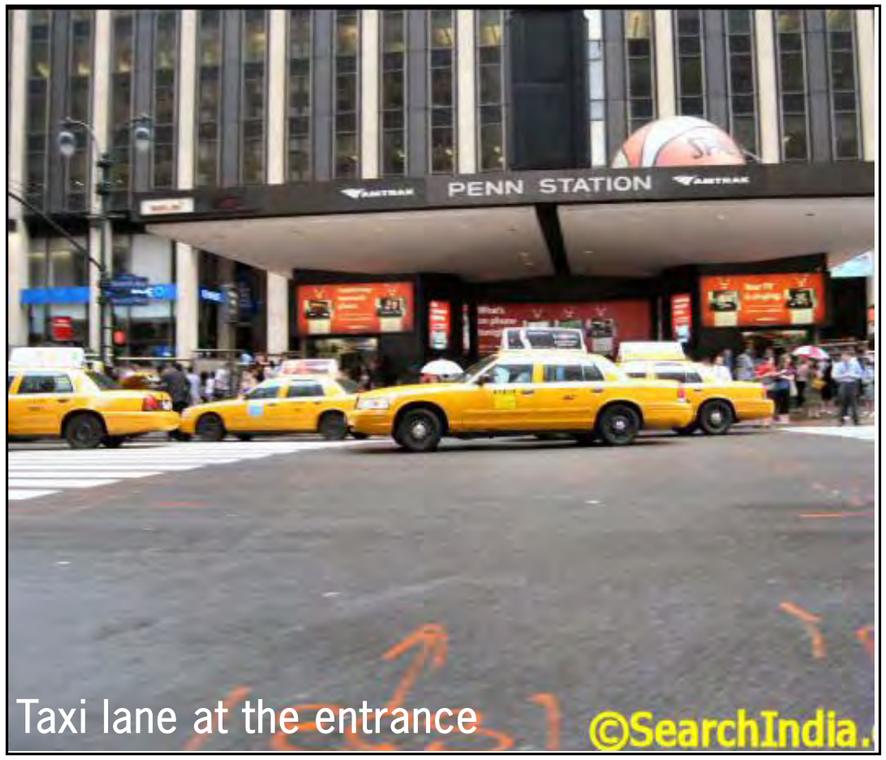
Graph B.7.3 shows the ACELA line scheme and conventional railroad schemes.

d. Rail infrastructure manager point of view

The Moynihan project and its impact on the Farley Post Office building keep concentrating discussions on Penn Station. NJT has plans for two more tracks under the Hudson and different proposals for concourse extensions.

Outside NYC, stations in New Rochelle (1500 P&R) and Stamford (2300P&R) on the North, Newark, Newark airport, and Iselin metropark (3.600 P&R) on the Southwest provide convenient access to the line by metropolitan residents, shown in B.7.4

Connection projects between Grand Central Station and Penn Station, allowing for conversion of the 1998 renovated Grand Central in a through station keeps open.

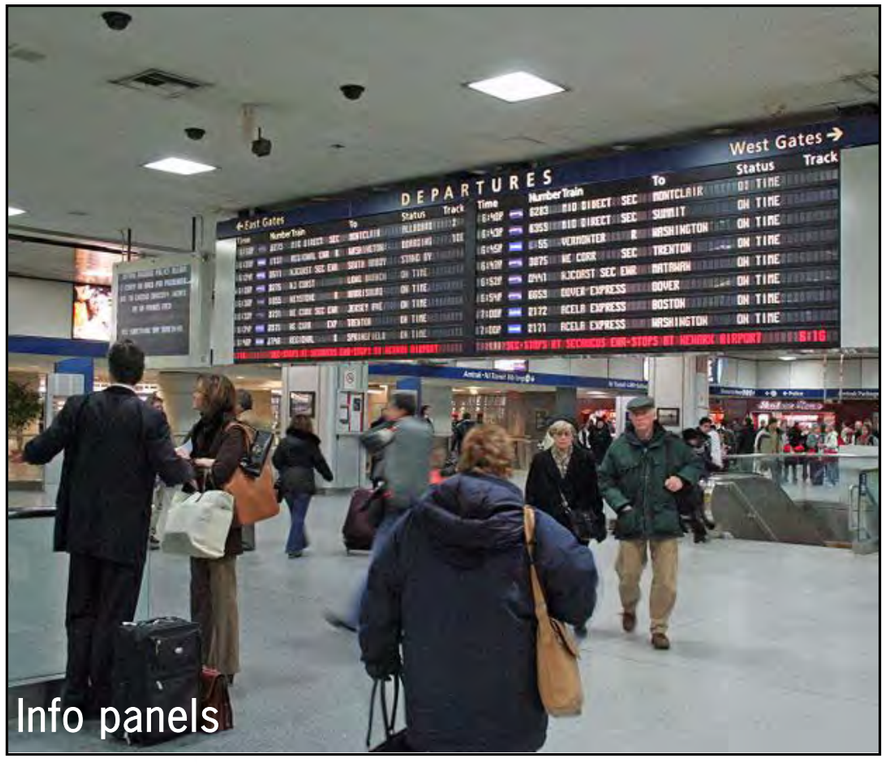


Taxi lane at the entrance

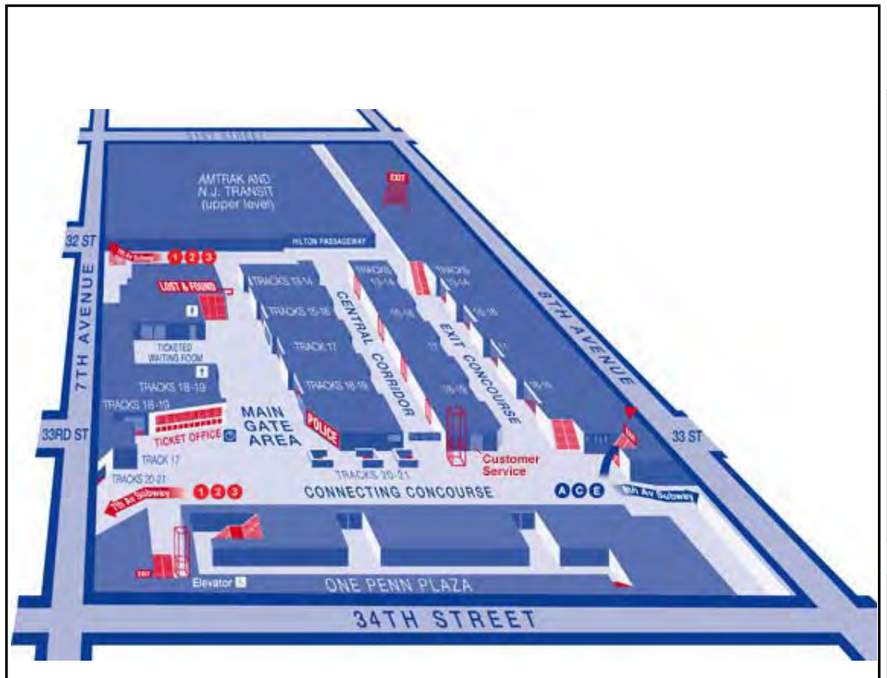
Subway connection

passenger

- Good accessibility from commuter and subway lines (same as before High Speed)
- Succesive concourse and interchange renewals of the different operators



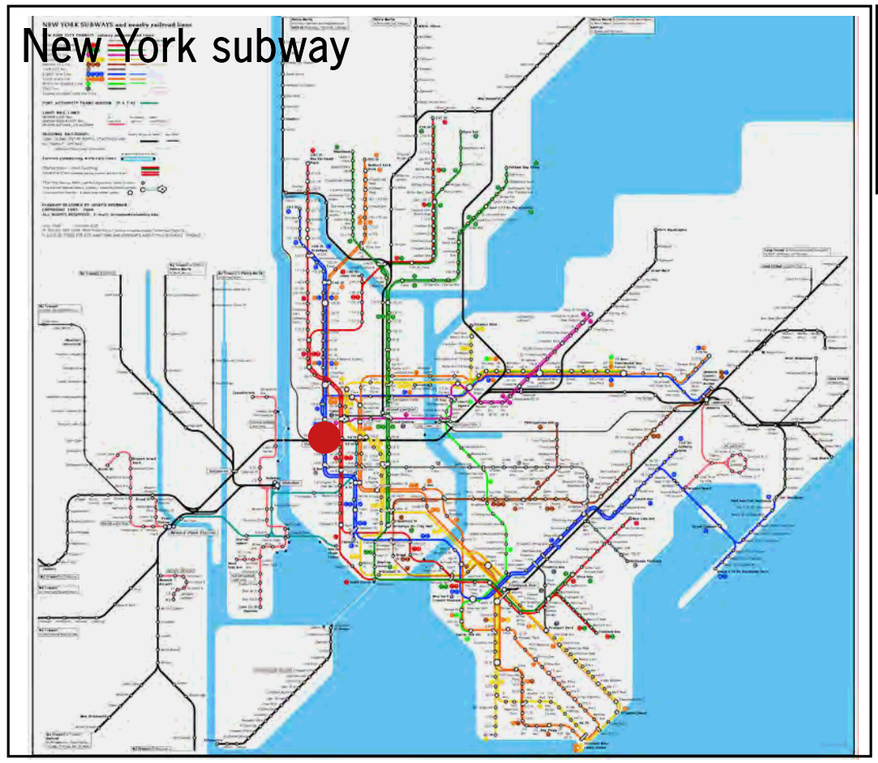
Info panels



Station access

Accessibility	High Speed stations in the city	1
	Total Region High Speed stations	6
	Nr of subway lines at the station	6
	Nr of commuter lines at the station	9
	Nr of bus routes at the station	8
	Subway st reached without transfer	228
	Commuter st reached without transfer	182
	Nr of public parking lot spaces	-
	Car parking fare (€/day)	-
	Bike renting fare (€/day)	-
	Rent a car companies	no
	Security Control?	yes
	Ticket control?	yes

Travel fares	First city	Washington
	travel fare by High Speed train (€)	101
	travel fare by Conventional train (€)	37
	travel fare by Car (€)	33
	travel fare by plane (€)	60

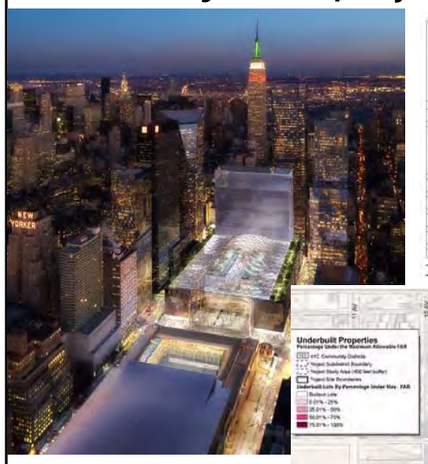


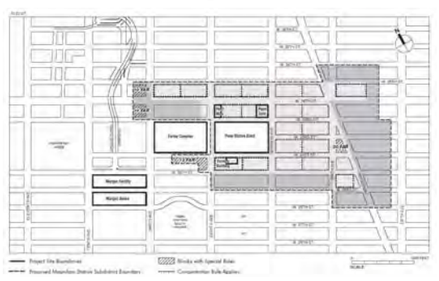
city

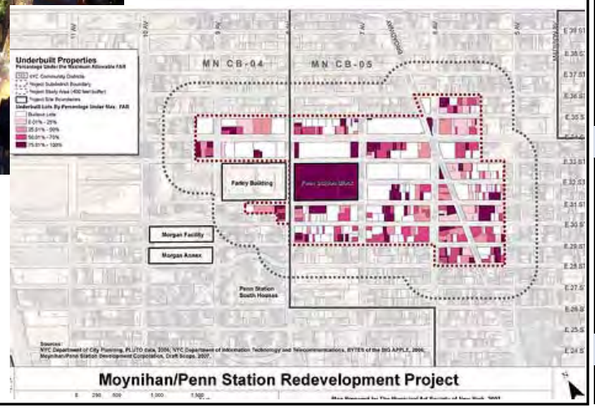
- Historic station (1906) demolished and rebuilt with Madison Square Garden on top (1962)
- New Grand Moynihan station redevelopment project involving 67 Ha. (40 blocks)

Commuter lines

Grand Moynihan project involving 40 blocks



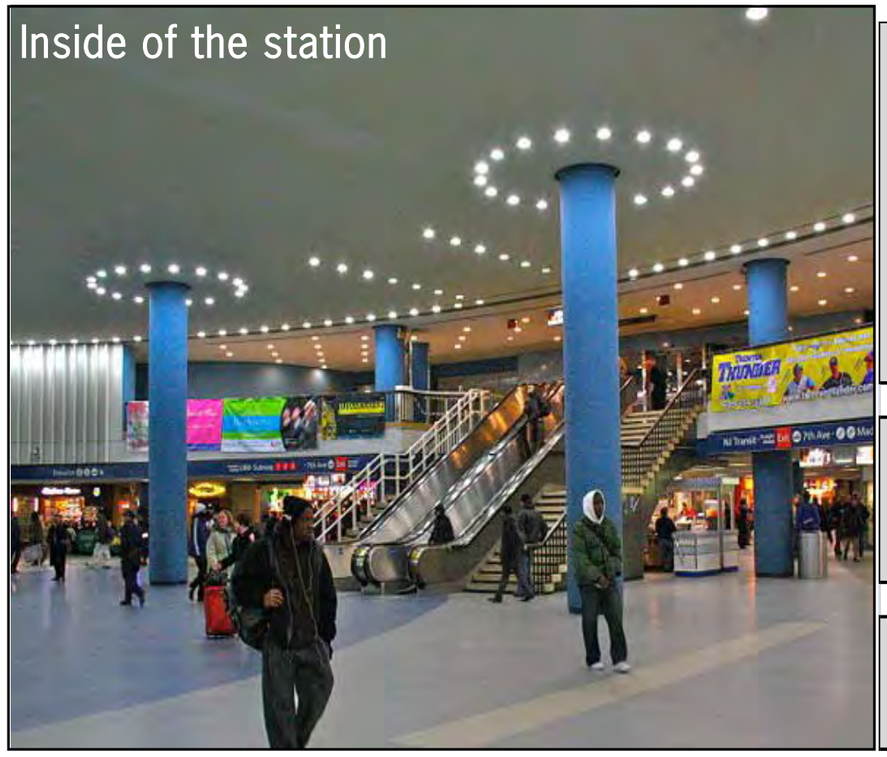




City numbers	City population	8.363.710
	City area (Km2)	790
	City density (hab/Km2)	10.587
	Region population	19.750.000
	Region area (Km2)	17.884
	Distance City Hall-Station (Km)	4,5
	International visitors a year	8.600.000
	Domestic visitors a year	36.650.000
PU T	Metro ridership in the city area (pax/day)	4.500.000
	Comm ridership in the city area (pax/day)	902.300
	Bus ridership in the city area (pax/day)	393.951
	Tram ridership in the city area (pax/day)	
Travel time	First destination	Washington
	travel time by High Speed train	2hr47min
	travel time by Conventional train	3hr15min
	travel time by Car	4hr30min
	travel time by plane*	1hr10min
	*only travel time	
	Urban develop. Total area planned (Ha)	66,7

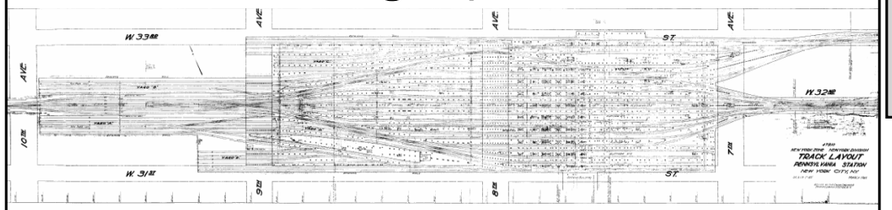
operator

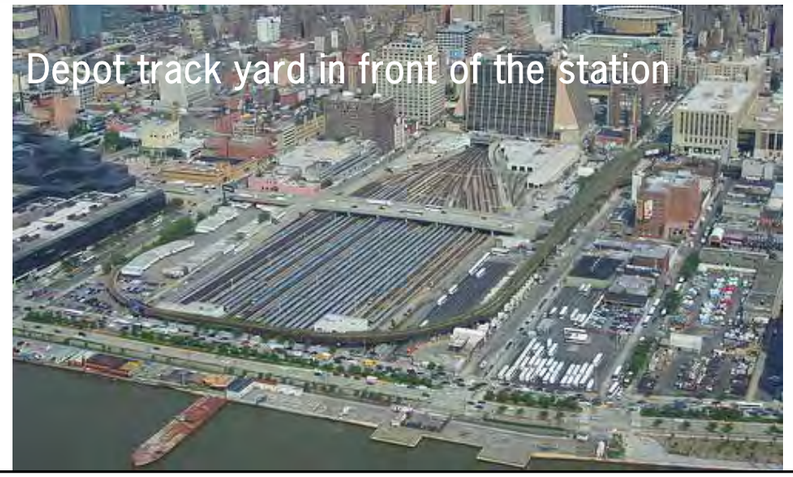
- Acela HS services on the corridor Boston-NYC-Philadelphia-Washington DC started 1999
- Is the only high speed line in the United States
- Coexisting with conventional long distance services, LIRR, and NJT at the station



Line	Operator	AMTRAK
	Services type	Through
	Opening date	11-dec-00
	High Speed lines from/to station	1
	High speed total length (Km, country)	362
	HS Services a day (both ways)	30
	Passengers a day	6.443
	% city HS trains going through this station	100
	First destination	Washington
	HS Services a day (both ways)	28
	% city trains going to this destination	93,33%
Trains	Maximum speed (Km/hour)	240
	Length (m)	202
	Cars per train	8
	Total seats	304
	Platform ocupancy time (min)	
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	
	Turnstile/entrance	

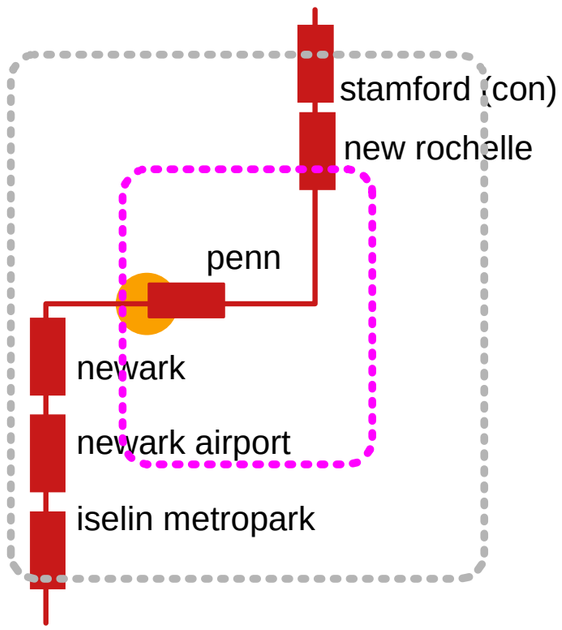
Platform level: 2 High Speed Tracks





infra manager

- Rail scheme change with Grand Central station only for commuting trains and Penn station covering both HS, long distance and LIRR
- Powerful P&R schemes in stations outside NYC



depot

in operation

Concourse: commercial area and pax services

Tracks	Railway Infra manager	Amtrack
	HS tracks yard	Through
	Station location	Underground
	Number of tracks	21
	Tracks used for High speed	2
	High Speed trains/day both ways	30
	Length of platforms	
Areas	Station footprint (sq mt)	32.000
	Total area (sq mts)	
	Platforms area (sq mt)	
	Commercial area (sq mt)	
	Number of Shops	
	Offices area (sq mt)	
	waiting area+pax services (sq mt)	
	Parking area (sq mt)	
Depots	Depot footprint (sq mts)	60.000
	Daily movements st-depot	
	Depot-station distance (Km)	0,5
€	Station construction costs (mill €)	1.863

Paris

1. The city and the region

The city of Paris, within its administrative limits covering 1.118 Km2, has an estimated population of 2.203.817; these numbers make it a ligth density city, with 1.971 hab/km2. It is situated on the river Seine, in northern France, at the heart of the Île-de-France region.

The Paris metropolitan area has a population of 11.769.433 inhabitants being one of the most populated metropolitan areas in Europe.

The city population represents only 19% of the metropolitan area.

2. The rail network and stations

Paris has an extensive railway network wich includes both long distance and commuter services.

Long distance services are the TGV trains connecting Paris with other cities across France as well as international services. There are 4 HS lines operating in Paris, leaving from 4 main HS stations in the city deserving the different destinations.

These lines are:

- TGV Nord, from Paris Gare du Nord
- TGV Est, from Paris Gare de l'Est
- TGV Sud-Est, from Paris Gare de Lyon
- TGV Atlantique, from Paris Gare Montparnasse

These lines also stop at other seven stations in the Paris metropolitan area. New railway projects are being developed along this area, such as connections with Orly airport, or the conversion of Paris Austerlitz into a main high speed station.

The present report studies Paris-CDG airport station (graphs B.9.1), Gare de Lyon (graphs B.9.2), and Gare du Nord (graphs B.9.3).

Commuter services are integrated in two different systems:

- RER (Regional Express Network), a rapid transit system serving Paris and its suburbs integrating the modern city-centre rail and a pre-existing set of regional rail lines. It has multiple connections with the Paris Métro. The network consists of five through lines: A, B, C, D and E and is still expanding. It is operated by RATP and SNCF jointly

- TRANSILIEN (Suburban rail): is the railway system operated by SNCF within Paris Île-de-France région. It consists of 6 lines departing from Paris railway stations: Saint Lazare, La Defense, Montparnasse, Nord, Est and Lyon.

Both systems transport 2.800.000 passengers daily.

Paris Métro, operated by RATP, is composed of 14 lines and transports 3.8 million passengers every day.

3. The HS arrival

The TGV opened to the public on 27 September 1981, with the inauguration of Paris-Lyon line

LGV Atlantique was the second line opening services, in 1989 and then LGV Nord to Calais and the Belgian border in 1993

Another HS landmark was the Eurostar service, connecting continental Europe to London via the Channel Tunnel beginning operation in 1994. New sections in UK allowed for time reductions in 2003 and 2007.

The LGV Est from Paris to Strasbourg was inaugurated on 15 March 2007, and opened to the public in the summer of 2007.

4. Effects of HS arrival

a. Passenger point of view

Prior to the Paris - Lyon operation, SNCF started a major publicity campaign focusing on the speed, frequency, reservation policy, normal price, and broad accessibility of the service. The TGV was much faster than normal trains, cars, or aeroplanes. TGV trains became an inmediate success.

All TGV trains offered, for instance, catering facilities, family carriages and private telephone areas to help make the train journey more convenient. At the beginning (1981) of the HS services, much better services with very competitive travel times were offered at the same price at the passenger. HS was, for the passenger, a new and more convenient mode of transportation.

Although station accesibility remained the same, services starting from the old terminals in Paris, additional services and sharp punctuality became standards of the new HS services. Although prices are not anymore the same as conventional trains, TGV service standards are the landmark for long distance service trains in France. New quiet cars and e-reservations started in 2006.

HS station diversification by line is not a real advantage for the passenger, having a single HS station for each destination, except the suburbs stations such as CDG stations at Roissy airport, deserving several destinations.

b. City point of view

TGV lines took advantage of existing infrastructure in the Paris area. Real HS started outside of the city suburbs. TGVs often use intra-city tracks and stations built for lower speed trains.

No city effect was therefore associated with the HS arrival at the city center stations, the service using the same station and access, and no urban developments were associated to the event.

In some cases there have been enhancements of commuter or subway connections, such as new RER lines deserving HS railway stations. All TGV stations are connected to several metro lines and/ or RER commuter lines.

At the same time new stations have been built in suburban areas or in the open countryside several kilometers away from Paris. This allows TGVs to stop without incurring too great a time penalty, and provide better accesibility to residents of the outskirts of the city, as well as opportunities for new urban developments.

c. Operator point of view

TGV system carried 98 million passengers during 2008, an increase of 8 million (9.1%) on the previous year.

The network of high-speed TGV trains, which have been in existence since 1981, connects 200 destinations in both France and the rest of Europe. Since its start in 1981 it changed operational schemes and procedures for long distance trains, moving to reversible fixed train sets from locomotive and wagons, and introducing new schemes of maintenance, as well as reservations and quality control systems.

Train maintenance is performed at nearby huge depots adjacent to each terminal, although same operations such as cleaning and catering are performed on the platforms.

Several national and international air relationships (Paris –Brussels) were even closed because of TGV competition, an enormous success that is facing congestion problems, leading to the conception of doubledecker trains to increase capacity of trains.

Security control exists only for Eurostar services to London, while there is a ticket access control to platforms.

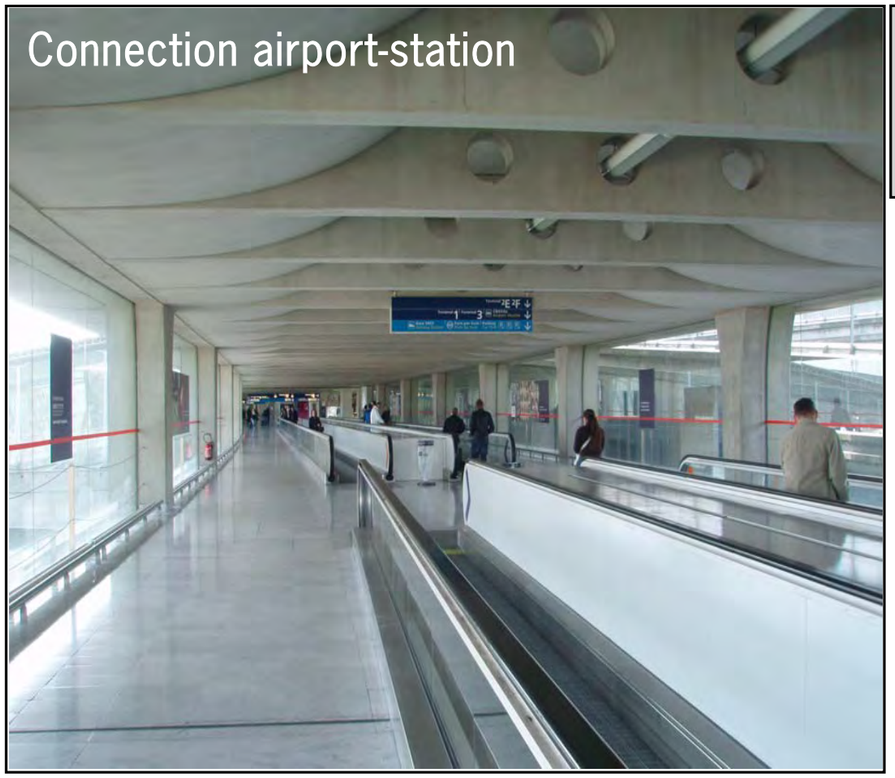
d. Rail infrastructure manager point of view

TGV heavy traffic and policy of new stations in the suburbs, has induced several interconnection of lines in the outskirts of Paris, trying to deserve destinations on different lines from the same station, compensating the problems of dead end and single destinations at stations in the city center.

Despite excellent public transport access to the stations, provision of parking spaces is very significant, normally in the surroundings of the station rather than at the station itself.

RER line B platforms at the station

Connection airport-station

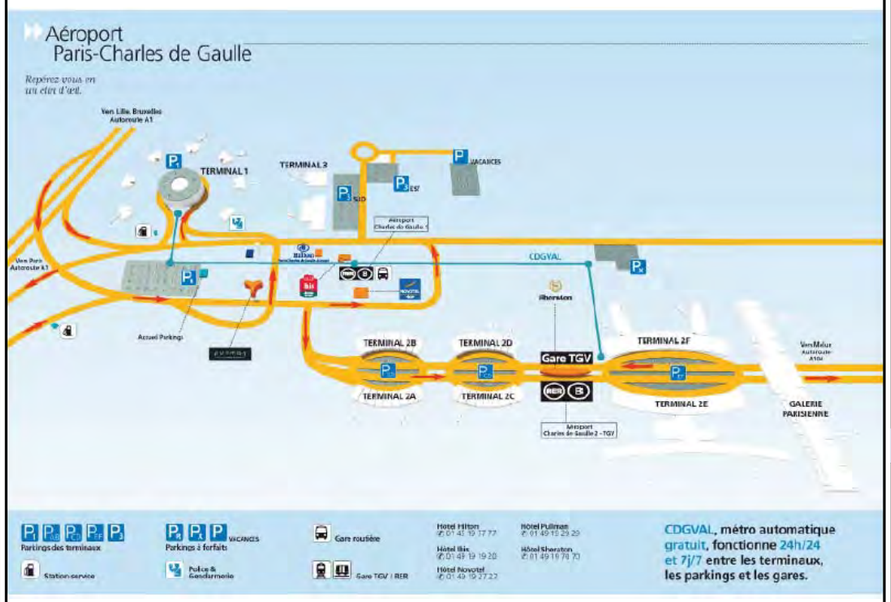


passenger

- Average of 10 minutes walking to Charles de Gaulle airport terminals
- Connection with RER line B. RER tracks adyacent to TGV tracks
- Not connections with metro system
- Huge parking shared with airport passengers with 15.000 spaces
- Large ticket booths, with long waiting time
- Direct access via the A1 Autoroute
- Taxis are available in front of the RER station

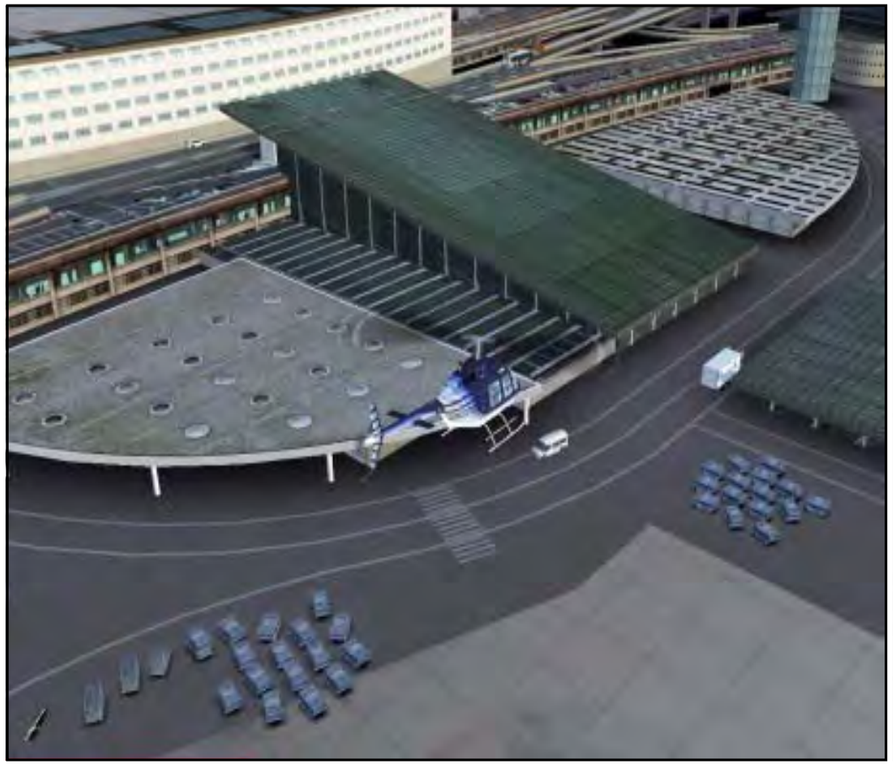
Info panels and automatic ticket machines

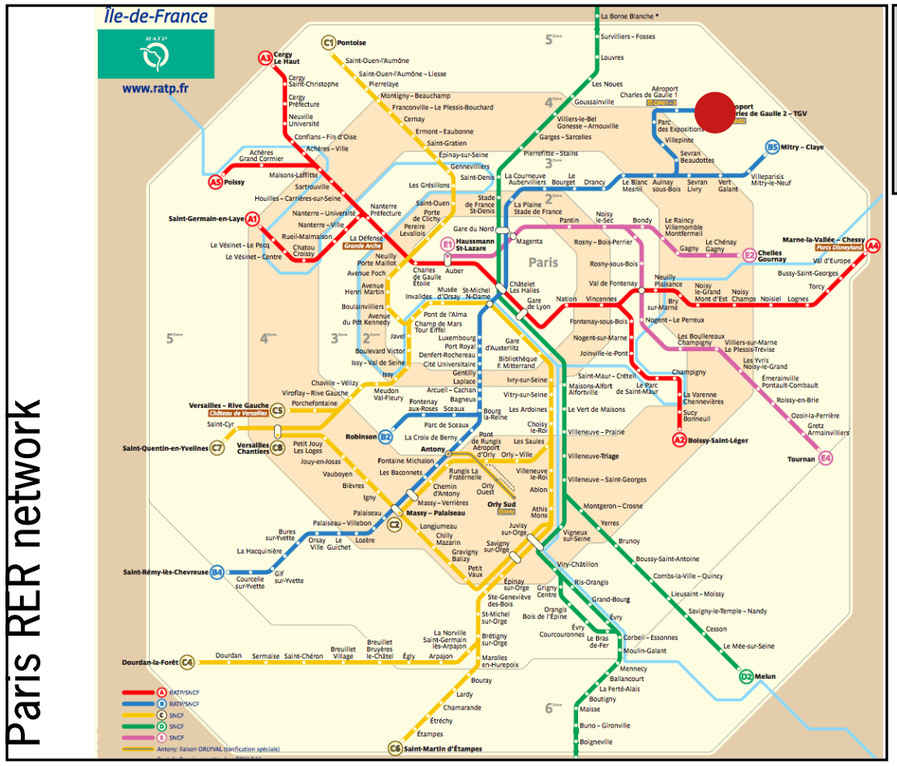
Station accessibility



Accessibility	High Speed stations in the city	4
	Total Region High Speed stations	11
	Nr of subway lines at the station	0
	Nr of commuter lines at the station	1
	Nr of bus routes at the station	12
	Subway st reached without transfer	0
	Commuter st reached without transfer	42
	Nr of public parking lot spaces	15.000
	Car parking fare (€/day)	48
	Bike renting fare (€/day)	1
	Rent a car companies	1
	Security Control?	no
	Ticket control?	yes

Travel fares	First city	Lyon
	travel fare by High Speed train (€)	65
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	72
	travel fare by plane (€)	200

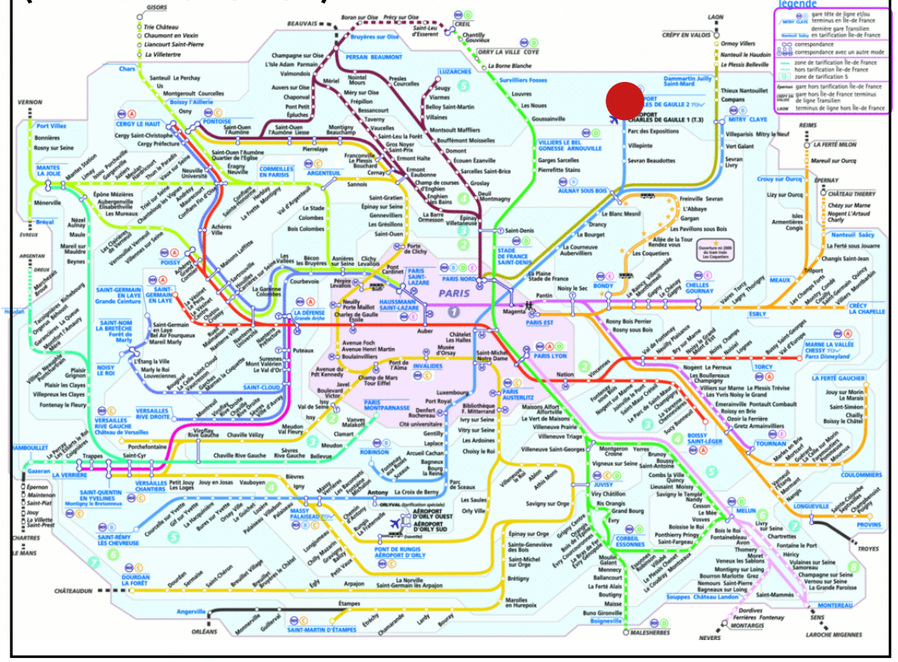




city

- In the center of Charles de Gaulle Airport Terminal 2
- Modern building, integrated in the airport

Paris suburban trains network (RER+Transilien)

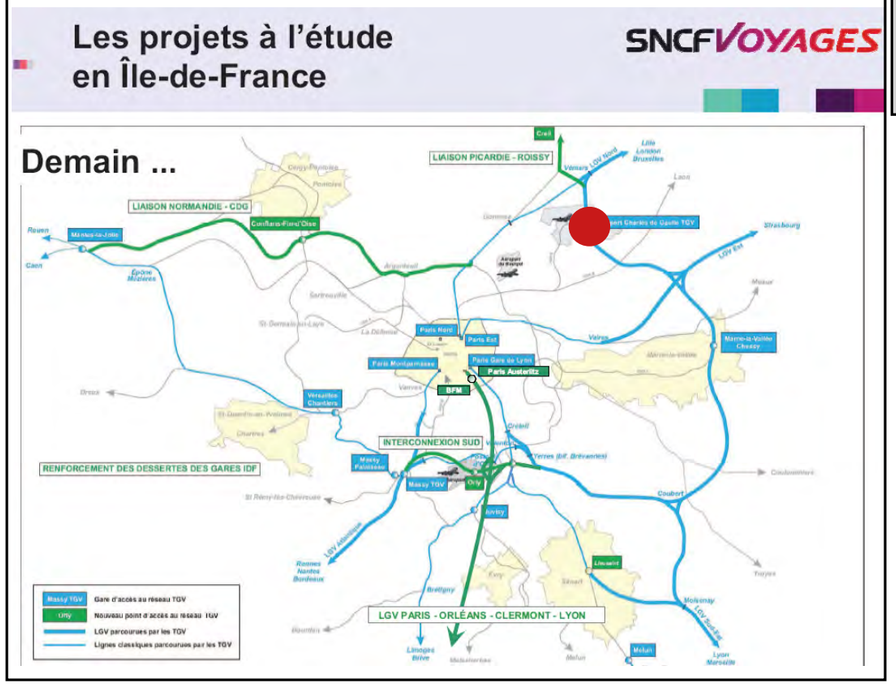


Station-airport surrounding area

City numbers	City population	2.203.817
	City area (Km2)	1.118
	City density (hab/Km2)	1.971
	Region population	11.769.433
	Region area (Km2)	14.518
	Distance City Hall-Station (Km)	23
	International visitors a year	17.400.000
	Domestic visitors a year	11.600.000
PUT	Metro ridership in the city area (pax/day)	3.855.556
	Comm ridership in the city area (pax/day)	2.777.778
	Bus ridership in the city area (pax/day)	1.000.000
	Tram ridership in the city area (pax/day)	140.000
Travel time	First destination	Lyon
	travel time by High Speed train	2hr10min
	travel time by Conventional train	-
	travel time by Car	4hr20min
	travel time by plane*	1hr15min
	*only travel time	
	Urban develop. Total area planned (Ha)	-

France HS Network

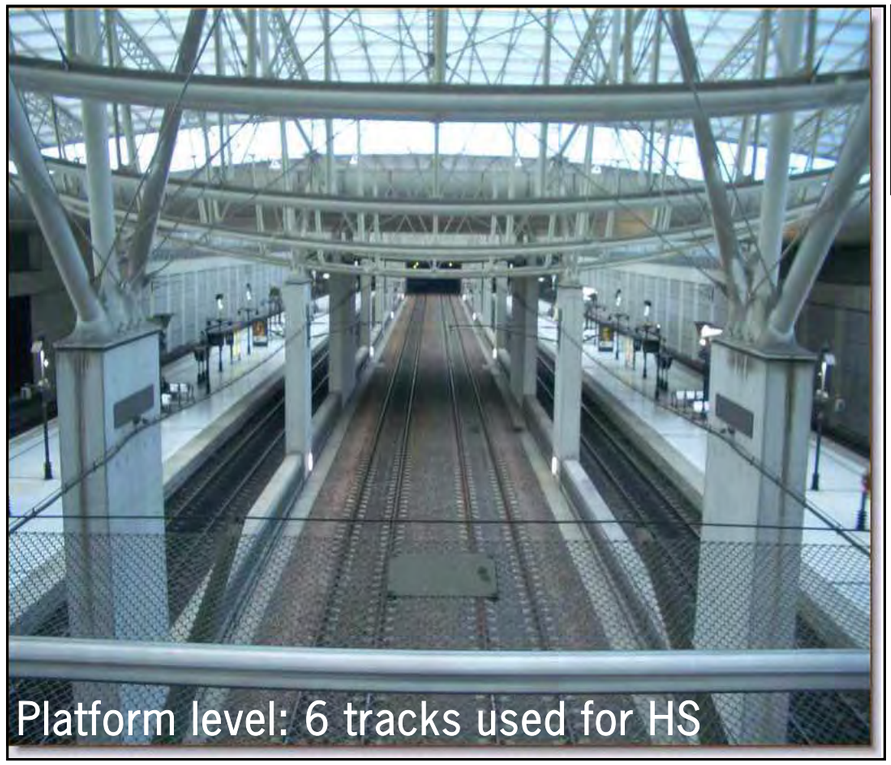
Paris HS Network



operator

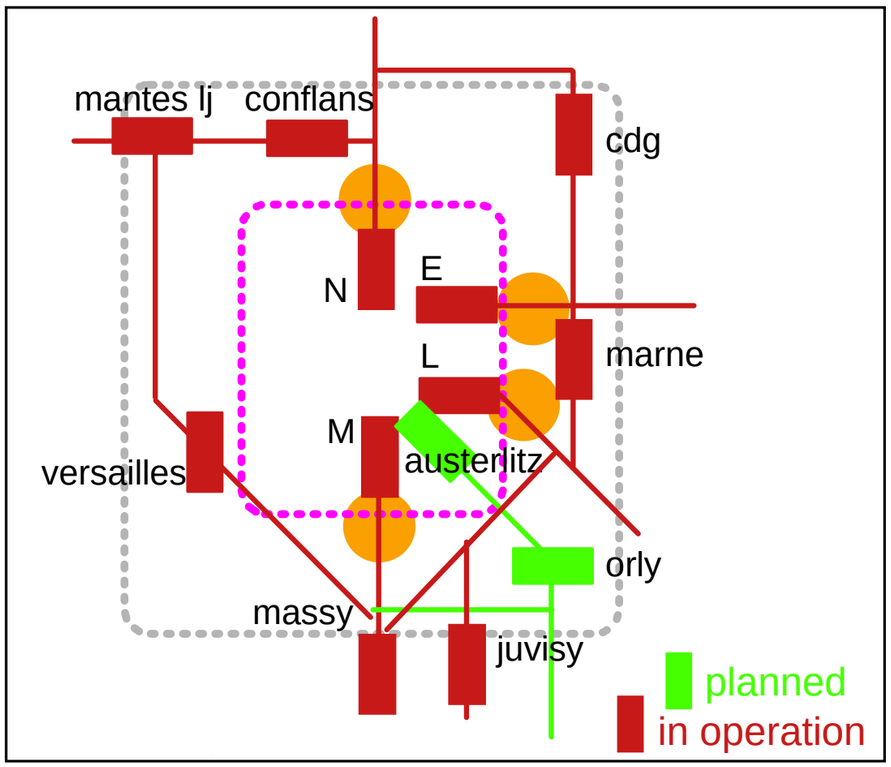
- HS started operation in 1994
- Intermediate station in the LGV Interconnexion Est line
- SNCF operates direct TGV services to several French stations

Line	Operator	SNCF
	Services type	Through
	Opening date	1994
	High Speed lines from/to station	1
	High speed total length (Km, country)	1.872
	HS Services a day (both ways)	150
	Passengers a day	1.500
	% city HS trains going through this station	25,00%
	First destination	Lyon
	HS Services a day (both ways)	24
	% city trains going to this destination	16,00%
Trains	Maximum speed (Km/hour)	300
	Length (m)	490
	Cars per train	20
	Total seats	1.020
	Platform ocupancy time (min)	5-6
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	no
	Turnstile/entrance	no



infra manager

- 6 high speed tracks; 2 of them through tracks



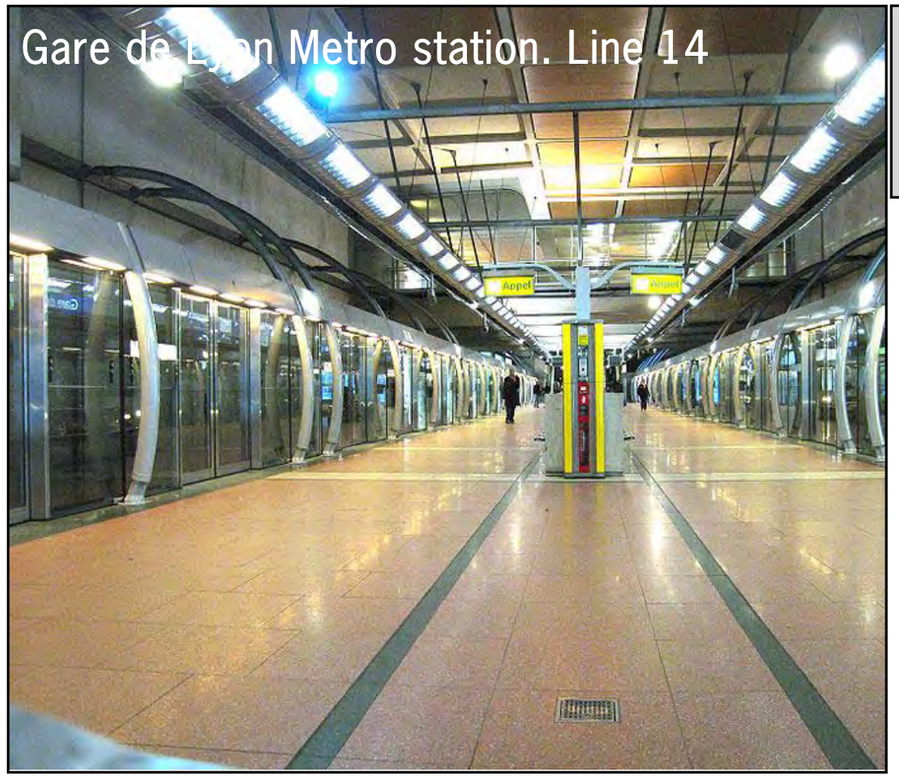
Tracks	Railway Infra manager	RFF
	HS tracks yard	Through
	Station location	Underground
	Number of tracks	8
	Tracks used for High speed	6
	High Speed trains/day both ways	61
	Length of platforms	480

Areas	Station footprint (sq mt)	12.476
	Total area (sq mts)	13.469
	Platforms area (sq mt)	10.511
	Commercial area (sq mt)	390
	Number of Shops	2
	Offices area (sq mt)	2.239
	waiting area+pax services (sq mt)	5.198
	Parking area (sq mt)	-

Depots	Depot footprint (sq mts)	-
	Daily movements st-depot	-
	Depot-station distance (Km)	-

€	Station construction costs (mill €)	260

Bus stop adjacent to the station

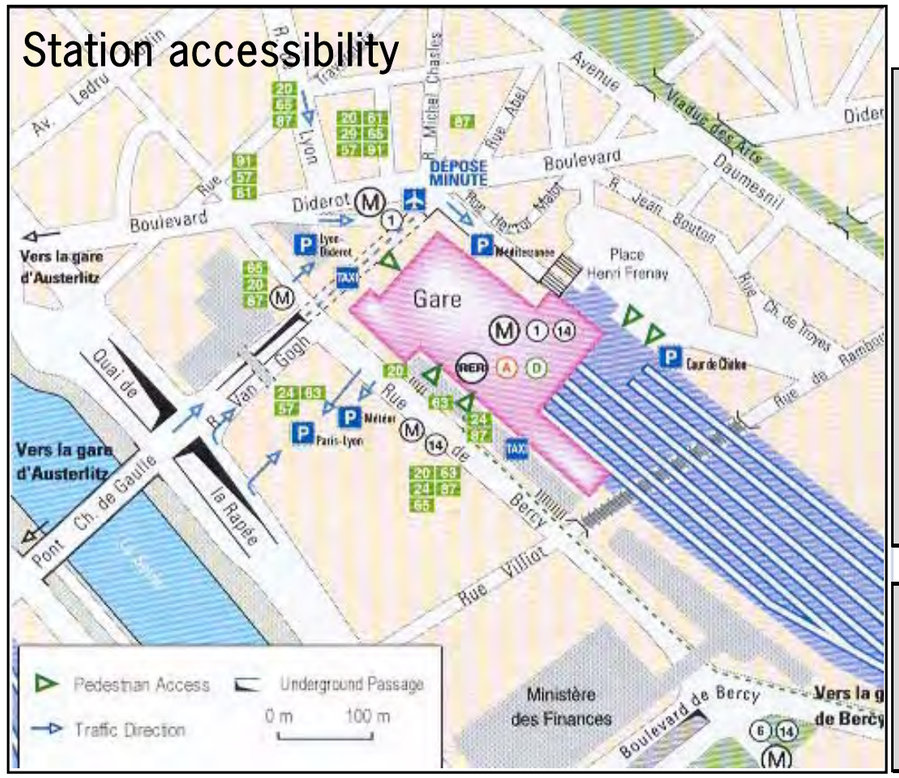


Gare de Lyon Metro station. Line 14

passenger

- Good connections with bus, metro lines 1 and 14 and RER A and E services
- Lots of public parkings around the station

Access gates and info panels

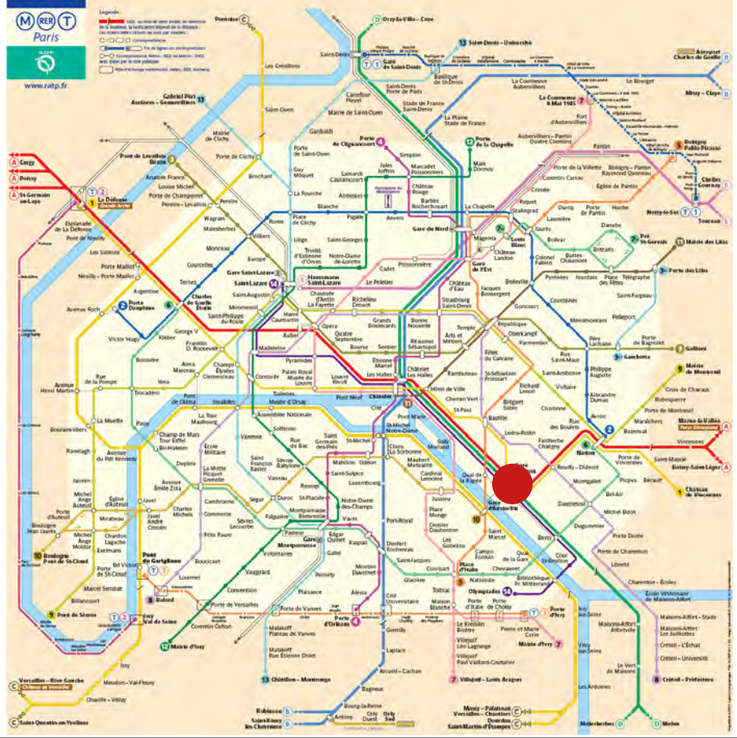


Station accessibility

Accessibility	High Speed stations in the city	4
	Total Region High Speed stations	11
	Nr of subway lines at the station	2
	Nr of commuter lines at the station	2
	Nr of bus routes at the station	8
	Subway st reached without transfer	33
	Commuter st reached without transfer	105
	Nr of public parking lot spaces	3.555
	Car parking fare (€/day)	25
	Bike renting fare (€/day)	1
	Rent a car companies	6
	Security Control?	no
	Ticket control?	Yes

Travel fares	First city	Lyon
	travel fare by High Speed train (€)	56
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	72
	travel fare by plane (€)	200

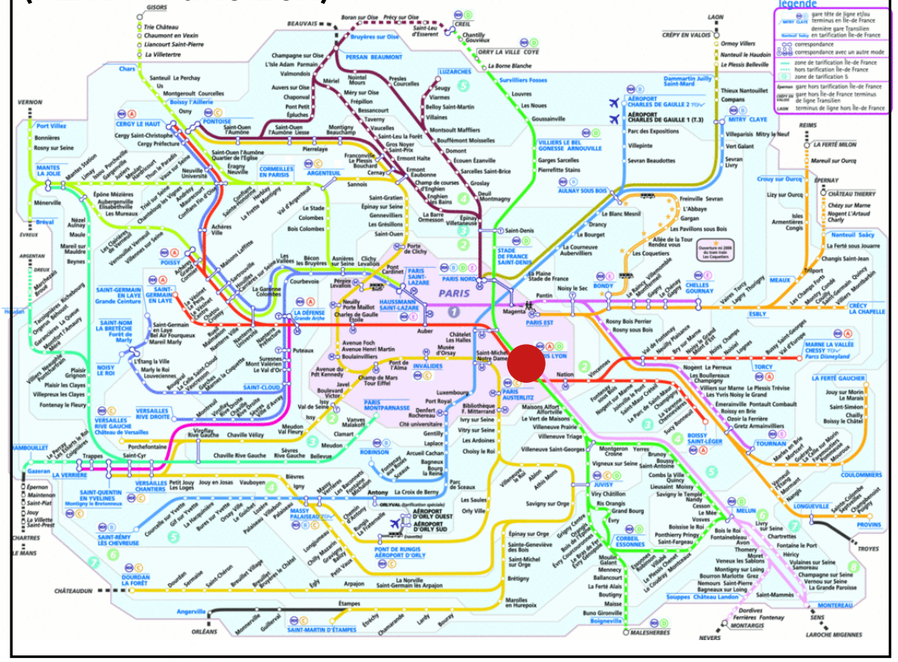
Paris metro and RER network



city

- No real estate projects
- Station was built for the World Exposition of 1900. On multiple levels, it is considered a classic example of the architecture of its time
- Despite the classic architecture, the station has been modernized to accommodate the high-speed TGV trains that whisk travelers throughout France.

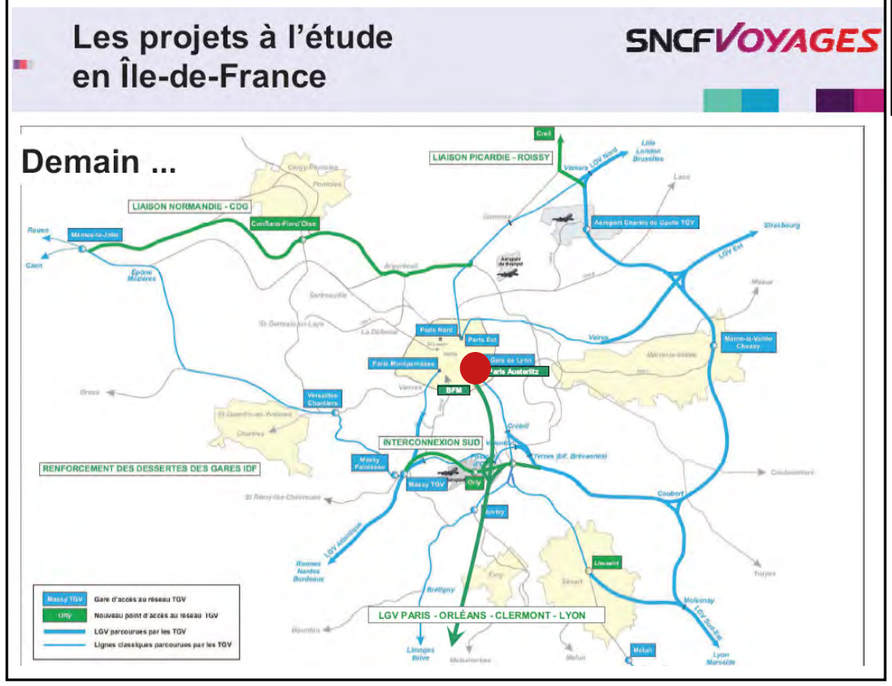
Paris suburban trains network (RER+Transilien)



City numbers	City population	2.203.817
	City area (Km2)	1.118
	City density (hab/Km2)	1.971
	Region population	11.769.433
	Region area (Km2)	14.518
	Distance City Hall-Station (Km)	2,2
	International visitors a year	17.400.000
	Domestic visitors a year	11.600.000
PUT	Metro ridership in the city area (pax/day)	3.855.556
	Comm ridership in the city area (pax/day)	2.777.778
	Bus ridership in the city area (pax/day)	1.000.000
	Tram ridership in the city area (pax/day)	140.000
Travel time	First destination	Lyon
	travel time by High Speed train	1hr57min
	travel time by Conventional train	-
	travel time by Car	4hr20min
	travel time by plane*	1hr15min
	*only travel time	
	Urban develop. Total area planned (Ha)	-

France HS Network

Paris HS Network



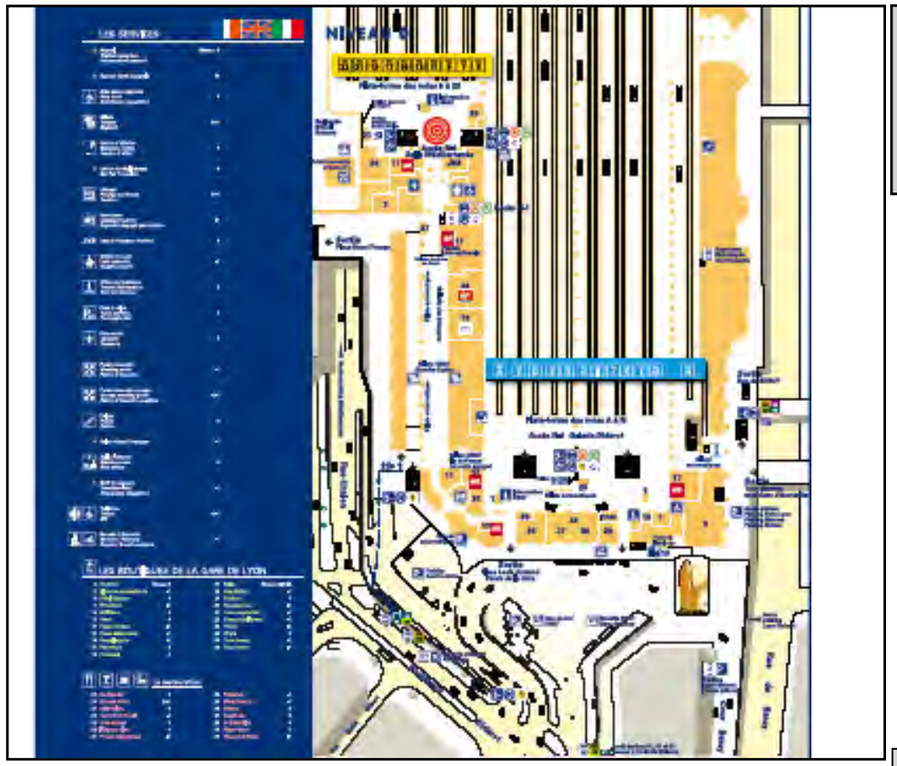
operator

- Started HS September 1981 with line LGV Sud-Est
- The inauguration marked the beginning of the re-invigoration of French passenger rail service
- The line was 87 Km shorter than the regular line
- The station is one of the 4 HS railway termini in Paris and runs all services to the south and east of France

TGV Train at the Station

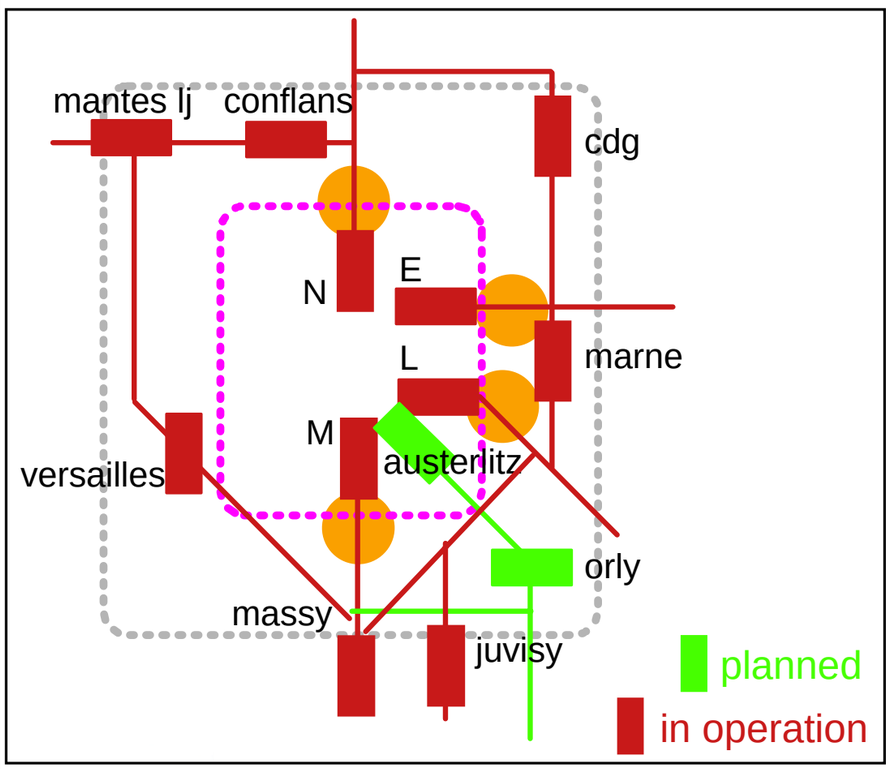
Inside of the station

Line	Operator	SNCF
	Services type	Dead End
	Opening date	27-sep-81
	High Speed lines from/to station	1
	High speed total length (Km, country)	1.872
	HS Services a day (both ways)	180
	Passengers a day	84.560
	% city HS trains going through this station	30,00%
	First destination	Lyon
	HS Services a day (both ways)	44
	% city trains going to this destination	24,44%
Trains	Maximum speed (Km/hour)	320
	Length (m)	400
	Cars per train	16
	Total seats	1020
	Platform ocupancy time (min)	20
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	no



infra manager

- 20 high speed tracks
- Dead end squeme configuration
- Huge offices area (almost half of the station area)



Tracks	Railway Infra manager	RFF
	HS tracks yard	Dead End
	Station location	At grade
	Number of tracks	22
	Tracks used for High speed	20
	High Speed trains/day both ways	210
	Length of platforms	400

Areas	Station footprint (sq mt)	81.000
	Total area (sq mts)	110.813
	Platforms area (sq mt)	47.954
	Commercial area (sq mt)	8.600
	Number of Shops	44
	Offices area (sq mt)	47.975
	waiting area+pax services (sq mt)	18.234
	Parking area (sq mt)	-

Depots	Depot footprint (sq mts)	280.000
	Daily movements st-depot	-
	Depot-station distance (Km)	2

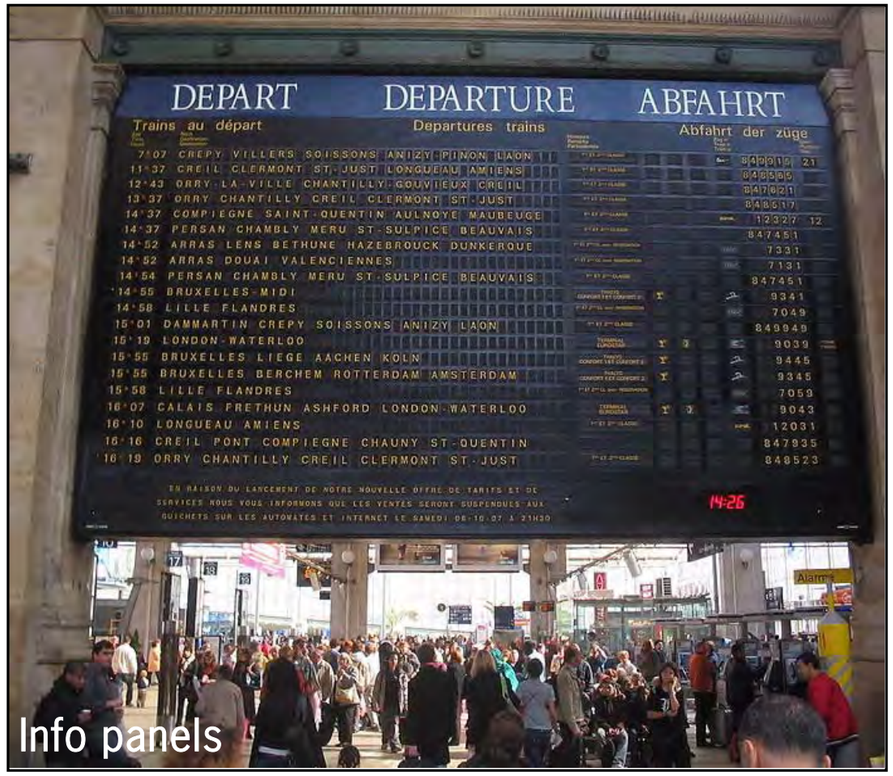
€	Station construction costs (mill €)	-


Bike renting at the station

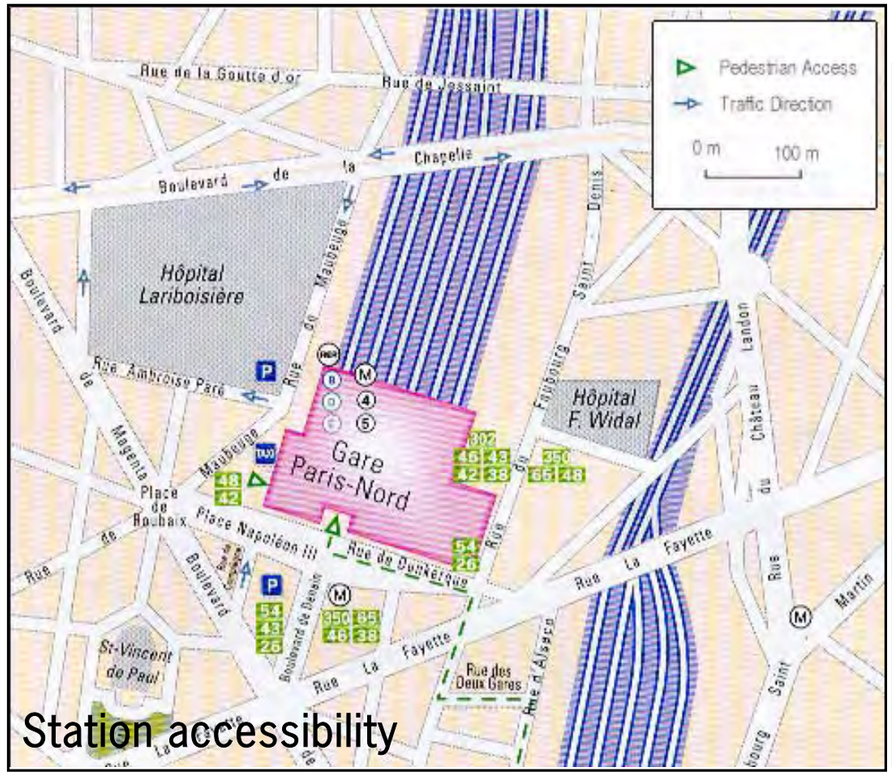
Conexions with metro/RER/airport

passenger

- Connections with several urban transportation lines, including metro and RER
- Busiest railway station in Europe
- Huge security for the station due to the position of the station as a gateway to the northern suburbs of Paris.



Info panels

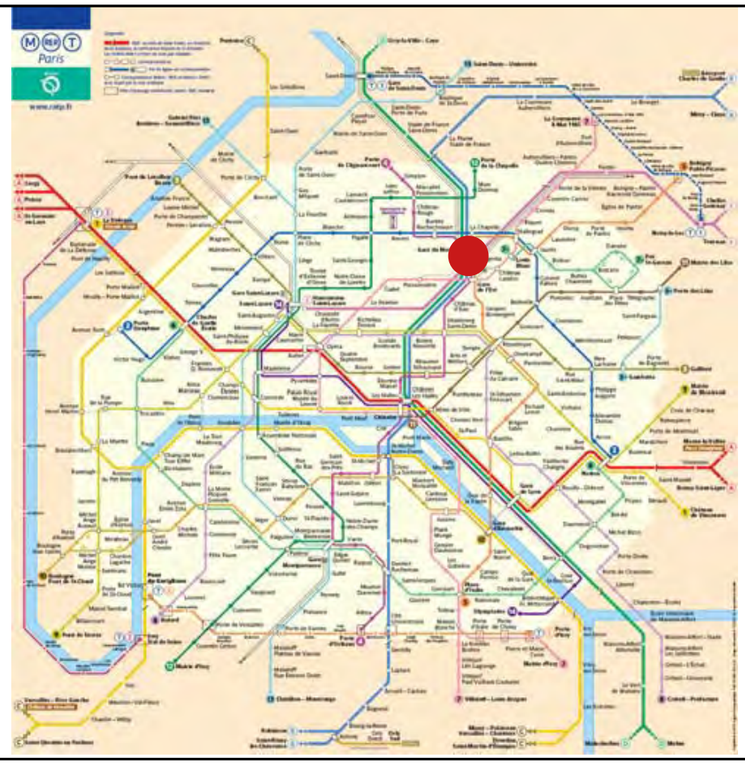


Station accessibility

Accessibility	High Speed stations in the city	4
	Total Region High Speed stations	11
	Nr of subway lines at the station	2
	Nr of commuter lines at the station	6
	Nr of bus routes at the station	10
	Subway st reached without transfer	46
	Commuter st reached without transfer	242
	Nr of public parking lot spaces	3.737
	Car parking fare (€/day)	25
	Bike renting fare (€/day)	1
	Rent a car companies	5
	Security Control?	no
	Ticket control?	yes

Travel fares	First city	Lille
	travel fare by High Speed train (€)	40
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	35
	travel fare by plane (€)	-

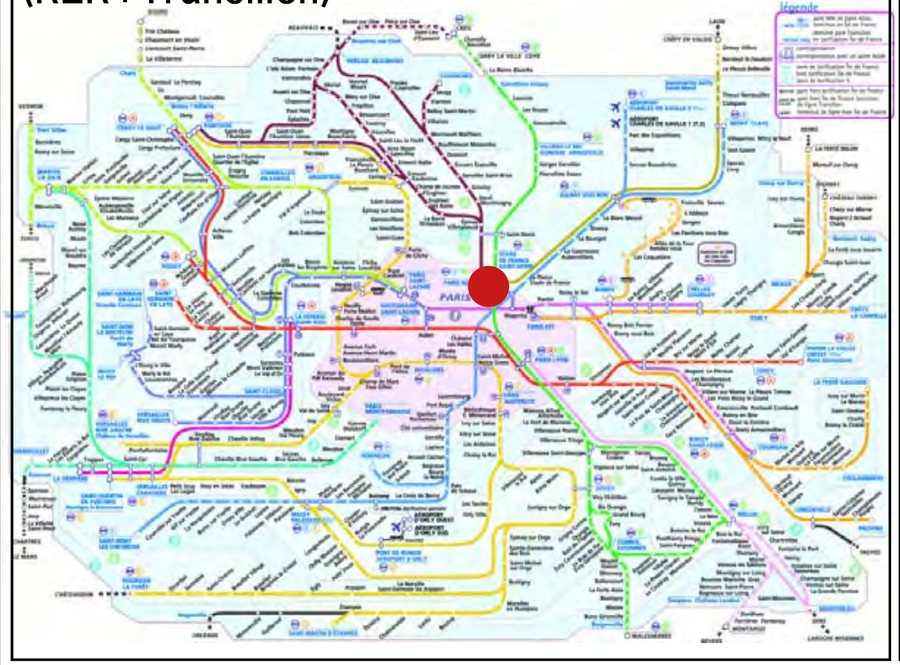
Paris metro and RER network



city

- Historic building, built in 1864
- Completely rebuilt in 1889
- More expansion work was carried out between the 1930s and the 1960s
- There is a project to build a connecting hallway between Gare Du Nord and Gare de L'Est, wich is projected to open around the time when the new LGV Est begins serving the station.

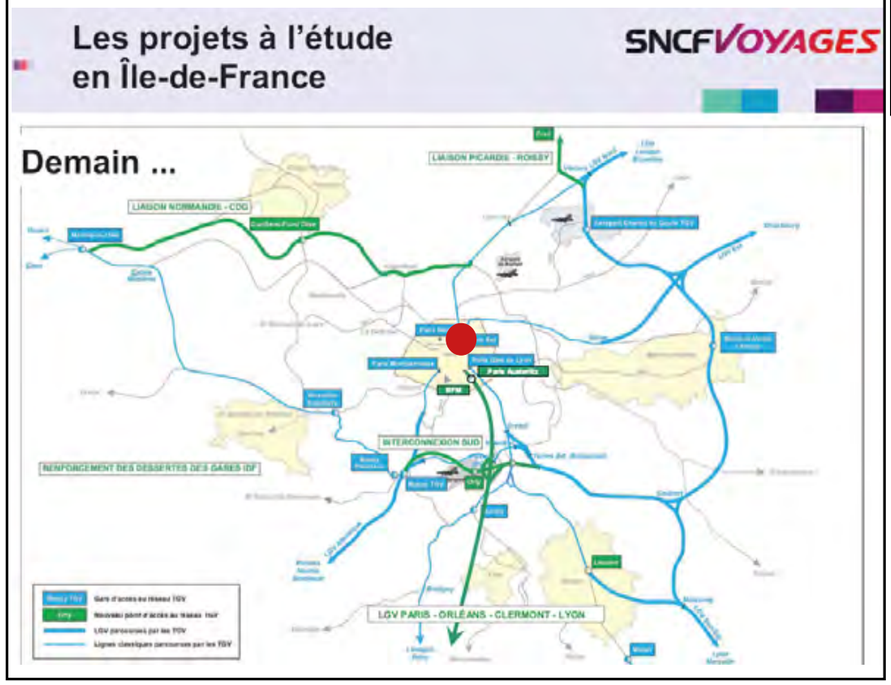
Paris suburban trains network (RER+Transilien)



City numbers	City population	2.203.817
	City area (Km2)	1.118
	City density (hab/Km2)	1.971
	Region population	11.769.433
	Region area (Km2)	14.518
	Distance City Hall-Station (Km)	2,7
	International visitors a year	17.400.000
	Domestic visitors a year	11.600.000
PUT	Metro ridership in the city area (pax/day)	3.855.556
	Comm ridership in the city area (pax/day)	2.777.778
	Bus ridership in the city area (pax/day)	1.000.000
	Tram ridership in the city area (pax/day)	140.000
Travel time	First destination	Lille
	travel time by High Speed train	1hr
	travel time by Conventional train	-
	travel time by Car	2hr15min
	travel time by plane*	-
	*only travel time	
	Urban develop. Total area planned (Ha)	-

France HS Network

Paris HS Network



operator

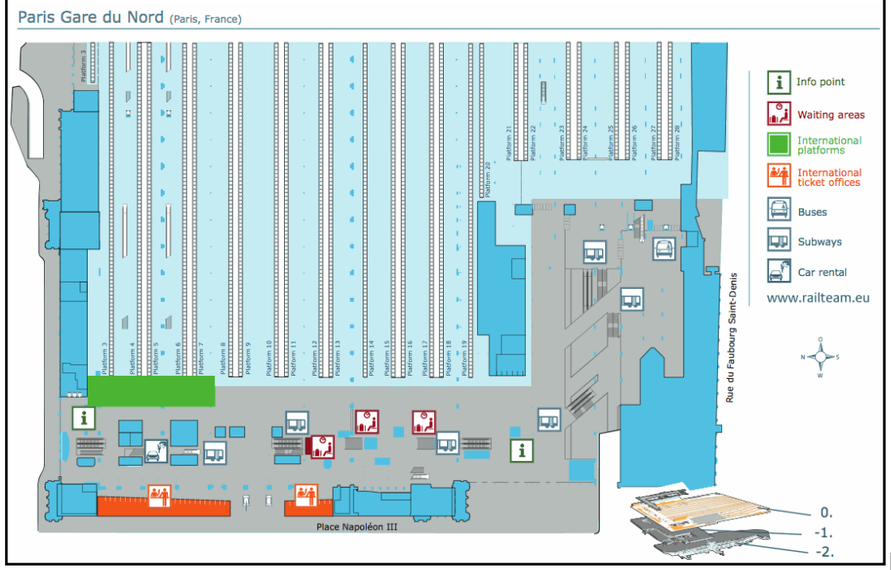
- Started HS 1993 with the arrival of LGV-Nord, wich connects Paris with Belgian border and the Channel tunnel
- The line sees the widest variety of high-speed rolling stock
- Three different services:
  - ✓Eurostar to London
  - ✓TGV to northern France, operated by SNCF
  - ✓Thalys to Belgium, Germany and Netherlands

TGV Train at the Station

Inside of the station.

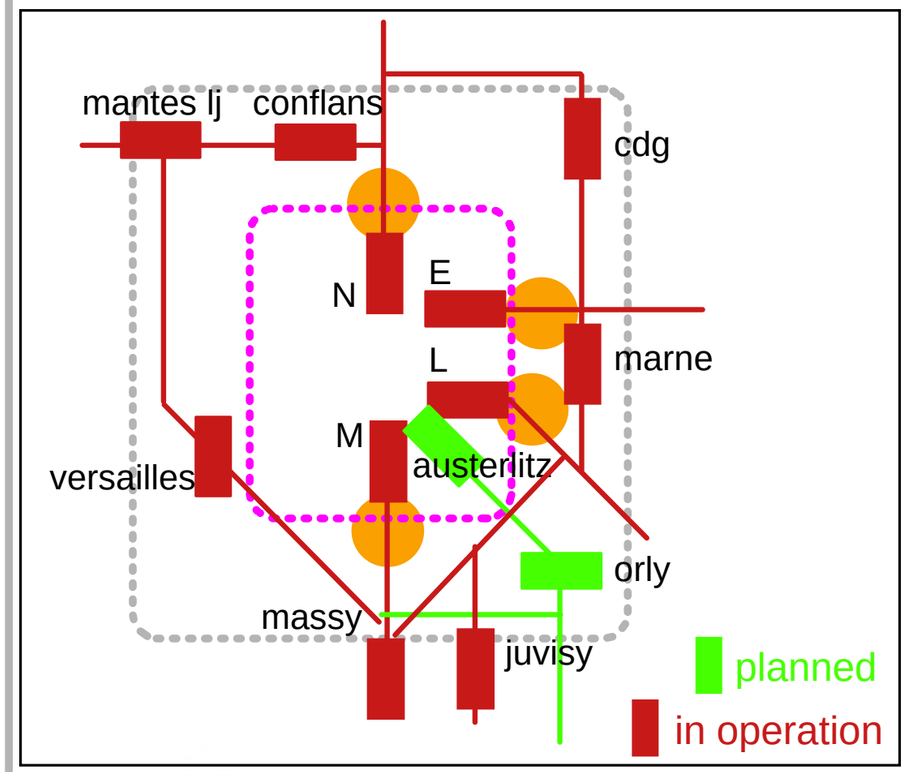
Line	Operator	SNCF,Thalys,Eurost
	Services type	Dead End
	Opening date	1993
	High Speed lines from/to station	3
	High speed total length (Km, country)	1.872
	HS Services a day (both ways)	151
	Passengers a day	52.361
	% city HS trains going through this station	25,00%
	First destination	Lille
	HS Services a day (both ways)	44
	% city trains going to this destination	29,14%
Trains	Maximum speed (Km/hour)	300
	Length (m)	400
	Cars per train	18 (Eurostar)
	Total seats	772
	Platform ocupancy time (min)	20
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	yes (Eurostar)

Platform level



infra manager

- The arrival of Eurostar trains required a reorganisation of the rail tracks
- 44 tracks, 16 HS tracks:
  - ✓4 tracks for Eurostar
  - ✓2 tracks for Thalys services
  - ✓10 tracks for TGV trains



Tracks	Railway Infra manager	RFF
	HS tracks yard	Dead End
	Station location	At grade
	Number of tracks	44
	Tracks used for High speed	16
	High Speed trains/day both ways	156
	Length of platforms	250
Areas	Station footprint (sq mt)	103.500
	Total area (sq mts)	105.840
	Platforms area (sq mt)	53.662
	Commercial area (sq mt)	8.169
	Number of Shops	80
	Offices area (sq mt)	21.614
	waiting area+pax services (sq mt)	13.790
	Parking area (sq mt)	-
Depots	Depot footprint (sq mts)	300.000
	Daily movements st-depot	-
	Depot-station distance (Km)	2
€	Station construction costs (mill €)	-

Rome

1. The city and the region

The city of Rome has a population of 2,743,796 inhabitants, and a surface of 1,285 square km it is the largest and most populated city in Italy. The population density of the city is not very high and amounts to 2,135 inhab. /sq km.

The province of Rome, which surrounds the large municipality of Rome consists in about 4,148,913 inhabitants, that is about 75% of the whole population of the Lazio region (5,664,714 inhabitants). City population is 48% of the Lazio region

2. The rail network and stations

Given the shape of the city of Rome with reference to its territory, the rail network consists of a series of railway lines that - at least in their initial sections - run along the routes of the historical consular roads. Therefore there is a link running along the Tyrrhenian line (Rome-Genoa); two links going northwards, consisting in the HS lines and a line dedicated to Intercity and commuter services; a link pointing eastwards towards Pescara and finally two links going southwards, a coastal line and an inland line, the former along the Casilina road, and the latter reaching Naples through Frosinone. The HS line linking Rome to Naples was built next to this route and since December 2005 HS trains have been running according to a regular HS shuttle service.

The regional routes are served by 8 regional lines, called FR, which ensure an urban-like service in the suburban metropolitan area as well. One of these lines crosses the North-eastern side of the province of Rome (Orte) linking it to the western part of the province, where the Leonardo da Vinci airport of Rome (Fiumicino) is situated. Besides the 8 FR lines there is another fast connection directly linking Rome Termini station to the Fiumicino Airport.

Besides the regional lines, public urban transport mobility is operated by two Underground lines which interconnect under Rome Termini station, carrying 320.000 passengers daily and by other three regional lines managed by Metro S.p.A., connecting respectively Rome Termini to Pantano, Viterbo and Lido di Roma.

3. The HS arrival

The High speed service entered into operation in Rome Termini in December 2005 with the Rome–Naples link. Soon after, other rail sections gradually entered into operation. By December 2009 the HS backbone had been completed and consisted in about 1,000 kms of rail line, with through links from Turin to Salerno, running through Milan, Bologna, Florence, Rome and Naples. Graphs B.11 present Termini data.

4. Effects of HS arrival

a. Passenger point of view

The High speed service arrived in Rome Termini in December 2005 when the HS link of Rome–Naples came into operation and later, with the gradual activation of the other sections North of Rome, which did not involve Rome Termini station directly, but had an effect on the travel times related to the Rome-Milan route. Since then, a considerable increase in rail passengers, who choose the HS service that has become competitive with air travel, has been recorded.

Rome Termini station allows easy accessibility to Regional services, as well as to the two underground lines, which can be reached through the shopping mall located in the underground floor of the station, and to the tram and bus services located in the square just in front of the station. In addition, it hosts the direct shuttle service “Leonardo Express” that links Rome Termini station to Fiumicino Airport (Leonardo da Vinci), every 20 minutes.

Like Paris, Berlin and London, Rome too will soon have a hi-tech railway station, not only conceived as train terminal, but also as a meeting-place for shopping, wellness or leisure. The new Rome Tiburtina station, currently under construction, will be a kind of suspended urban hub, a fly-over covered “boulevard” built over the tracks, an ultra-modern HS junction, designed, among other things, to reduce travel times between Rome and Milan to 2hrs 45 mins, but also structured to be a vital ganglion for regional commuter trains, aimed at decongesting the historical and very central Rome Termini station.

The mega construction site of Rome Tiburtina, opened in 2007 over an area of 90 hectares, will be completed between the end of 2010 and the beginning of 2011.

The new station – with an overall planned investment of 320 mln euros, 190 of which for the high speed and 130 for the other infrastructures – will develop a surface of 50,000 square meters, 10,000 of which dedicated to commercial activities. The plan for the surrounding 10 hectares is to equip them with new green areas for cultural, social, recreative and sport services as well as with cycling tracks for the inhabitants of the neighbourhood.

Currently all the long distance trains, that are not headed to Rome Termini, stop at Rome Tiburtina station. However only very few HS runs on the Rome-Naples route carry out service to Rome Tiburtina station and not to Rome Termini.

All the trains of the FR1 and FR2 regional lines pass through Rome Tiburtina station – which is in the East part of Rome and attracts an average of 22 million people a year. The station also hosts the Tiburtina station of the Underground "B" line, whilst the Autostazione Tibus bus terminal stands at about a hundred meters from the station, across the front square. This is a modern bus terminal for the arrival and departure of long and medium distance bus services, directed to all the various cities in Italy and abroad. The terminal is also the end station for a large number of city bus lines.

b. City point of view

Rome Termini is Rome's main railway station. Initially built in 1867, was enlarged several times and in 1950 got its caracteristic front roof. Rome Termini has gained a prominent role in the urban, regional and national transport system. Recently the "Grandi Stazioni" project took shape, starting from idea of the station as being a privileged point of transit, a fundamental resource for the city and a universe in continuous expansion. The aim of the project was to transform the 13 most important Italian stations into comfortable and safe environments, with the double role of being multi-transport hubs, but also urban meeting points or squares, full of facilities and shopping opportunities.

The renewal of Rome Termini station has proved the validity of this idea, with an investment of about 119 million euros and a tight-scheduled rhythm of works that were completed in occasion of the 2000 Jubilee. The station is in Piazza dei Cinquecento, between Via Marsala and Via Giovanni Giolitti, right in the centre of the city.

A shopping mall was built inside Rome Termini, covering a total surface of 23,600 square meters, placed both at the track level and in the underground level that connects the station to the entrances of the underground network. In this area one can find about 130 shops with all sorts of commercial activities (restaurants, supermarkets, clothes shops etc..) as well as other specific facilities targeted to customer needs (car rentals, banks, post offices).

A special architectonical area of Rome Termini station, called "Ala Mazzoniana" has recently been refurbished and has become a poly-functional centre for public utility services, shopping, events, catering, fitness and culture.

c. Operator point of view

Rome Termini station is the hub where almost all HS trains and the majority of regional, long and medium distance trains converge. This "hub" idea has favoured interchange and encouraged even those travellers who live in towns not directly linked to the HS backbone to use HS services.

Every day 450.000 travellers pass through Rome Termini station, 34% of whom are passing through the station while in transit to other destinations.

The quality standard of services has been increased thanks to the restructuring of the ticket-office, the development of the information structures, the introduction of automatic ticket-offices, new left-luggage offices and hygienic services.

The system of pssenger signs has been rethought according to a criterion of immediate intelligibility, using a clear and uniform style.

d. Rail infrastructure manager point of view

The Rome Termini asset covers an area of 225,000 square meters. The station closes from 1h 00 a.m. to 4h 00 a.m. Security is managed from a central control room.

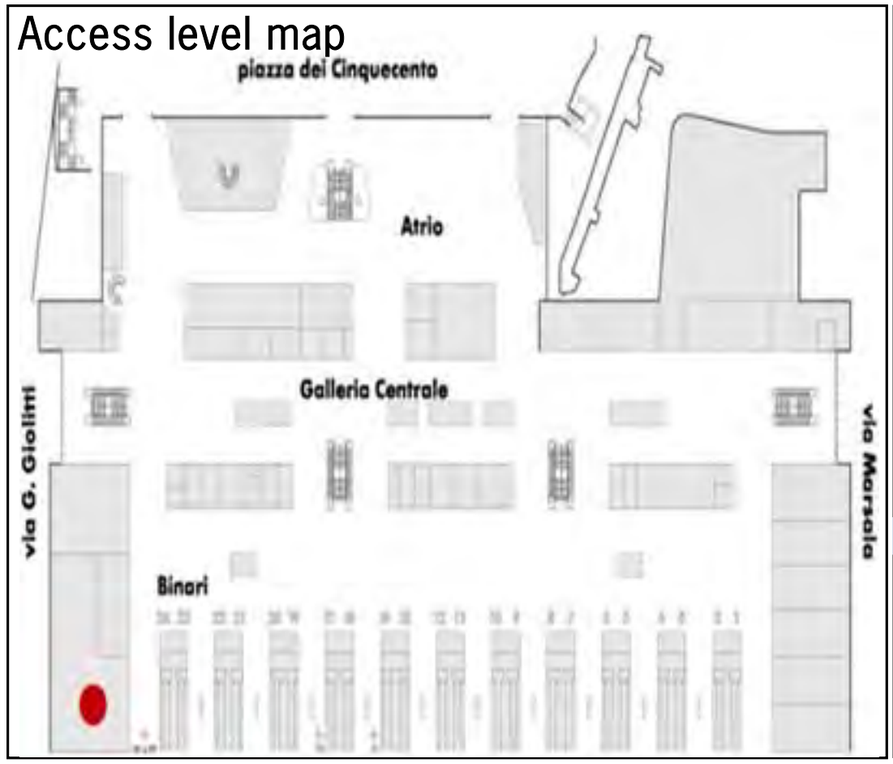
The future system will include both Roma Termini and Tiburtina to a major extent.

Ticket booths

passenger

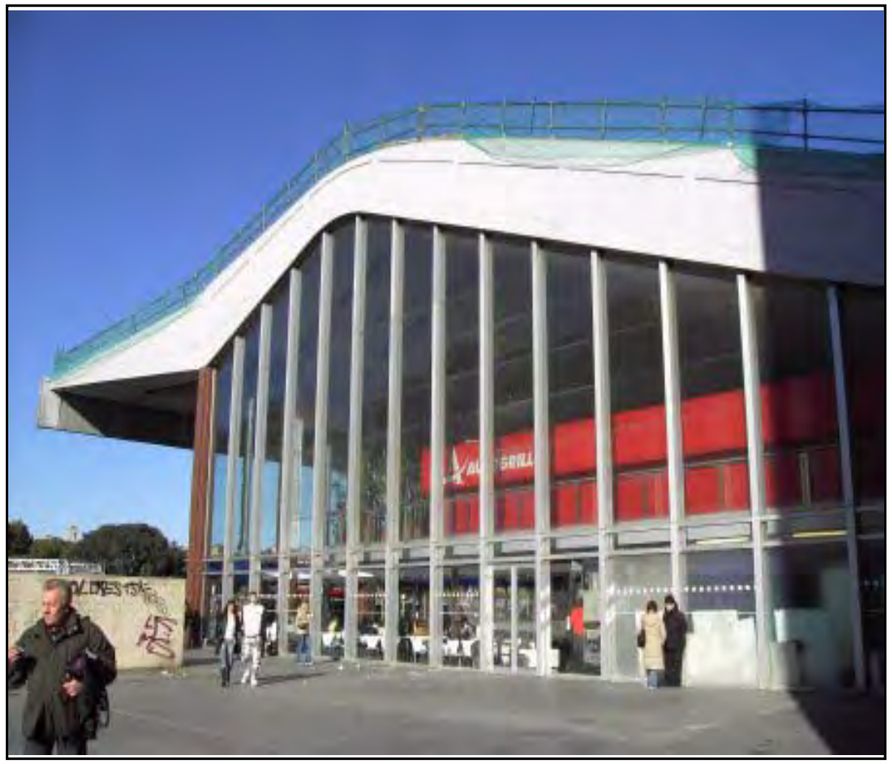
- Wide and modern commercial area
- Convergence of subway, local, regional and HS services
- Reduced access and transfer time

Access level map



Accessibility	High Speed stations in the city	2
	Total Region High Speed stations	2
	Nr of subway lines at the station	2
	Nr of commuter lines at the station	9
	Nr of bus routes at the station	80
	Subway st reached without transfer	49
	Commuter st reached without transfer	81
	Nr of public parking lot spaces	164
	Car parking fare (€/day)	18
	Bike renting fare (€/day)	-
	Rent a car companies	13
	Security Control?	yes
	Ticket control?	no

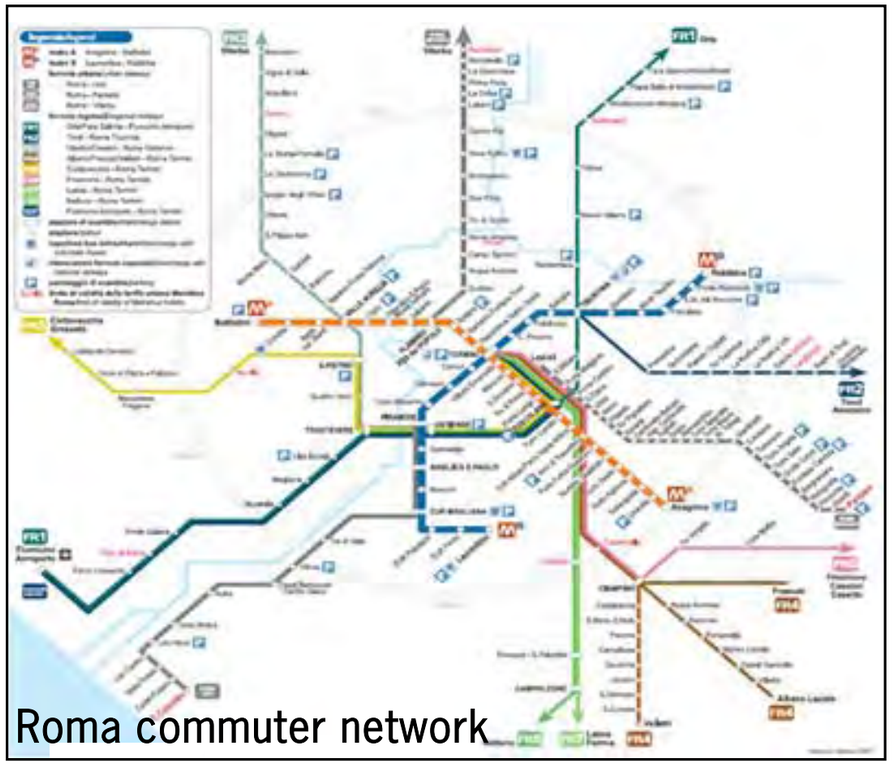
Travel fares	First city	Milano
	travel fare by High Speed train (€)	89
	travel fare by Conventional train (€)	46
	travel fare by Car (€)	74
	travel fare by plane (€)	206



Roma subway network

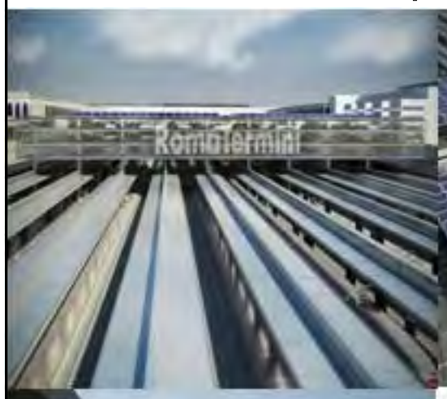
city

- Renewal of the station with a new parking area and photovoltaic panels
- Main hub of the subway



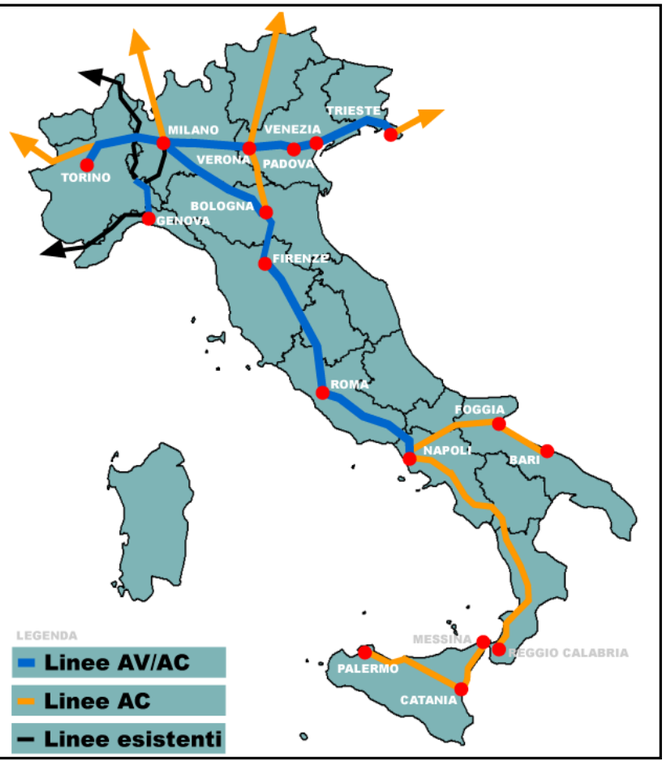
Roma commuter network

Roma Termini development



City numbers	City population	2.741.086
	City area (Km2)	1.285
	City density (hab/Km2)	2.132
	Region population	5.664.714
	Region area (Km2)	17.203
	Distance City Hall-Station (Km)	2,5
	International visitors a year	4.900.832
	Domestic visitors a year	2.998.728
PU T	Metro ridership in the city area (pax/day)	906.849
	Comm ridership in the city area (pax/day)	180.000
	Bus ridership in the city area (pax/day)	
	Tram ridership in the city area (pax/day)	3.098.630
Travel time	First destination	Milano
	travel time by High Speed train	3hr
	travel time by Conventional train	6hr34min
	travel time by Car	5hr30min
	travel time by plane*	1hr10min
	*only travel time	
	Urban develop. Total area planned (Ha)	-

Italy High Speed Railway Network



Roma railway network

operator

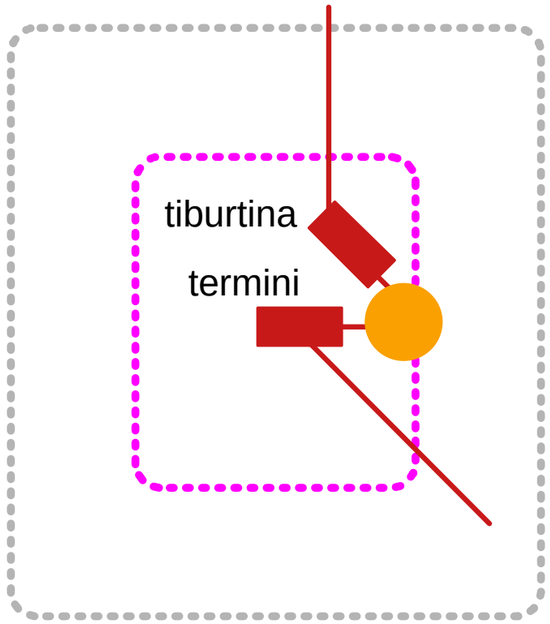
- Main departure and arrival station of the HS services
- “Leonardo Express” service to the Rome Airport
- Main station for the local and regional services

Line	Operator	Trenitalia
	Services type	Dead End
	Opening date	Dec 2005
	High Speed lines from/to station	1
	High speed total length (Km, country)	1.000
	HS Services a day (both ways)	91
	Passengers a day	28.500
	% city HS trains going through this station	94,00%
	First destination	Milano
	HS Services a day (both ways)	70
	% city trains going to this destination	85,00%
Trains	Maximum speed (Km/hour)	300
	Length (m)	328
	Cars per train	11
	Total seats	603
	Platform ocupancy time (min)	20
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	no
	Turnstile/entrance	no

Underground commercial area

infra manager

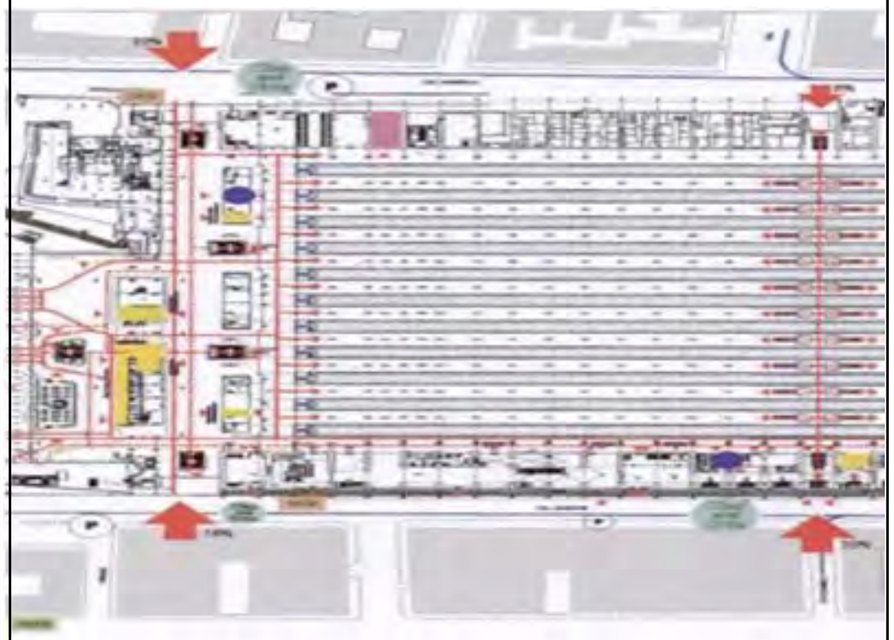
- Started December 2005
- High Speed line northwards
- Future Station Roma Tiburtina: meeting place for shopping, to decongest Roma Termini



depot

in operation

Track level map and commercial area



Tracks	Railway Infra manager	RFI
	HS tracks yard	Dead End
	Station location	At Grade
	Number of tracks	31
	Tracks used for High speed	8
	High Speed trains/day both ways	140
	Length of platforms	400

Areas	Station footprint (sq mt)	
	Total area (sq mts)	225.000
	Platforms area (sq mt)	50.000
	Commercial area (sq mt)	23.600
	Number of Shops	128
	Offices area (sq mt)	73.400
	waiting area+pax services (sq mt)	1.600
	Parking area (sq mt)	5.200

Depots	Depot footprint (sq mts)	
	Daily movements st-depot	190
	Depot-station distance (Km)	2,5

€	Station construction costs (mill €)	

Ankara

1. The city and the region

Central Ankara has a population of 3,763,591, covering 2.516 Km2. The metropolitan municipality, containing the central part of the city and the remaining balance of the 8 districts under its jurisdiction, has a total population of 4.600.000.

Ankara metropolitan area almost matches up with the city area, the city population being 82% of then total metropolitan area, as shown in graphs B.12.

2. The rail network and stations

Ankara rail system is basically composed of one west-east line crossing the city. This line is shared by the suburban rail and all long distance services, including high speed line Ankara-Eskisehír.

Suburban rail has 18 stations all over Ankara city and carries every day over 65.000 passengers.

Main station is Ankara Gari Railway Station, in the city center. A new terminal is in construction adjacent to the old one to keep traffic increases.

Long distance services to the west go from Ankara station through a high speed line that has been recently built. The branch to the east is still a conventional line, but first section Ankara-Sivas is in construction and expected to be finished in 2011.

Ankara metro has 2 lines with 22 stations and transports 320.000 passengers everyday. Three more lines are being constructed.

3. The HS arrival

High Speed services began in Ankara in March 13, 2009 with the inaguration of the first section of the Ankara-Istambul high speed line through the Bosphorus Tunnel planned to be finished in 2011.

This first section is from Ankara Gari Station to Eskisehír, stopping at Sincan, in Ankara metropolitan area.

The east part of the line is in construction till Sivas and planned till Kars, and goes all over Turkey, stopping in the cities of Yozgat, Erzincan and Erzurum. The station will then be a through station for the HS line.

4. Effects of HS arrival

a. Passenger point of view

Besides reduction in travel times, other passenger benefits have to attend the new terminal which is being constructed adjacent to old Ankara Gari Railway station, to allow for capacity increases.

Passengers will find easier to reach the new high speed station by walk, by bike, by public transport or even by car, to main destinations such as the business center and the city center. Design criteria set a queueing time of 5 minutes for different activities (security control, ticket booths, taxi time, advance presentation...).

New additional services are planned for the passenger like parking garages, 16 café-restaurants, shopping center with 80 shops, 3 cinemas, conference room,etc.

b. City point of view

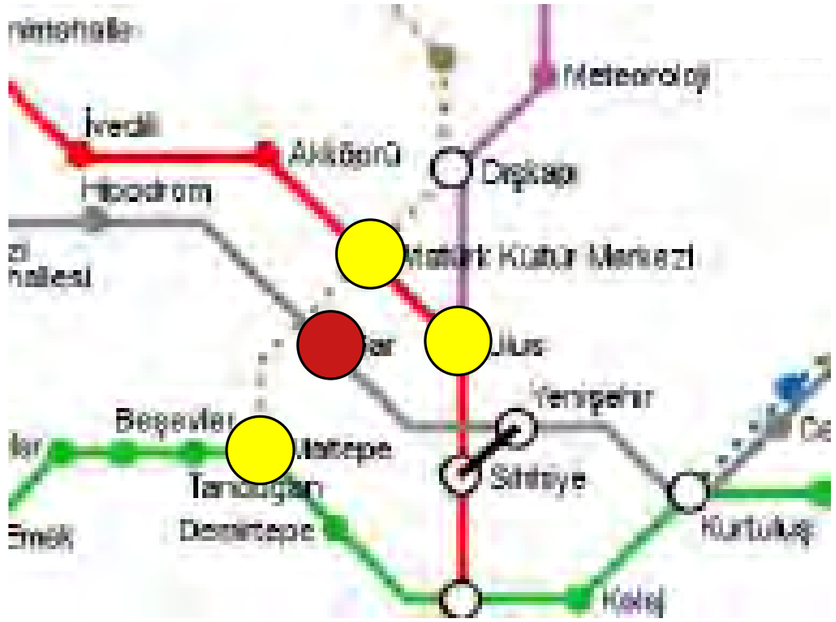
The new station will have an area of almost 130.000 sq mt distributed in 5 floors: 4 will be underground and the ground floor. 87.880 sq mt will be ocupied by the terminal building and 41.400 sq mt by a 2000 spaces parking (now 100).

The new terminal will contribute to new developments and to promote city urban plans. It is designed to be an emblematic modern building with a very positive access impact to parks, squares, bridges, underpasses and urbanization.

The creation of the new station will be an opportunity for new lines and station of the bus, metro and commuter systems, just after being commenced operation.

c. Operator and infrastructure manager point of view

Due to recent arrival of HS services, operational aspects will not be effective until new station opens with more tracks, platforms and services.



Ankara Gari commuter rail station

Subway stations

Taxis at the station

passenger

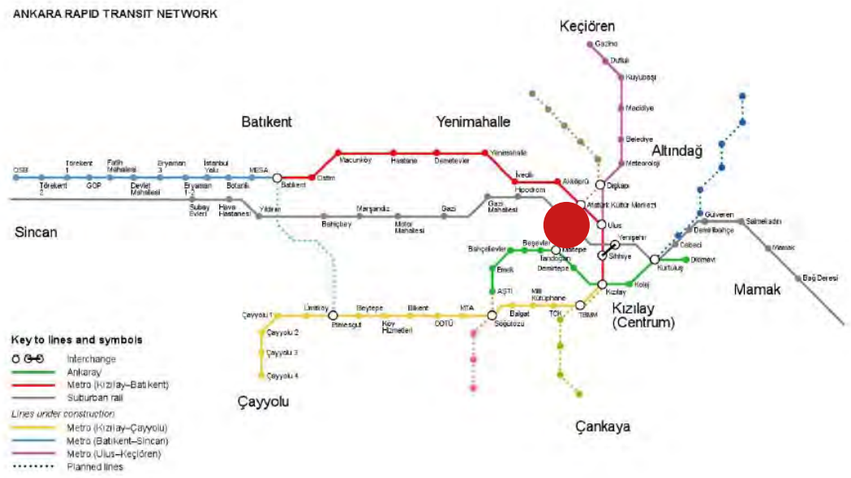
- Good connection with commuter lines
- Lack of good connection with subway
- Relies on buses and taxi

Platforms

Accessibility	High Speed stations in the city	1
	Total Region High Speed stations	2
	Nr of subway lines at the station	-
	Nr of commuter lines at the station	1
	Nr of bus routes at the station	
	Subway st reached without transfer	21
	Commuter st reached without transfer	17
	Nr of public parking lot spaces	100
	Car parking fare (€/day)	
	Bike renting fare (€/day)	
	Rent a car companies	
	Security Control?	no
	Ticket control?	no

Travel fares	First city	Eskisehír
	travel fare by High Speed train (€)	20
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	21
	travel fare by plane (€)	-

Ankara subway and commuter network



city

- Urban renewal linked to new station project
- Regional High Speed station at Sincan
- The station is not well connected with the subway system

New terminal being constructed adjacent to the old one

City numbers	City population	3.763.591
	City area (Km2)	2.516
	City density (hab/Km2)	1.496
	Region population	4.600.000
	Region area (Km2)	
	Distance City Hall-Station (Km)	
	International visitors a year	
	Domestic visitors a year	23.520
PU T	Metro ridership in the city area (pax/day)	320.000
	Comm ridership in the city area (pax/day)	65.000
	Bus ridership in the city area (pax/day)	1.100.000
	Tram ridership in the city area (pax/day)	1.840.000
Travel time	First destination	Eskisehír
	travel time by High Speed train	1hr30min
	travel time by Conventional train	-
	travel time by Car	3hr40min
	travel time by plane*	-
	*only travel time	
	Urban develop. Total area planned (Ha)	1,6

Turkish Railway Network

operator

- Services Ankara-Eskisehír
- Second line with through squeme planned

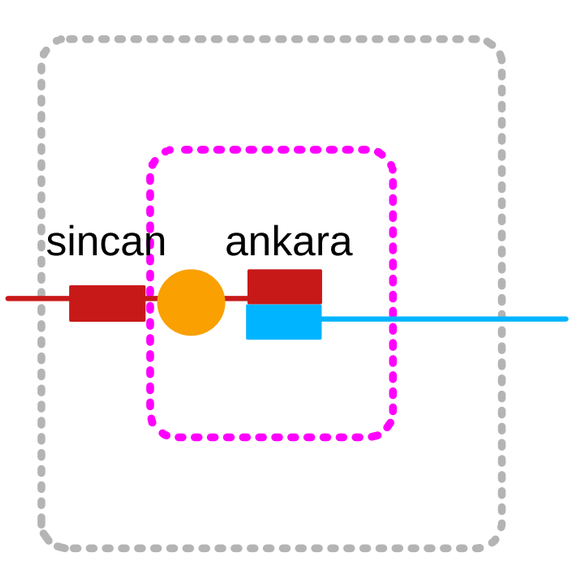

Train at the Station

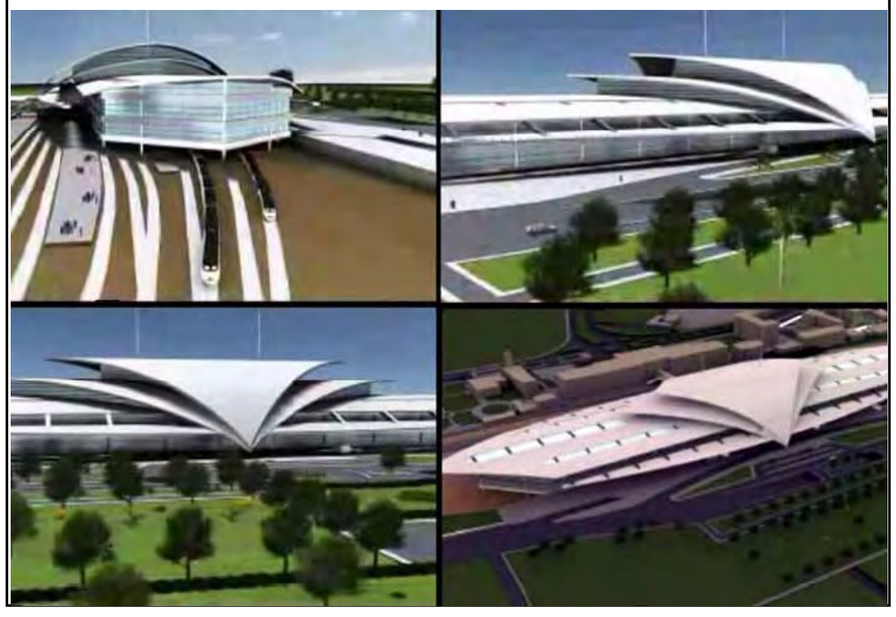

Inside of the station

Line	Operator	TCDD
	Services type	Dead End
	Opening date	13-mar-09
	High Speed lines from/to station	1
	High speed total length (Km, country)	235
	HS Services a day (both ways)	8
	Passengers a day	2.000
	% city HS trains going through this station	100
	First destination	Eskisehír
	HS Services a day (both ways)	7
	% city trains going to this destination	87,50%
Trains	Maximum speed (Km/hour)	250
	Length (m)	200
	Cars per train	8
	Total seats	419
	Platform ocupancy time (min)	
Station	Info panels	
	Automatic ticket machine	
	Lockers	
	Turnstile/entrance	

infra manager

- New station (adjacent) in construction under PPP





Tracks	Railway Infra manager	TCDD
	HS tracks yard	Through
	Station location	At grade
	Number of tracks	
	Tracks used for High speed	2
	High Speed trains/day both ways	8
	Length of platforms	300

Areas	Station footprint (sq mt)	19.800
	Total area (sq mts)	123.500
	Platforms area (sq mt)	8.950
	Commercial area (sq mt)	10.355
	Number of Shops	52
	Offices area (sq mt)	
	waiting area+pax services (sq mt)	57.000
	Parking area (sq mt)	

Depots	Depot footprint (sq mts)	896.000
	Daily movements st-depot	
	Depot-station distance (Km)	7

€	Station construction costs (mill €)	

Beijing

1. The city and the region

Beijing is China's second largest city after Shanghai. It has a population of 13.200.000 inhabitants, with a surface of 1.300 sq km and a density of 10.154 inhab/sq m.

The metropolitan area population is 17.55 million inhabitants, the city population being therefore 85% of the metropolitan area.

2. The rail network and stations

Beijing railways link the city of Beijing to other China cities by an extense network all over the country, as shown, with the main parameters in graphs 13.

According to the "Middle and Long Term Railway Network Plan", by 2020 the operating length of Chinese Railways will be over 120.000 km, of wich over 16.000 km will be high-speed railways.

By 2009, only the 115 km between Beijing and Tianjin were in operation. Is the first section of the Beijing-Shanghai line, to be finished in 2011.

In the same way, two more high speed lines are under construction:

- Beijing-Guangzhou (Hong Kong) line: works have been started, and Wuhan-Guangzhou section will be put into operation before the end of 2010.
- Beijing-Harbin (Dalian) line: works have all been started, and 45% investment of Harbin-Dalian section has been completed.

All Beijing long distance railways start at one of the four main stations in the proper city: Beijing Station, Beijing South, Beijing North and Beijing West. Beijing-Tianjin high speed trains leave from Beijing South Station. In the near future, all stations are planned to have high speed services.

Six Beijing suburban railways have been proposed. It is a commuter rail service that connects urban Beijing with outlying districts and counties beyond the reach of the city's Beijing Subway network. Of the total 6 lines, only line S2 from Beijing North Station has been put into operation (Augost 6, 2008). Line S1 construction works began in 2009. The other lines are all planned. S3, S4 and S5 will start at Beijing South.

Beijing subway has 9 lines and 126 stations, transporting 4.000.000 passengers a day, and being the fifth busiest subway network in the world.

3. The HS arrival

The Beijing–Tianjin Intercity Railway entered service on August 1, 2008. CRH trains running on the line at a top speed of 350 km/h were the fastest conventional trains in the world when it was opened. The 120 km journey between Beijing and Tianjin was shortened from the original 70 minutes to 30 minutes, with a minimum headway of 3 minutes.

The line has two terminal stations at Beijing South and Tianjin, and two intermediate stations at Yizhuang and Wuqing. One more, Yongle Railway Station, is reserved for future use.

4. Effects of HS arrival

a. Passenger point of view

Beijing South Railway Station was an associated project to Beijing Olympic Games.

It consists of a large-scale modern multimodal transport hub that integrates national railway, city subway, buses, taxis, etc. The Station is served by Subway Line 4, which links the station to central Beijing at Xuanwumen and the Xidan shopping area, and many bus routes. A second subway line (14) is under construction, and will be a west-east future connection.

Entrances and exits are distributed in all four directions, with parking lots for taxis and private cars on the east and west sides and a descending parking lot for buses on the north side. Passengers arriving by taxi and by car can enter the station through the elevated entrance platform; passengers arriving by bus can enter the elevating waiting room from the entrance hall on the ground floor; passengers arriving by subway can enter the station through the underground transfer hall.

On the elevated concourse level, there are designated waiting areas (with better seating) for passengers travelling First or Deluxe/VIP Class, as well as passengers holding deluxe soft sleeper tickets. Automated ticket machines, which sell tickets to and from Tianjin, are available throughout, as are traditional ticket counters.

b. City point of view

The new station replaced the old Beijing South Railway Station, also known as the Yongdingmen Railway station before 1988, which stood 500 meters away and operated from 1897 to 2006. The new Beijing South Station, reportedly the largest in Asia, joins the Beijing Railway station and the Beijing West Railway Station as the third passenger rail hub in the Chinese capital. It serves as the terminus for many trains to the city, including the Beijing-Tianjin Intercity Rail, which can reach speeds above 346 km/h.

The enormous oval-shaped station was designed by the UK/Hong Kong architectural firm, Terry Farrell and Partners, in collaboration with the Tianjin Design Institute, and has won the Royal Institute of British Architects 2009 International Award.

The station does not involve urban development operations in the area, being inserted in a neighbourhood of quite modern high rise buildings.

c. Operator point of view

Beijing South Railway Station mainly operates CRH (China Railway High-speed) trains of Beijing-Tianjin inter-city rail transport, as well as trains to Qingdao and Jinan. All trains to Jinan, Qingdao and Shanghai are shifted to depart from the railway station. In the near future, there will be as many as some 100 pairs of trains to more cities.

Beijing South station is estimated to deliver more than 100 million passengers per year, with departing/arriving passengers reaching 1 million per day during peak time.

The station follows a through scheme, intended to be operated on the east side towards Tianjin, as it does now, and on the West side for the Shanghai HS services.

At the present, Beijing-Tianjin line transports 45.000 passengers every day. Trains from Tianjin to Beijing start at 06:20 and end at 23:30.

A ticket control system by turnstiles is required to access the platforms one level lower than the main concourse. Magnetic tickets operate the gates, as shown in graph B.13.1.

Call for boarding trains is made shortly before departure, which creates huge crowds in the main concourse until turnstiles to access platforms are open.

A new depot is to be constructed westwards of the station, to replace the present one, located further on east direction.

Trains are serviced at the platform, cleaning exterior and interior, and providing catering for next train service.

d. Rail infrastructure manager point of view

The station has five levels, two overground and three underground. The ground floor is the platform layer and the first floor holds the waiting area. Exit passages and the transfer hall are on the 1st underground layer and the 2nd and 3rd underground layers are reserved for subway line 4 and 14 respectively.

There are 24 platforms in total that have the capacity to dispatch 30,000 passengers per hour. The 251,000 sq m waiting area can accommodate 10,000 passengers.

Beijing-Tianjin Intercity Railway was the only high speed line operating in Beijing in 2009. There are sixty pairs of trains every day. Most of them are CRH (China Railway High-speed) trains to Tianjin Tanggu, which means visitors can run to Tianjin in 30 minutes from the new South station.

The layout of the station is a through station, while for Tianjin services is used as a dead end station, trains coming and leaving heading East.

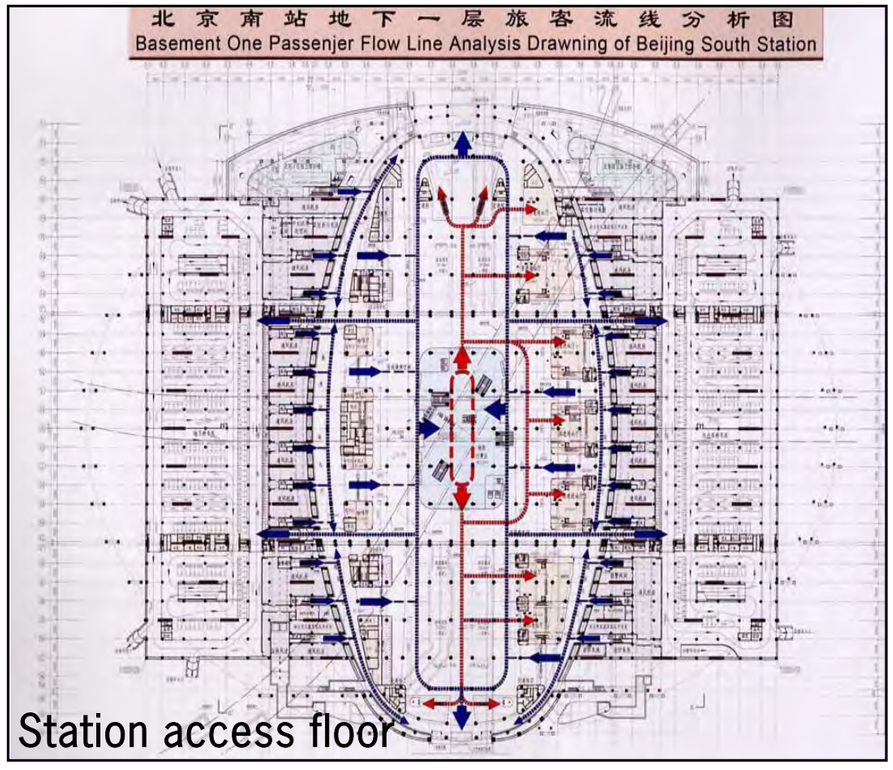
Security control at the entrance

Access gates to the platforms

passenger

- Good access time using underground line (second line is planned)
- Excellent transfer time
- Large spaces and services at the station

Info panels

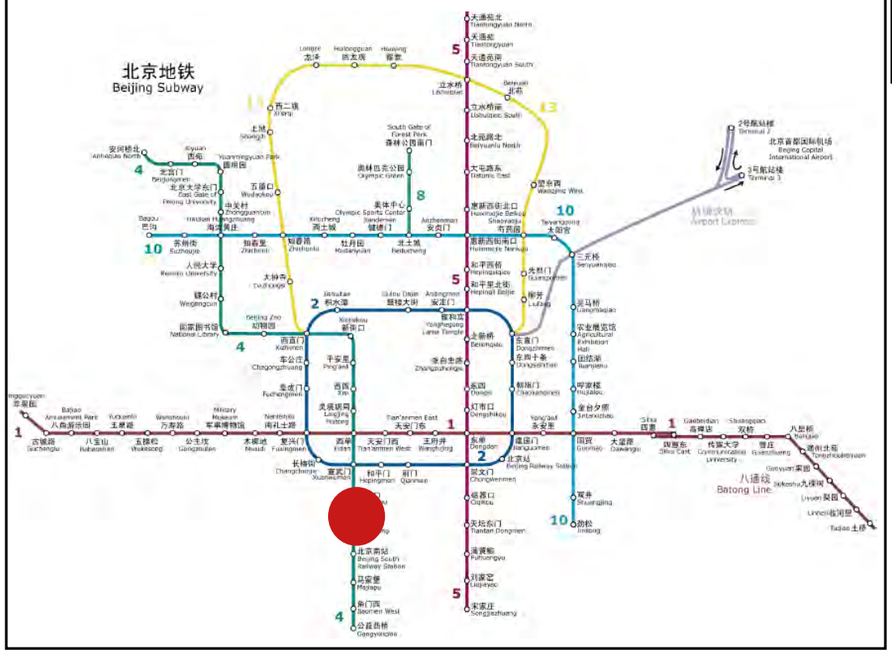


Station access floor

Accessibility	High Speed stations in the city	1
	Total Region High Speed stations	2
	Nr of subway lines at the station	2
	Nr of commuter lines at the station	3
	Nr of bus routes at the station	2
	Subway st reached without transfer	23
	Commuter st reached without transfer	-
	Nr of public parking lot spaces	800
	Car parking fare (€/day)	3,50
	Bike renting fare (€/day)	2
	Rent a car companies	-
	Security Control?	yes
	Ticket control?	yes

Travel fares	First city	Tianjin
	travel fare by High Speed train (€)	6
	travel fare by Conventional train (€)	2
	travel fare by Car (€)	10
	travel fare by plane (€)	-

Beijing subway



city

- No development area around the station (already built)
- Metro line 1 in service and planned line 14 (station prepared)

Beijing future commuter network

Development area adjacent to the station

City numbers	City population	13.200.000
	City area (Km2)	1.300
	City density (hab/Km2)	10.154
	Region population	17.550.000
	Region area (Km2)	6.562
	Distance City Hall-Station (Km)	
	International visitors a year	4.355.000
	Domestic visitors a year	142.800.000
PU T	Metro ridership in the city area (pax/day)	4.000.000
	Comm ridership in the city area (pax/day)	
	Bus ridership in the city area (pax/day)	11.000.000
	Tram ridership in the city area (pax/day)	-
Travel time	First destination	Tianjin
	travel time by High Speed train	30min
	travel time by Conventional train	1hr
	travel time by Car	1hr30min
	travel time by plane*	-
	*only travel time	
	Urban develop. Total area planned (Ha)	

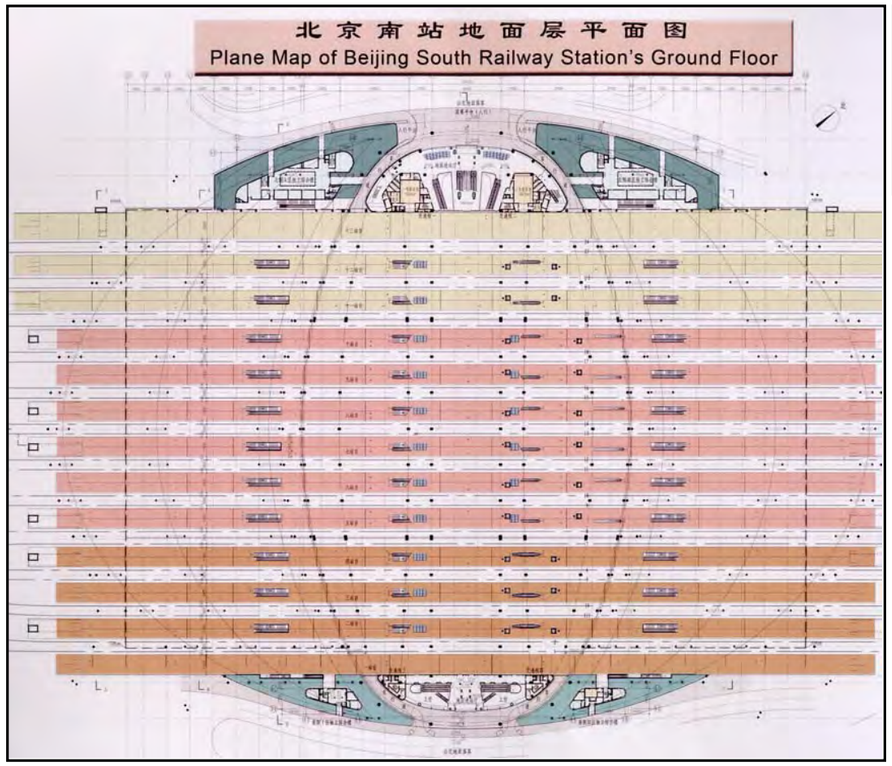
operator

- Enhance quality of service
- Large spaces, but crowded waiting areas


Train at Beijing South Station

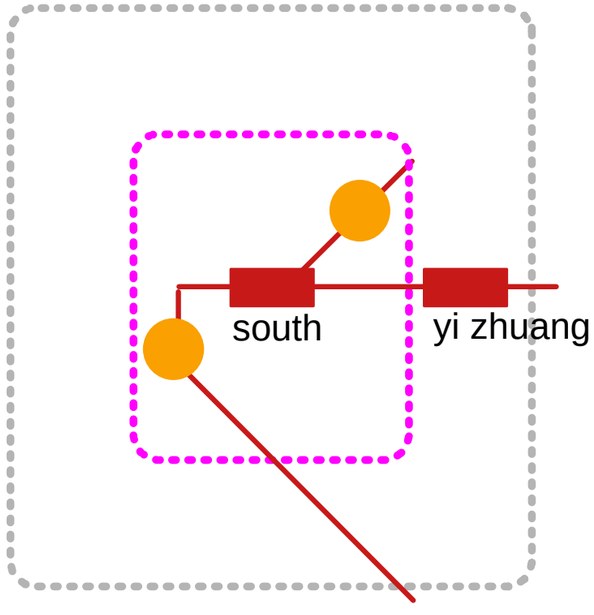

Inside of the station

Line	Operator	M of R
	Station type (services)	Dead End
	Years opened High Speed	1,5
	High Speed lines from/to station	1
	High speed total length (Km, country)	120
	Services a day (both ways)	120
	Passengers a day	45.000
	% city trains going through this station	100
	First destination	Tianjin
	Services a day (both ways)	120
	% city trains going to this destination	100,00%
Trains	Maximum speed (Km/hour)	350
	Length (m)	200
	Cars per train	8
	Total seats	572
	Platform ocupancy time (min)	3-15
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	5

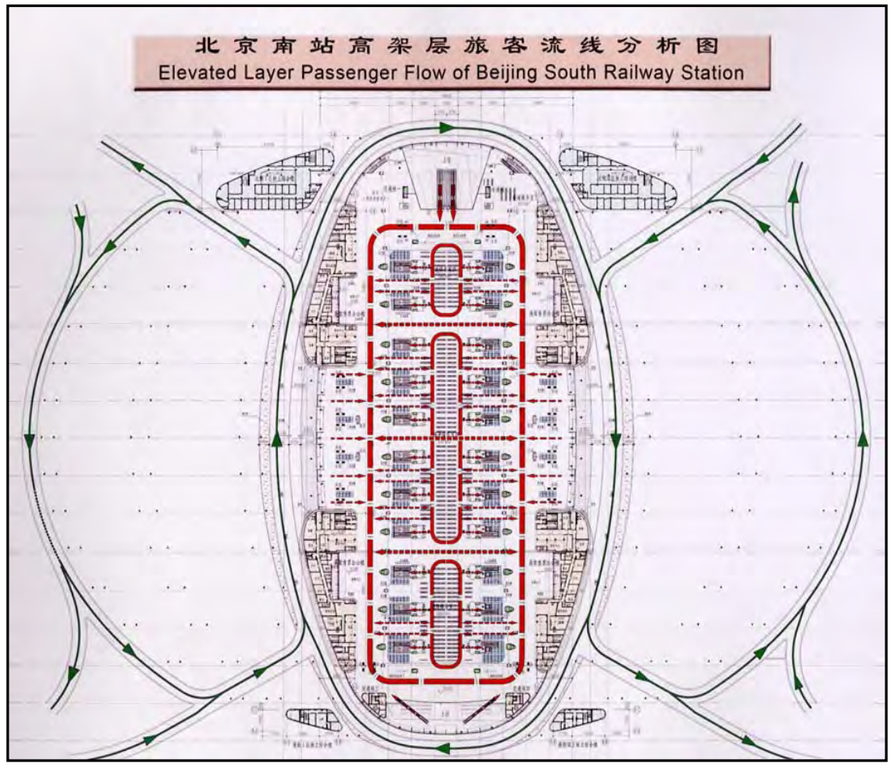


infra manager

- Complete new rail scheme in Beijing
- Through services possible and new Shanghai line prepared
- New depot westwards closer than existing one



in operation



Tracks	Railway Infra manager	Min of Railw
	HS tracks yard	Through
	Station location	At grade
	Number of tracks	24
	Tracks used for High speed	24
	High Speed trains/day both ways	120
	Length of platforms	480

Areas	Station footprint (sq mt)	170.000
	Total area (sq mts)	322.000
	Platforms area (sq mt)	127.000
	Commercial area (sq mt)	5.400
	Number of Shops	
	Offices area (sq mt)	2.500
	waiting area+pax services (sq mt)	25.600
	Parking area (sq mt)	77.500

Depots	Depot footprint (sq mts)	992.000
	Daily movements st-depot	
	Depot-station distance (Km)	8,8

€	Station construction costs (mill €)	500

Seoul

1. The city and the region

Seoul city population is 10.464.000 inhabitants, with a surface of 605 km2, being one of the most densely populated Asian cities, with a density of 16,500 inhab/sq km.

The Seoul National Capital Area, which includes the Incheon metropolis and most of Gyeonggi province, has 24.5 million inhabitants being the world's second largest metropolitan area. Almost half of South Korea's population live in the Seoul National Capital Area. City population is 43 % of the population of the metropolitan area.

2. The rail network and stations

Seoul has two long distance main stations: Seoul and Yongsan stations, both well connected by subway/commuter system.

KORAIL operates all long distance services.

- The HS Geongbu line to Busan (and conventional trains) starts at **Seoul station,** presented in graphs B.14
- The HS Honam line to Mokpo (and all the other regional lines) starts at **Yongsan station,** presented in graphs B.15

Seoul has metro and commuter systems that sometimes run on the same tracks. Metro is operated by both Seoul Metropolitan Subway and Seoul Metropolitan Rapid Transit Corporation.
Several companies operate Seoul commuter lines, including KORAIL (National Korea Railroad Company) that shares some of these lines with Seoul Metropolitan Subway.

Other lines are totally operated by private companies such as the Incheon airport train by AREX (being extended), Incheon line 1 by Incheon Rapid Transit Corporation, Yongin line and recently built line 9.

Alltogether, commuter and subway network has 22 lines and transports 8.000.000 passengers every day, being the third most used metro system in the world.

3. The HS arrival

After 12 years of construction, service on the Gyeongbu Line (connecting Seoul to Busan via Daejeon and Daegu) and the Honam Line (Yongsan to Gwangju and Mokpo) opened on **April 1, 2004.** Initially there was high-speed track for only part of the distance (from Seoul to Daegu).

Construction of the second phase of the Gyeongbu Line, linking Daegu to Busan, started in June 2002, and is expected to be completed by the end of 2010. The new section follows a different, more easterly route, with new stations planned for Gyeongju and Ulsan. A further improvement of the travel time to 2 hour and 10 minutes between Seoul and Busan is expected.

High-speed track for the Honam Line from Seoul via Osong to Gwangju and Mokpo is also planned, with construction to start in 2009 for tentative completion in 2014.

4. Effects of HS arrival

a. Passenger point of view

New services cut travel time between Seoul and Busan from 4 hours and 10 minutes to 2 hours and 40 minutes and between Yongsan and Mokpo from 4 hours and 42 minutes to 2 hours and 58 minutes.

Seoul Station is served by Seoul Subway Line 1 and 4 and by the Gyeongui commuter line. AREX railway line operated by Korail Airport Railroad Company will be extended to Seoul Station to connect it with the Incheon International Airport and Gimpo Airport. Works are planned to be finished by the end of 2010.

The station is also connected with 28 bus routes and there are 83 bus stations in the big interchange at the surrounding area.

Yongsan Station is served by Seoul Subway Line 1 and the Jungang Line commuter railway and it is a central location for Gyeongwon Line and Honam line (conventional and KTX services).

b. City point of view

The station was renamed "Seoul Station" in 1947. The station was expanded throughout the post-Korean War era, and a new terminal adjacent to the existing one was completed in 2004 to coincide with the introduction of KTX high-speed rail service, including a commercial center, department stores and parking lot.

Further huge urban renewals are taking place both around Seoul and Yongsan stations, to increase convenience and accessibility of rail users, to promote historic and cultural space and to arrange the aging area around both stations, taking advantage of the accesibility provided by HS services.

At **Seoul station** area, the Convention Center project uses a 55.826 sq m parcel wich includes residences, convention centre, culture and entertainment, business offices, hotels and shoping. The total floor size of development is 280.545 sq m, and is shown on graph B.14.2.

There is also an urban project around **Yongsan station** that hosts an International Business District, Retail facility, Cultural facility, Residential, hotel, etc. in a total area of 533.000 sq m. that will induce aprox. 67 trillion Korean won, shown on graph B.15.2.

c. Operator point of view

Seoul station is the primary terminus for the KTX and express services to Busan and local service to Dorasan.

Since 2004, when opening of KTX, services to Mokpo where moved to Yongsan station, in order to provide further capacity at both stations.

Both stations are through stations, with the depot built on purpose for HS trains, and located at Hang Shin 5 km north of Seoul station that has replaced the old depot instalations close to Yongsan station, where the new urban project development is going to take place.

The HS arrival with its 20 car trainsets long 388 m changed completely operational schemes, and even departure stations for different services at Seoul.

In terms of passenger ridership, KTX has been a big success, transporting 38 million passengers in 2008, just four years after starting operation, caught mainly from aviation.

Graphs B.14. 3 and B.15.3 present values for operational parameters of both stations.

d. Rail infrastructure manager point of view

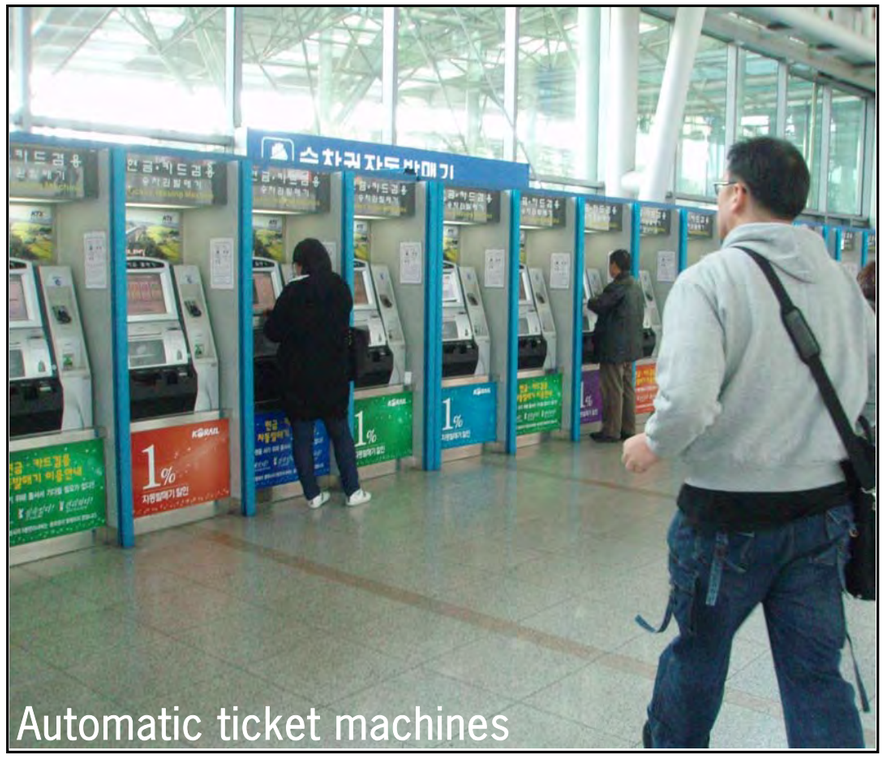
Prior to 2004, all long-distance trains serving Seoul terminated at the old Seoul Station, but with the opening of the Korea Train Express (KTX), services were shared depending their destination by the refurbished and extended **Seoul Station** and **Yongsan Station**, which took over some of Seoul station services.

The through scheme at Seoul Station is a peculiar one, with three tracks between platforms in some sections that allow for through good services across the station.

Yongsan Station is also a major railway station in Seoul. Located in Yongsan Gu, is not only the terminus for high-speed trains and long-distance trains on a number of railway lines, including most trains on the Honam Line, but also to all trains on the Janghang and Jeolla Lines.

Prior commercial developments in 2004, included a major cinema adjacent to the station, and in August 2006, the whole station building was made into a large department store, called Park Mall. The new urban project is additional to these developments, already built on top of the station.

Besides Seoul Station and Yongsan station, there is a third HS station in the Seoul area, called Gwanmyeong, intended for P&R use and access from the Seoul suburbs which has not had a big success, because of lack of urban developments planned for in the surroundings.



Automatic ticket machines

Bus and taxi stop adjacents to the station

passenger

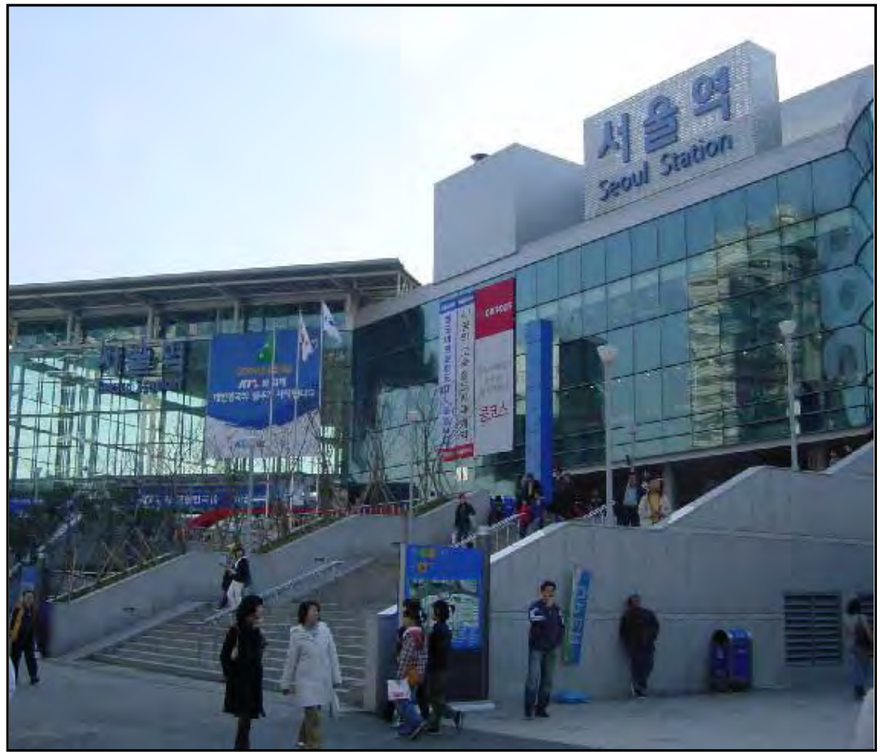
- Central location with good access time in metro (lines 1 and 4) and commuters (line G)
- Good transfer with adjacent bus interchage

Ticket booths and info panels

Station accessibility

Accessibility	High Speed stations in the city	2
	Total Region High Speed stations	3
	Nr of subway lines at the station	2
	Nr of commuter lines at the station	1
	Nr of bus routes at the station	28
	Subway st reached without transfer	46
	Commuter st reached without transfer	95
	Nr of public parking lot spaces	800
	Car parking fare (€/day)	12
	Bike renting fare (€/day)	-
	Rent a car companies	
	Security Control?	no
	Ticket control?	no

Travel fares	First city	Busan
	travel fare by High Speed train (€)	17
	travel fare by Conventional train (€)	25
	travel fare by Car (€)	30
	travel fare by plane (€)	53

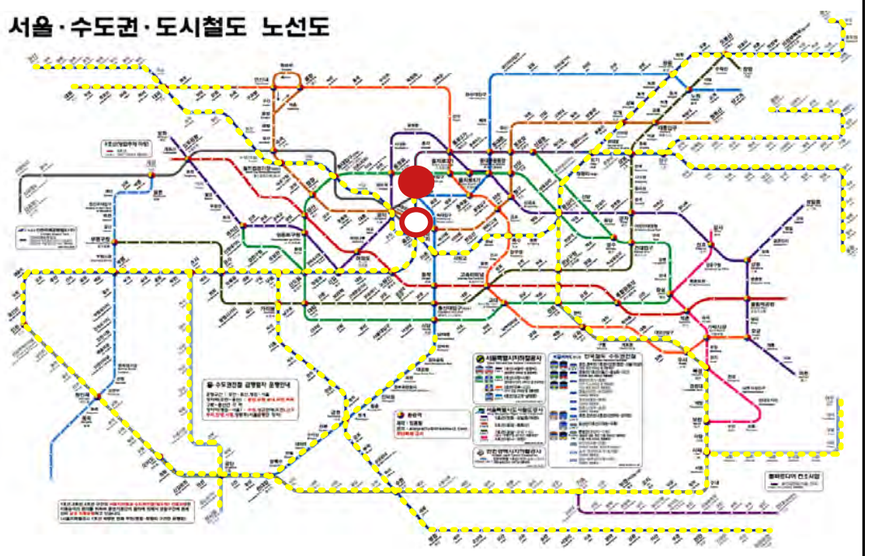


city

- First remodelation of station: other tracks in service
- Second huge urban project: convention center, new north track yards
- New commuter line in service
- Future commuter line connecting with both airports (Incheon and Gimpo). In construction

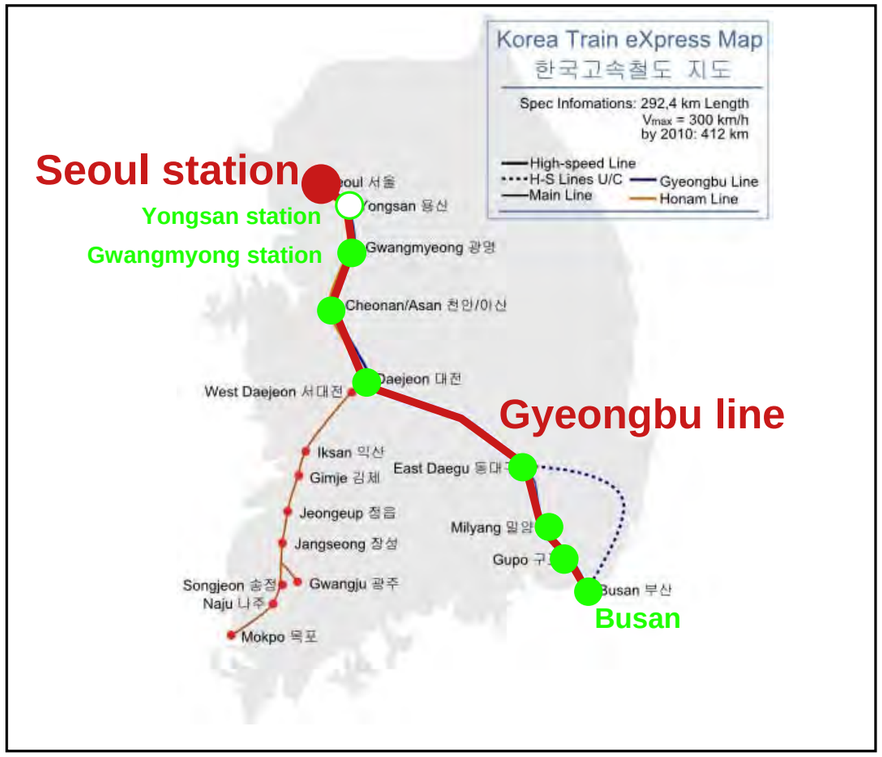
Seoul subway + commuter

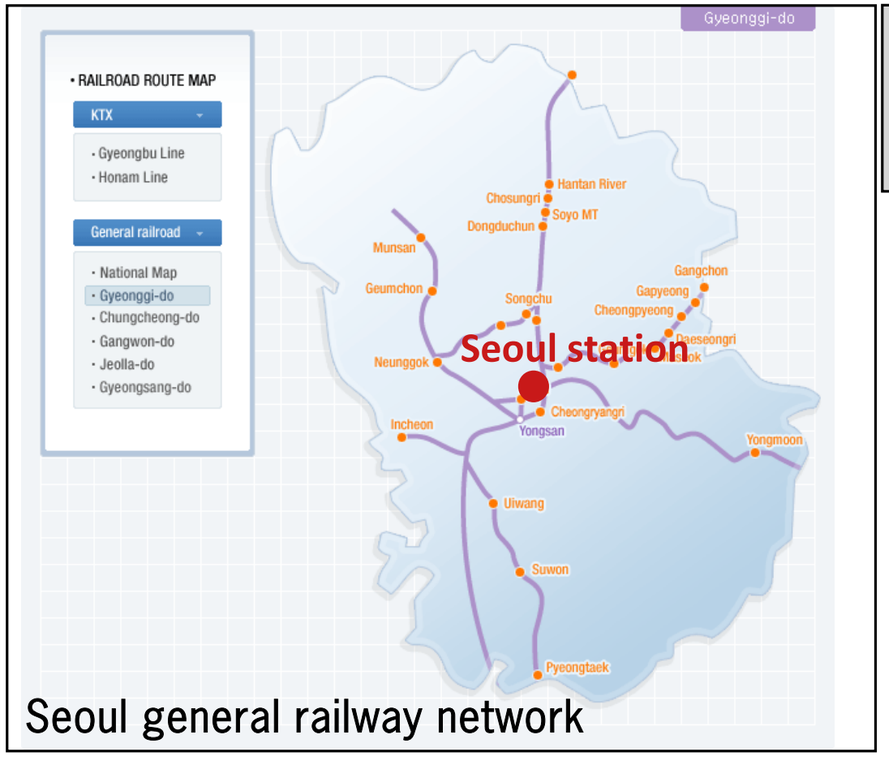
Korail



Urban plans

City numbers	City population	10.464.061
	City area (Km2)	605
	City density (hab/Km2)	17.288
	Region population	24.472.063
	Region area (Km2)	5.076
	Distance City Hall-Station (Km)	1,5
	International visitors a year	12.000.000
	Domestic visitors a year	
PUT	Metro ridership in the city area (pax/day)	8.000.000
	Comm ridership in the city area (pax/day)	
	Bus ridership in the city area (pax/day)	4.531.000
	Tram ridership in the city area (pax/day)	-
Travel time	First destination	Busan
	travel time by High Speed train	2hr50min
	travel time by Conventional train	5hr
	travel time by Car	4hr30min
	travel time by plane*	55min
	*only travel time	
	Urban develop. Total area planned (Ha)	28,05





Seoul general railway network

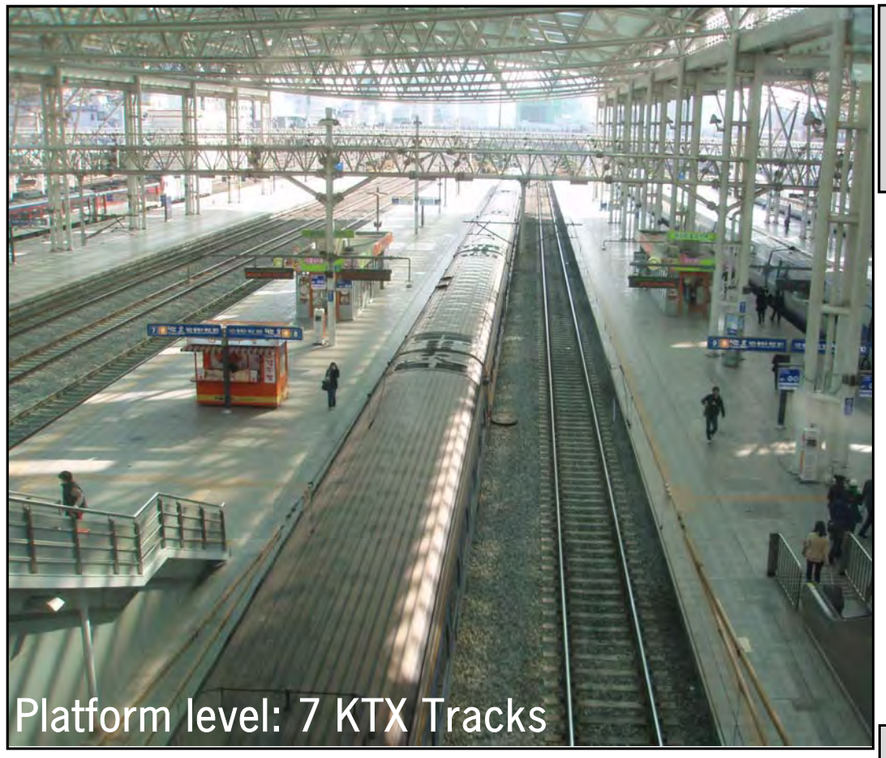
operator

- Station in origin to Busan trains only to avoid capacity and congestion problems
- HS trains to Mokpo from Yongsan station

KTX at Seoul Station

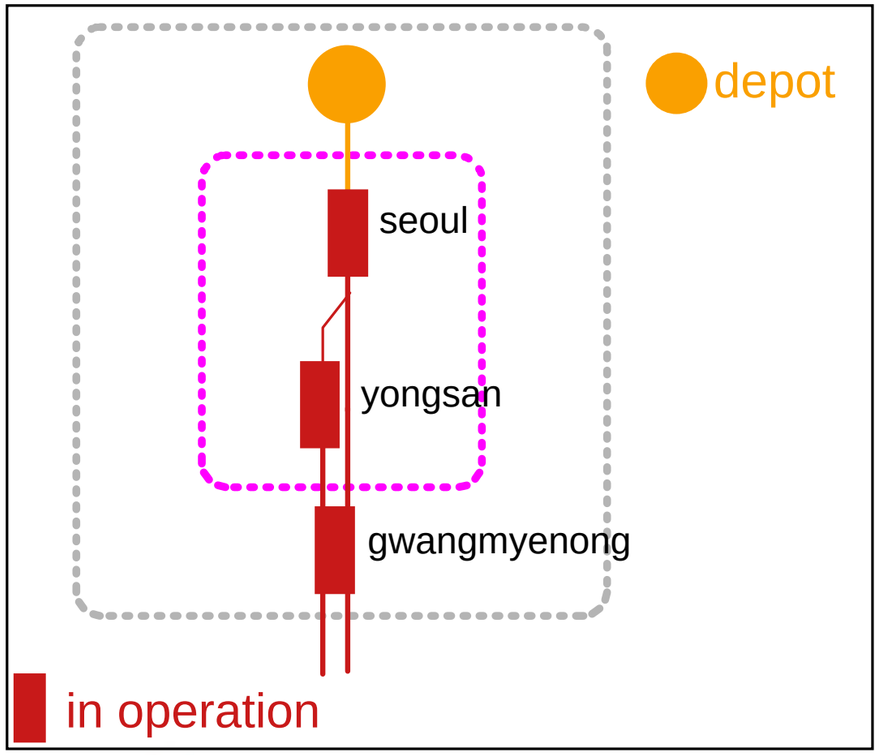

Inside of the station

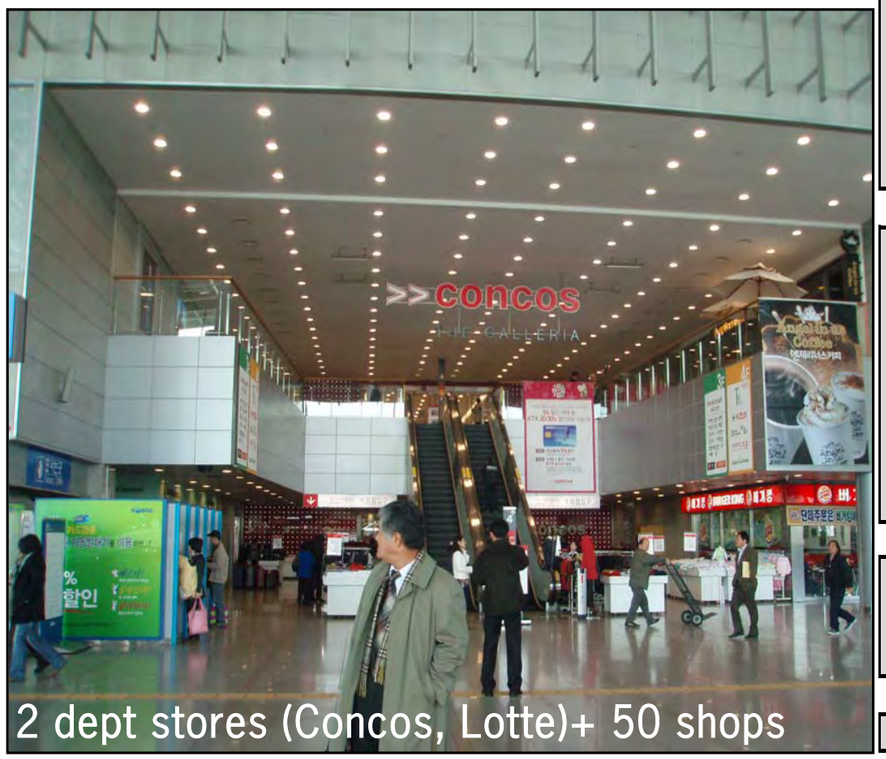
Line	Operator	KORAIL
	Services type	Dead End
	Opening date	01-apr-04
	High Speed lines from/to station	1
	High speed total length (Km, country)	330
	HS Services a day (both ways)	106
	Passengers a day	24.900
	% city HS trains going through this station	73,61%
	First destination	Busan
	HS Services a day (both ways)	74
	% city trains going to this destination	69,81%
Trains	Maximum speed (Km/hour)	300
	Length (m)	388
	Cars per train	20
	Total seats	935
	Platform ocupancy time (min)	20
Station	Info panels	yes (10)
	Automatic ticket machine	yes (38)
	Lockers	yes (13)
	Turnstile/entrance	no



infra manager

- Keeps the same through squeme with depot at north
- Shared lines by HS and conventional trains





Tracks	Railway Infra manager	KR
	HS tracks yard	Through
	Station location	At grade
	Number of tracks	14
	Tracks used for High speed	7
	High Speed trains/day both ways	106
	Length of platforms	450

Areas	Station footprint (sq mt)	106.256
	Total area (sq mts)	240.023
	Platforms area (sq mt)	27.500
	Commercial area (sq mt)	31.854
	Number of Shops	52
	Offices area (sq mt)	16.143
	waiting area+pax services (sq mt)	
	Parking area (sq mt)	20.680

Depots	Depot footprint (sq mts)	1.300.470
	Daily movements st-depot	104
	Depot-station distance (Km)	14,9

€	Station construction costs (mill €)	64,9

Parking at Yongsan Station

passenger

- Good connection to metro line 1 and commuter Jungan line

Automatic ticket machines.

Station access

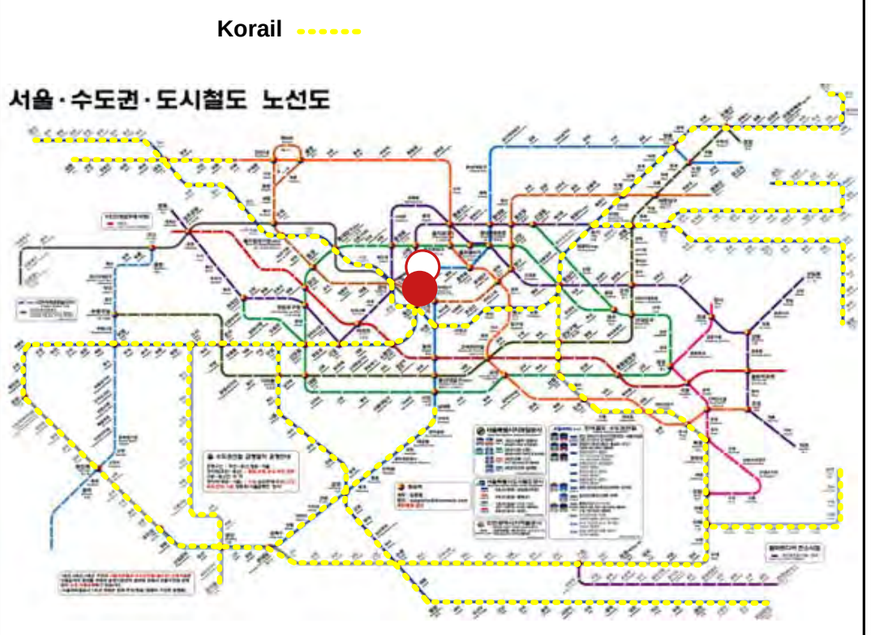
Accessibility	High Speed stations in the city	2
	Total Region High Speed stations	3
	Nr of subway lines at the station	1
	Nr of commuter lines at the station	1
	Nr of bus routes at the station	6
	Subway st reached without transfer	27
	Commuter st reached without transfer	95
	Nr of public parking lot spaces	600
	Car parking fare (€/day)	6,6
	Bike renting fare (€/day)	-
	Rent a car companies	1
	Security Control?	no
	Ticket control?	no

Travel fares	First city	Mokpo
	travel fare by High Speed train (€)	25
	travel fare by Conventional train (€)	12
	travel fare by Car (€)	32
	travel fare by plane (€)	52

city

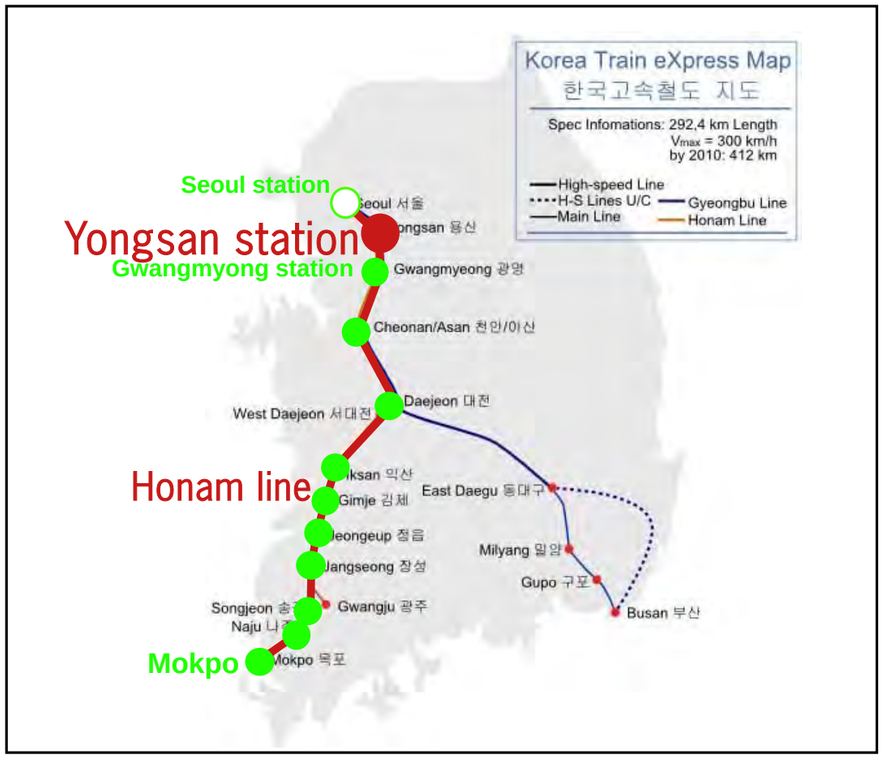
- Huge urban operation involving both station and railyard adjacent (old depot) and new transport lines
- Gwanmyeong station on region with P&R
- Future commuter line connecting with both airports (Incheon and Gimpo). In construction

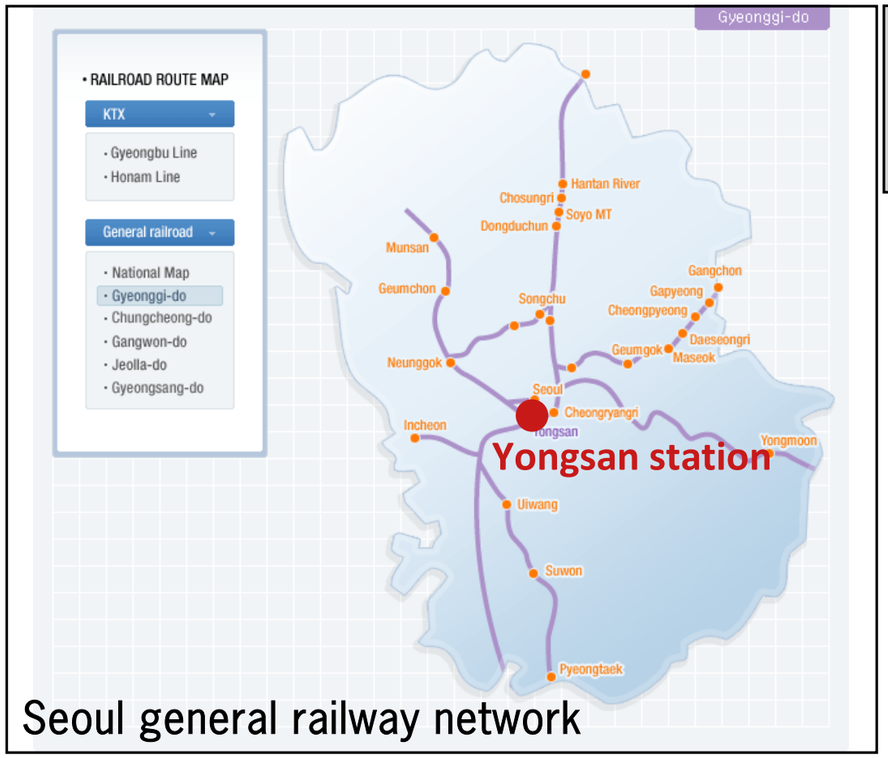
Seoul subway + commuter



Urban plans

City numbers	City population	10.464.061
	City area (Km2)	605
	City density (hab/Km2)	17.288
	Region population	24.472.063
	Region area (Km2)	5.076
	Distance City Hall-Station (Km)	4,7
	International visitors a year	12.000.000
	Domestic visitors a year	
PU T	Metro ridership in the city area (pax/day)	8.000.000
	Comm ridership in the city area (pax/day)	
	Bus ridership in the city area (pax/day)	4.531.000
	Tram ridership in the city area (pax/day)	
Travel time	First destination	Mokpo
	travel time by High Speed train	3hr20min
	travel time by Conventional train	7hr15min
	travel time by Car	4hr
	travel time by plane*	55min
	*only travel time	
	Urban develop. Total area planned (Ha)	340,56





Seoul general railway network

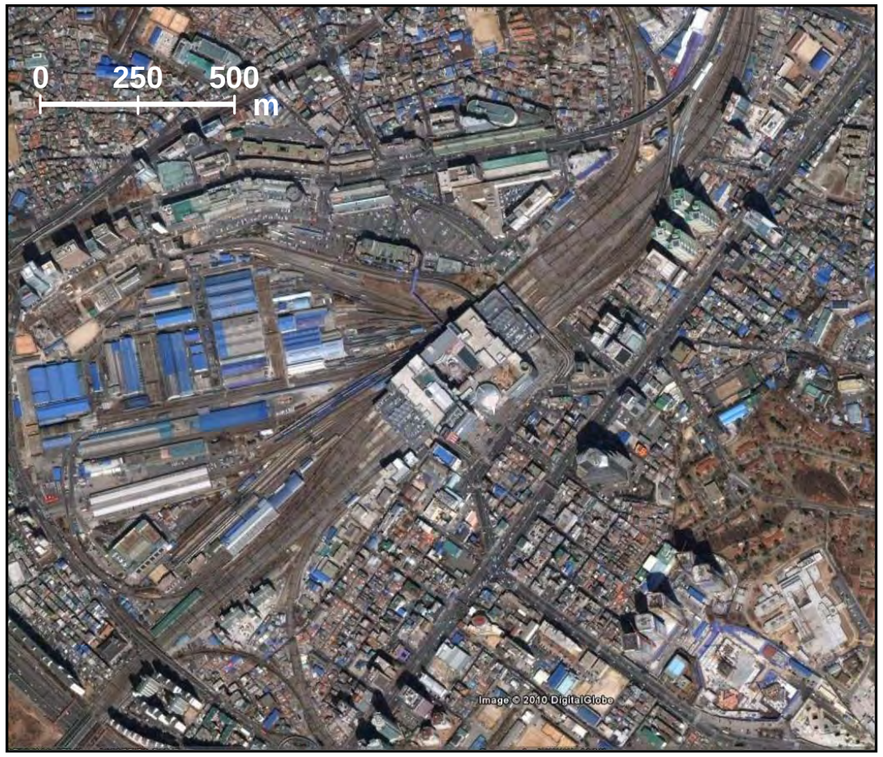
operator

- Station in origin to Mokpo trains only to avoid capacity and congestion problems
- HS trains to Busan from Seoul station

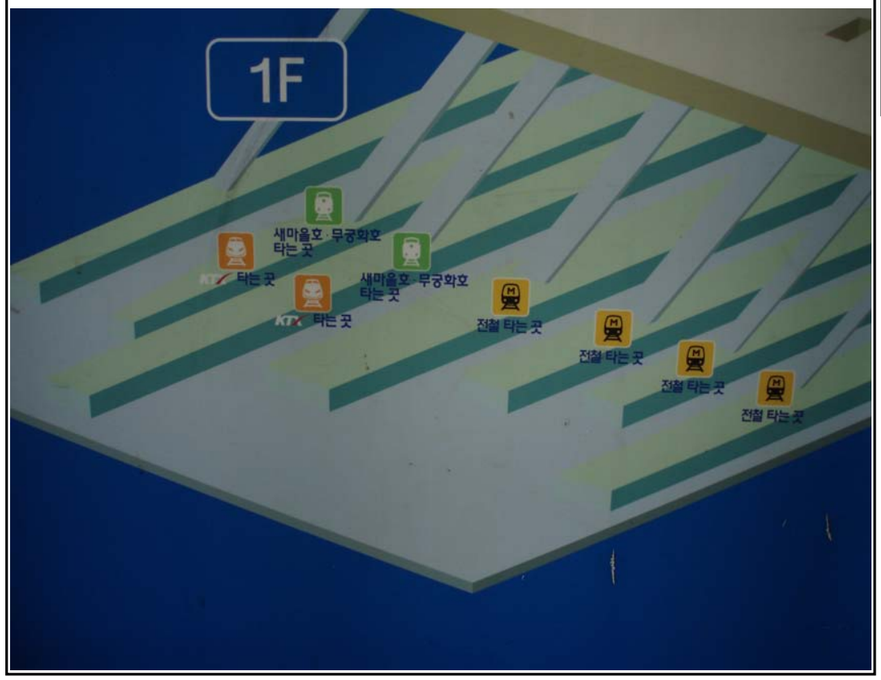
KTX leaving from Yongsan Station


Inside of the station

Line	Operator	KORAIL
	Services type	Dead End
	Opening date	2004
	High Speed lines from/to station	1
	High speed total length (Km, country)	330
	HS Services a day (both ways)	38
	Passengers a day	12.000
	% city HS trains going through this station	26,39%
	First destination	Mokpo
	HS Services a day (both ways)	28
	% city trains going to this destination	73,68%
Trains	Maximum speed (Km/hour)	300
	Length (m)	388
	Cars per train	20
	Total seats	935
	Platform ocupancy time (min)	20
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	no

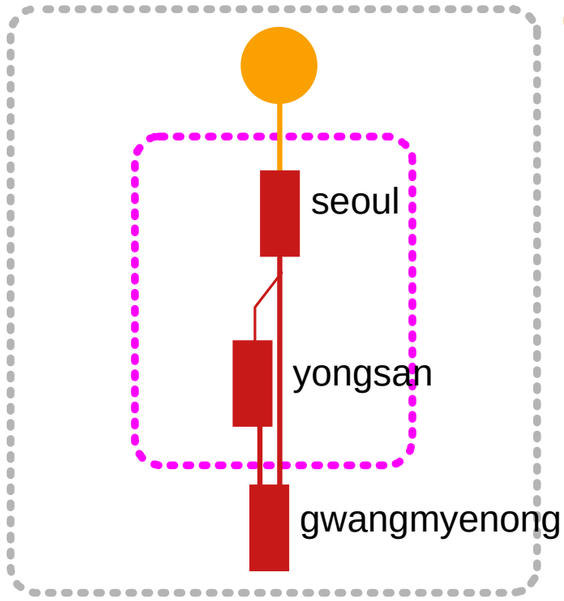


Platform level: 2 KTX Tracks



infra manager

- Through squeme
- New workshop adjacent to depot in service 2010
- Commercial center on top of the station



Commercial areas

Tracks	Railway Infra manager	KR
	HS tracks yard	Through
	Station location	At grade
	Number of tracks	13
	Tracks used for High speed	2
	High Speed trains/day both ways	38
	Length of platforms	
Areas	Station footprint (sq mt)	70.000
	Total area (sq mts)	
	Platforms area (sq mt)	
	Commercial area (sq mt)	
	Number of Shops	
	Offices area (sq mt)	
	waiting area+pax services (sq mt)	
	Parking area (sq mt)	
Depots	Depot footprint (sq mts)	1.300.470
	Daily movements st-depot	
	Depot-station distance (Km)	17
€	Station construction costs (mill €)	

Taipei

1. The city and the region

Taipei city population is 2.619.920 inhabitants, with a surface of 272 km2 and a density of 9.640 inhab/sq km.

Taipei metropolitan area, composed of Taipei City, Taipei County, and Keelung City has a population of 6, 7 million inhabitants, being Taipei city population the 39% of the metropolitan.

2. The rail network and stations

Taipei rail system is basically composed of the Taiwan west coast lines crossing the city and going through north-south corridor. The corridor is 335 km long and includes the conventional “Western Line” and the recently built “Taiwan High Speed Rail”.

There are not commuter systems in the city, but a future Rapid Transit line is being constructed to connect Taipei City with Taoyuan International Airport. This line is scheduled to begin services in 2013.

The most important station in Taipei is Taipei Main station, in the city center, wich is an intermediate station for conventional lines and the head station for high speed services, although one more station - Nangang - is planned in Taipei metropolitan area, becoming the new head station of the line when constructed.

Taipei metro network, with 9 lines and 80 stations, has a ridership of almost 1.3 million passengers every day. The 2018 extension plan is currently under construction.

3. The HS arrival

The HSR platforms at Taipei Main Station opened on March 2, 2007, bringing the entire line into operation. Travel times were reduced from 4, 5 / 2, 5 hours to just 90 minutes

Thirteen Taiwan High Speed Rail stations were planned in the western corridor, with eight stations already opened and five more stations (in Nangang, Miaoli, Changhua, Yunlin and Kaohsiung) to be built in future years.

4. Effects of HS arrival

a. Passenger point of view

Having maintained the location of Taipei main station, HS arrival did not affect accesibility to the station, its main effect being travel time reduction. The new station being located underground. Accesibility will be enhanced when the Taiwan Taoyuan International Airport Access MRT System is finished. However, it only takes 20 to 30 minutes drives to Taipei Songshan Airport by bus or taxi.

b. City point of view

Taipei Railway Station is located in the Zhongzheng District in downtown Taipei. The region just south of the station is known as "station front" because the original train station's main entrance faced south. The station rear area is actually located in the Datong District.

Taipei Station and its surroundings are currently undergoing intensive renovation and redevelopment since 2005. Japanese architect Fumihiko Maki was chosen to design two skyscrapers in the surroundings of the railroad station.

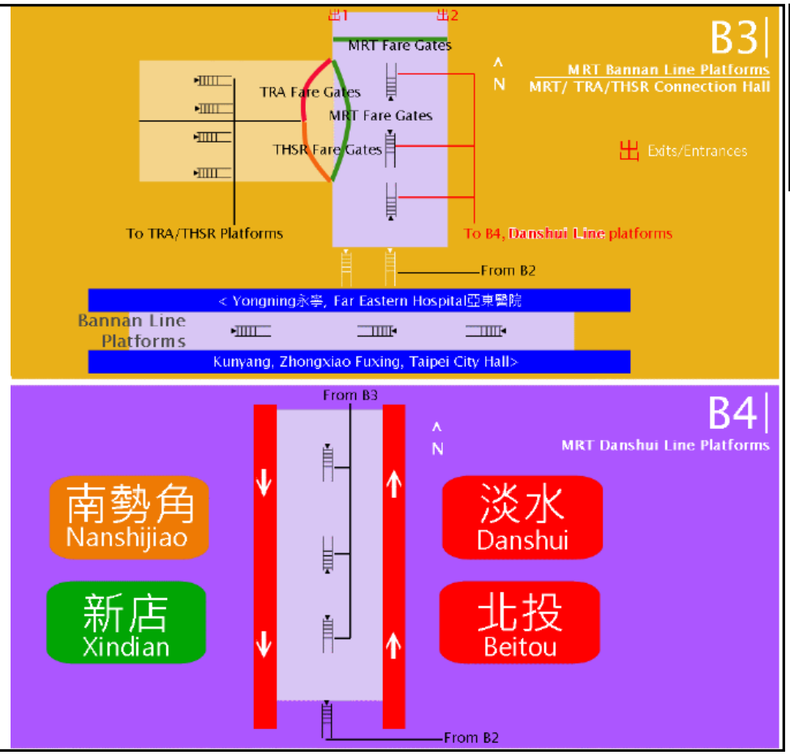
c. Operator and railway infrastructure manager points of view

Taiwan High Speed Rail shares the station with Taiwan Railway Administration .The station handles over 400,000 passengers per day, including 276,266 using the MRT.

The station serves around 140 trains per day (departures and arrivals).TRA offices are in the same station building. The througj scheme allows for easy depot connections.

Automatic ticket machines

Conexion with subway lines



passenger

- Keeps the same through scheme with depot at north
- Shared lines by HS and conventional trains
- Future connection with Taoyuan airport by the "Taoyuan airport MRT System" is planned for completion in 2014

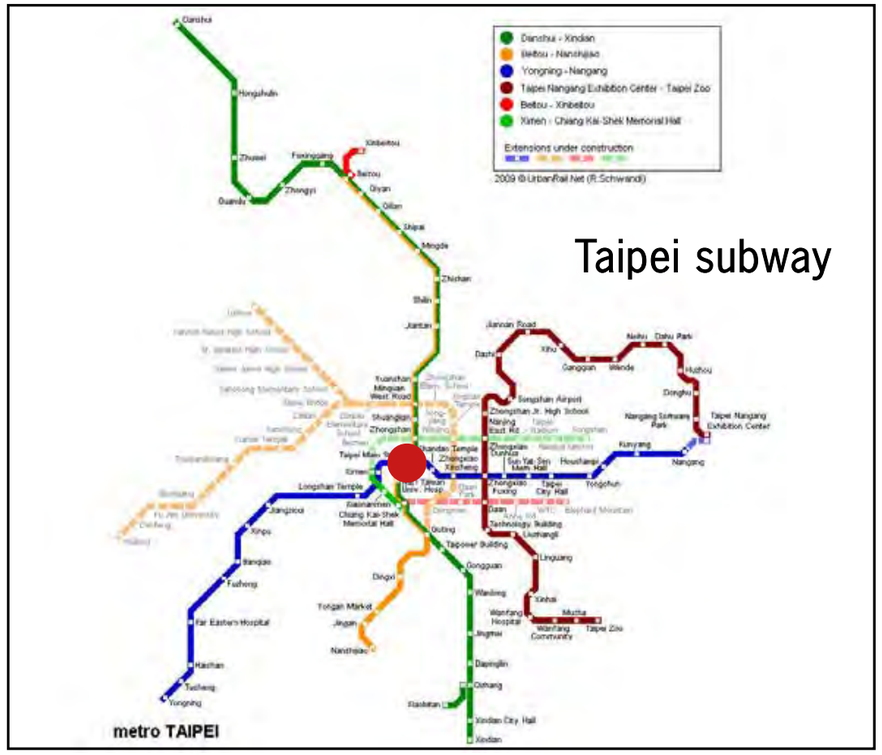

Info panels and ticket booths

Accessibility	High Speed stations in the city	1
	Total Region High Speed stations	3
	Nr of subway lines at the station	3
	Nr of commuter lines at the station	-
	Nr of bus routes at the station	
	Subway st reached without transfer	39
	Commuter st reached without transfer	-
	Nr of public parking lot spaces	322
	Car parking fare (€/day)	
	Bike renting fare (€/day)	
	Rent a car companies	
	Security Control?	
	Ticket control?	

Travel fares	First city	Zuoying
	travel fare by High Speed train (€)	22,5
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	34
	travel fare by plane (€)	50

city

- Good connection with 3 subway lines
- MRT system linking Taipei City and Taoyuan international airport is planned for 2013
- Plans for urban development area around the station
- Banciao station in the metropolitan area (13 Km away)
- Nangang station (3 Km) in north Taipei (future)



Taipei subway

Urban plans in the station area

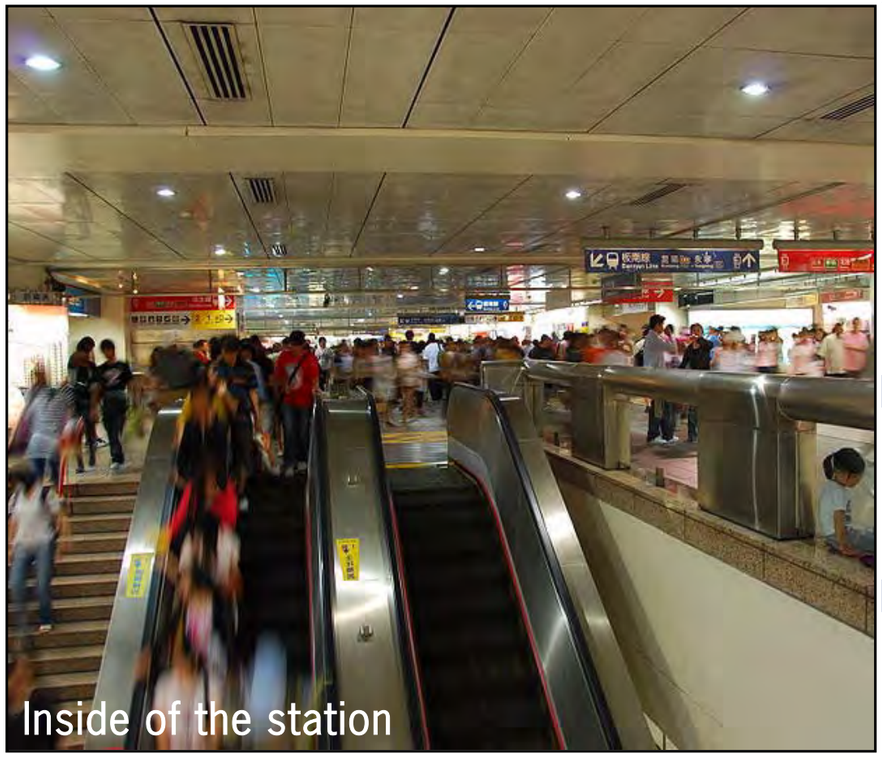
City numbers	City population	2.619.920
	City area (Km2)	271,80
	City density (hab/Km2)	9.639
	Region population	6.752.826
	Region area (Km2)	2.265
	Distance City Hall-Station (Km)	5,2
	International visitors a year	4.400.000
	Domestic visitors a year	
PU T	Metro ridership in the city area (pax/day)	1.284.644
	Comm ridership in the city area (pax/day)	-
	Bus ridership in the city area (pax/day)	2.200.000
	Tram ridership in the city area (pax/day)	-
Travel time	First destination	Zuoying
	travel time by High Speed train	1hr36min
	travel time by Conventional train	4,5hr(bef HS)
	travel time by Car	4hr
	travel time by plane*	50min(Kao)
	*only travel time	
	Urban develop. Total area planned (Ha)	47

Taiwan
HS rail
Network

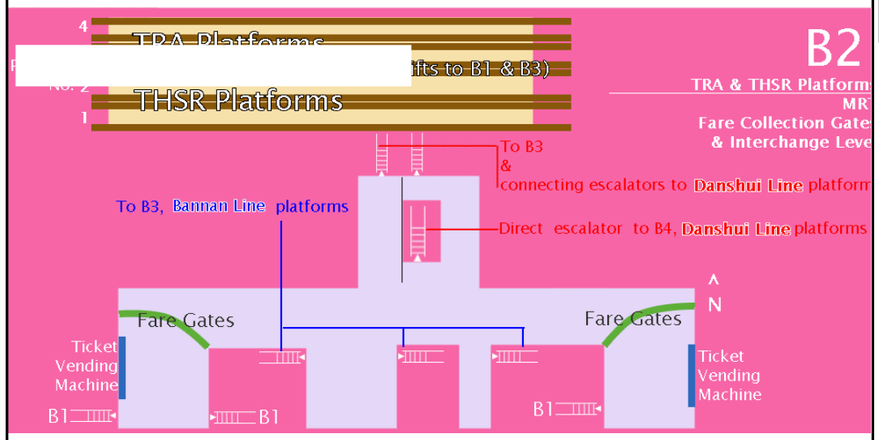
operator

- THSRC services Taipei-Zuoying started in 2007
- All trains stop at Banciao station


THSRC train at Taipei Main Station


Inside of the station

Line	Operator	THSRC
	Services type	Dead end
	Opening date	02-mar-07
	High Speed lines from/to station	1
	High speed total length (Km, country)	345
	HS Services a day (both ways)	132
	Passengers a day	89.859
	% city HS trains going through this station	100%
	First destination	Zuoying
	HS Services a day (both ways)	128
	% city trains going to this destination	96,97%
Trains	Maximum speed (Km/hour)	300
	Length (m)	304,7
	Cars per train	12
	Total seats	989
	Platform ocupancy time (min)	
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	
	Turnstile/entrance	yes

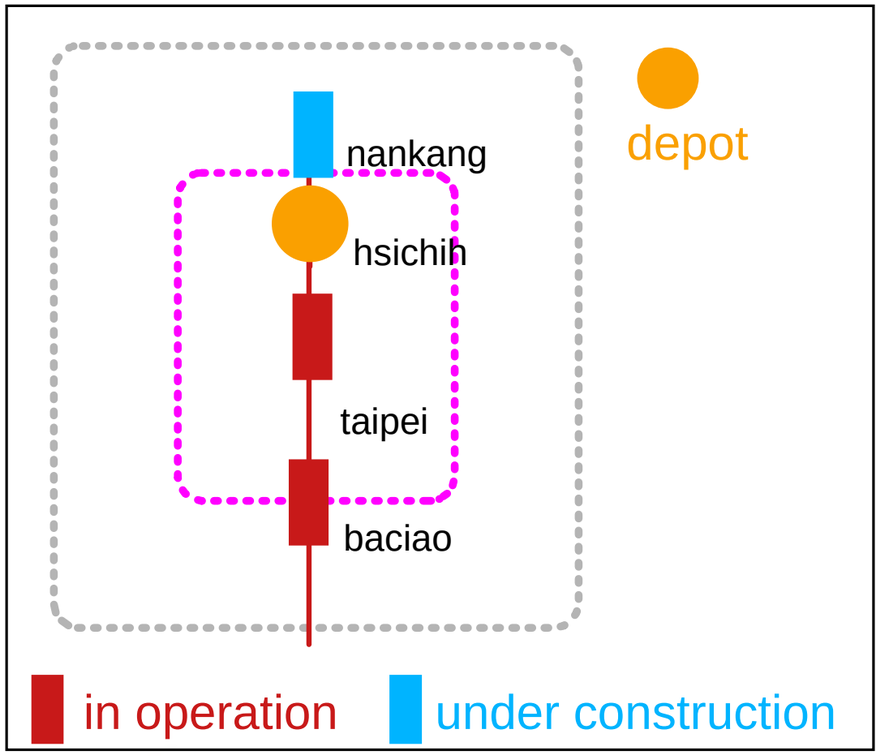


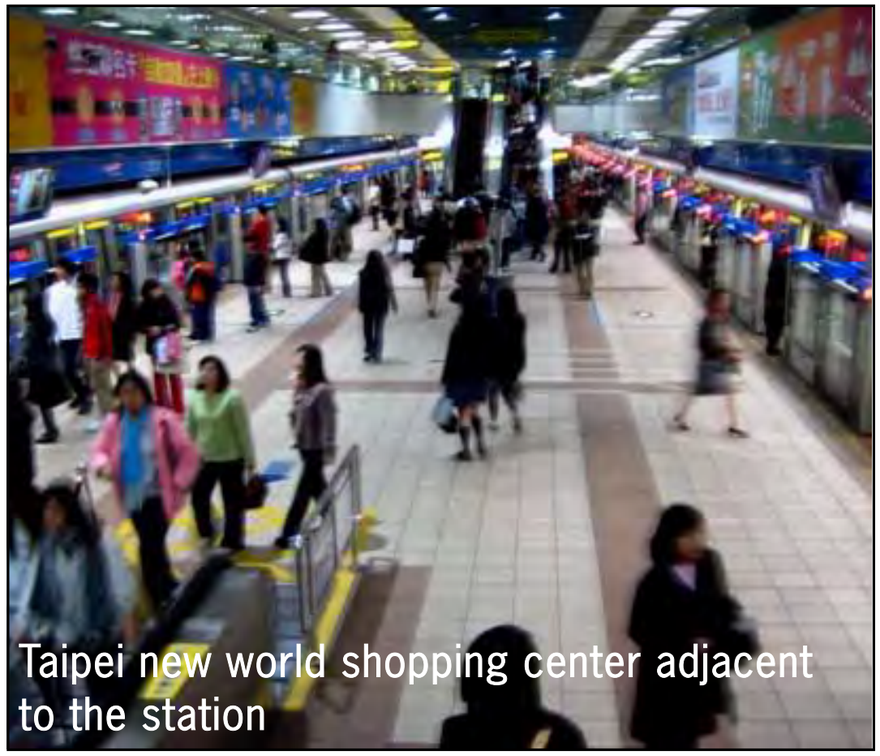
Platform level: 4 High Speed Tracks

infra manager

- Complete new HS line, with new depot, temporarily using sungshan
- HS underground station (5 levels) connected to Main station

Tracks	Railway Infra manager	THSRC
	HS tracks yard	Through
	Station location	Underground
	Number of tracks	12
	Tracks used for High speed	4
	High Speed trains/day both ways	132
	Length of platforms	
Areas	Station footprint (sq mt)	40.000
	Total area (sq mts)	
	Platforms area (sq mt)	
	Commercial area (sq mt)	
	Number of Shops	
	Offices area (sq mt)	
	waiting area+pax services (sq mt)	
	Parking area (sq mt)	8.500
Depots	Depot footprint (sq mts)	550.000
	Daily movements st-depot	
	Depot-station distance (Km)	22
€	Station construction costs (mill €)	400





Taipei new world shopping center adjacent to the station

Tokyo

1. The city and the region

The population of the 23 Tokyo special wards (Tokio-ku) is over 8 million people. This is considered to be the proper city. It has a surface of 617 Km2 and a density of 14.254 inhab/sq km.

The total population of the Tokyo prefecture is 12.790.000 inhabitants (Tokyo to). It has a surface of 2.187 Km2 and a density of 5.847 inhab/sq km.

The prefecture is the center of the Greater Tokyo Area, the world's most populous metropolitan area with 34 million people, covering an area of 8.014 Km2. the city population is 26% of the Greater Tokyo Area population.

2. The rail network and stations

Rail is the primary mode of transport in Tokyo. Tokyo has one of the most extensive urban railway networks in the world. There are 30 operators running 121 passenger rail lines (102 serving Tokyo and 19 more serving Greater Tokyo but not Tokyo proper). Despite this vastness, covering 3.000 km for commuter services alone, the network is still being expanded. Each of the region's rail companies makes their own maps, with key transfer points highlighted. 30 million passengers use commuter services daily.

Trains are often extremely crowded at peak travel times. Most lines in Tokyo are privately owned and operated. The subway system is operated by two different companies:the TOEI Subway is run directly by the Tokyo Metropolitan Government and Tokyo Metro is owned indirectly by the Tokyo and national governments. Rail and subway lines are highly integrated and dense; commuter trains from the suburbs use the subway underground tracks on many lines, emerging on the other side of the city again as commuter lines.

East Japan Railway Company, or JR East, is the largest passenger railway company in the world. It operates trains throughout the Greater Tokyo area (as well as the rest of northeastern Honshu).

In addition to operating some long-haul shinkansen lines, JR East operates 35 lines, Tokyo's largest commuter railway network. This network includes the Yamanote Line, which encircles the center of Tokyo. Besides JR East, other 30 private operators provide commuter services in the metropolitan area.

Some of the lines are tourist-oriented aerial lifts monorails, and funiculars.

Tokyo station is main intercity rail terminal in Tokyo, the busiest station in Japan in terms of number of trains per day (over 3,000), and the eighth-busiest in Japan in terms of passenger throughput.

Other main stations in Tokyo urban area are Ueno and Shinagawa stations.

Graphs B.17.1 to B.17.4 present graphs and values of different parameters from each one of the four considered points of view.

3. The HS arrival

The Tokaido Shinkansen began service on 1 October 1964, in time for the Tokyo Olympics. The conventional Limited Express service took six hours and 40 minutes from Tokyo to Osaka, but the Shinkansen made the trip in just four hours, shortened to three hours and ten minutes by 1965. It enabled day trips between Tokyo and Osaka, the two largest metropolises in Japan, changed the style of business and life of Japanese people significantly, and increased new traffic demand. The service was an immediate success, reaching the 100 million passenger mark in less than three years on 13 July 1967, and one billion passengers in 1976.

The Tokaido Line's rapid success prompted an extension westward to Hiroshima and Fukuoka (the Sanyo Shinkansen), which was completed in 1975.

The Shinkansen network has been developed since that year, becoming a network with 7 high speed lines, Joetsu (1982), Tohoku (1991) , Yamagata, Nagano and Akita, (shown in graph B.17.3) celebrating 40 years in 2004 having carried over 6 billion passengers.

Since 1970, development has also been underway for the Chuo Shinkansen, a planned maglev line from Tokyo to Osaka.

4. Effects of HS arrival

a. Passenger point of view

Tokyo station is the starting point and terminus for most of Japan's Shinkansen (high-speed rail lines), added to the historic station, and is also deserved by many local and regional commuter lines of Japan Railways, as well as the Tokyo Metro network.

The Shinkansen lines are on the east side of the station, along with the Daimaru department store.

The whole complex is linked by an extensive system of underground passageways which merge with surrounding commercial buildings and shopping centres, enhancing accessibility but making difficult the understanding of the station, as shown in graphs B.17.1 and B.17.3.

Of the 28 tracks of the station, only ten are used for HS services.

Therefore, the main advantage for passenger of HS arrival was travel time reduction and quality of service on board, whereas station complexity and congestion was even increased.

b. City point of view

Tokyo Station is located in the Marunouchi business district of Tokyo, near the Imperial Palace grounds and the Ginza commercial district.

The station complex is presently being redeveloped. The Marunouchi side will be restored to pre-war condition and the surrounding area converted into a broad plaza extending into a walkway toward the Imperial Palace, with space for bus and taxi ranks scheduled for 2011. On the Yaesu side, the exterior will be replaced by a much lower structure and twin high-rise towers at each end scheduled for 2013, shown in graph B.17.2.

There are also plans to provide faster connections to other nearby stations.

c. Operator point of view

High Speed railways operation in Tokyo station is shared by JR East and JR Central.

JR East operates Tohoku, Joetsu, Akita, Yamagata and Nagano Shinkansen lines, while JR Central operates Tokaido Shinkansen line.

The Tokaido Shinkansen is the world's busiest high-speed rail line. Carrying 151 million passengers a year (March 2008), it has transported more passengers (over 6 billion) than any other high speed line in the world. Between Tokyo and Osaka, the two largest metropolises in Japan, up to ten trains per hour with 16 cars each (1,300 seats capacity) run in each direction with a minimum of 3 minutes between trains.

Reversing trains and cleaning operations at the terminal are critical. Even if the scheme could be a through terminal, there are adjacent HS different lines operating like dead end terminals. Daily 600 HS trains are operated at Tokyo station.

Commercial and business activity is also provided at the station with a surface of 16.000 sq mt.

d. Rail infrastructure manager point of view

Number of tracks dedicated to HS services has increased along with new lines and services, from the initial 3 HS tracks in 1964, to 4 tracks in 1967, 5 in 1975, and 6 since 1979. 2 additional tracks were added in 1991 for the Tohuku line , increased to 4 in 1997. In total 10 HS tracks, 6 operated by JRCentral, and 4 by JREast.

Although Tokyo Station is the main intercity rail terminal in Tokyo, it is only the second-largest railway station in the city: although not HS stations, both Shinjuku and Ikebukuro Station handle more passengers.

A JR East project will extend the services of the Utsunomiya Line, the Takasaki Line, and the Joban Line to Tokyo Station by constructing the Tohoku Jokan Line

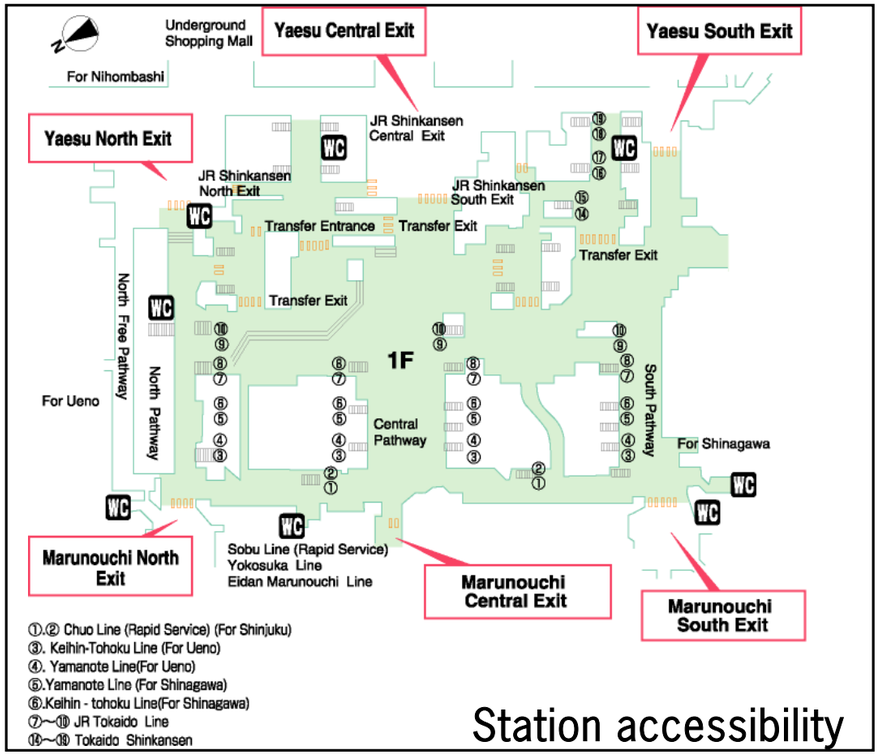
Shops at the station

Info panels at the platforms

passenger

- Huge complex station difficult to understand
- Excellent access time from city and region
- Good transfer time from metro and commuter


Turnstiles

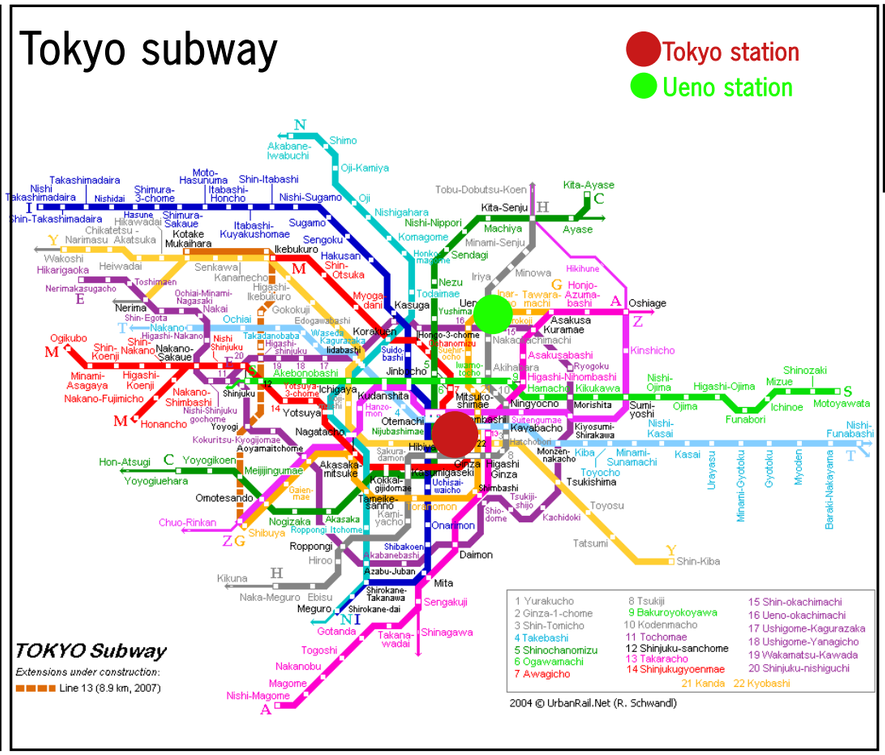


Station accessibility

Accessibility	High Speed stations in the city	3
	Total Region High Speed stations	12
	Nr of subway lines at the station	1
	Nr of commuter lines at the station	7
	Nr of bus routes at the station	21
	Subway st reached without transfer	26
	Commuter st reached without transfer	163
	Nr of public parking lot spaces	1.397
	Car parking fare (€/day)	52,8
	Bike renting fare (€/day)	-
	Rent a car companies	1
	Security Control?	no
	Ticket control?	yes

Travel fares	First city	Sendai
	travel fare by High Speed train (€)	81
	travel fare by Conventional train (€)	44
	travel fare by Car (€)	100
	travel fare by plane (€)	139

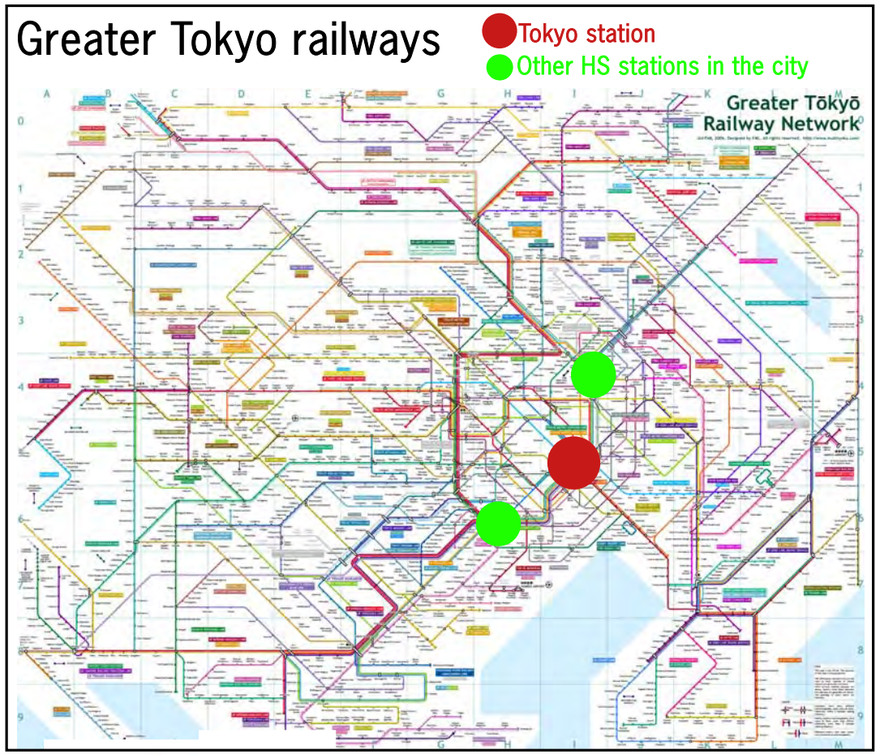
Tokyo subway



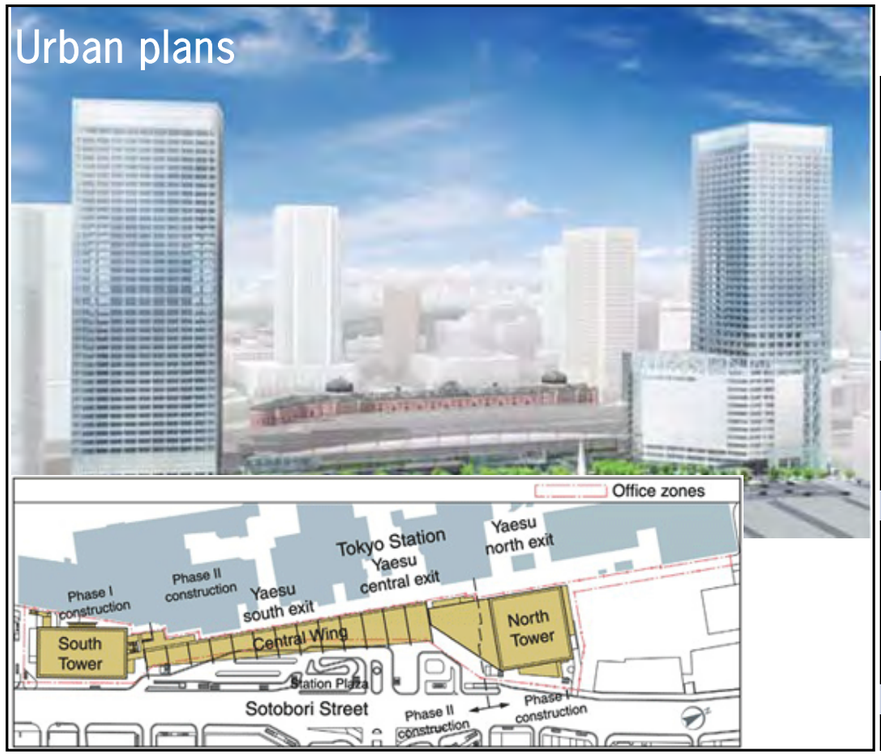
city

- Historic building and landmark
- High level of activity around the station
- Important urban development plans around the station (high rise)

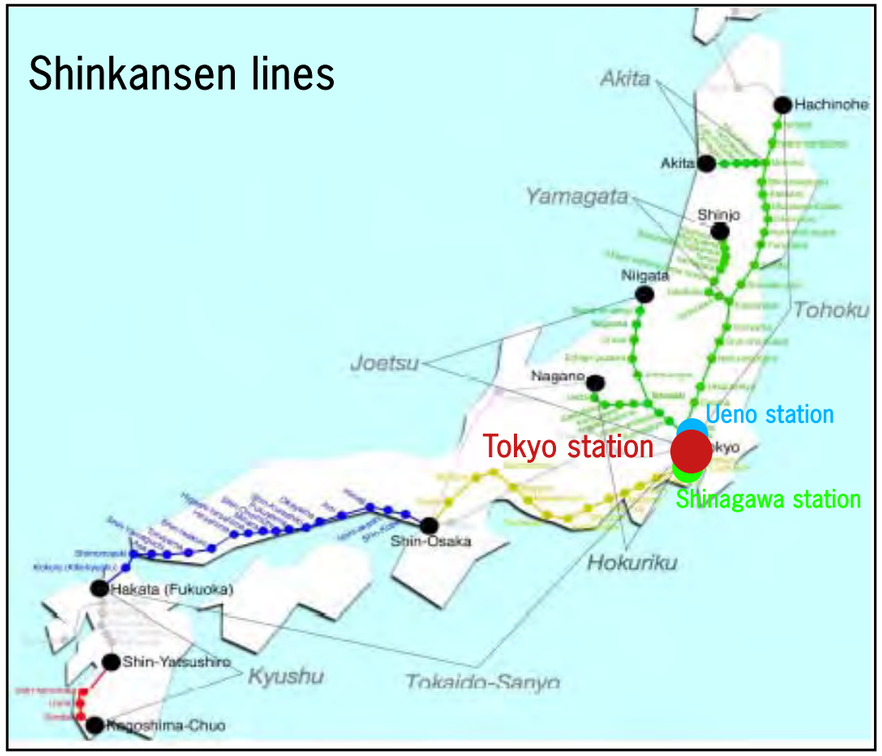
Greater Tokyo railways



Urban plans



City numbers	City population	8.795.000
	City area (Km2)	617
	City density (hab/Km2)	14.254
	Region population	34.000.000
	Region area (Km2)	8.014
	Distance City Hall-Station (Km)	7
	International visitors a year	4.810.000
	Domestic visitors a year	420.000.000
PU T	Metro ridership in the city area (pax/day)	6.237.660
	Comm ridership in the city area (pax/day)	33.106.000
	Bus ridership in the city area (pax/day)	5.008.220
	Tram ridership in the city area (pax/day)	319.504
Travel time	First destination	Sendai
	travel time by High Speed train	1hr38min
	travel time by Conventional train	-
	travel time by Car	5hr
	travel time by plane*	1hr
	*only travel time	
	Urban develop. Total area planned (Ha)	35,67



Tokyo HS rail Network

operator

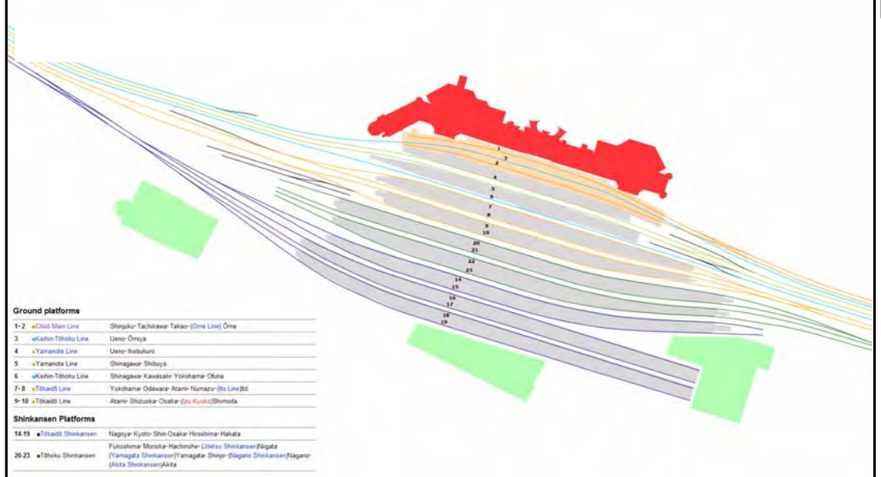
- High speed services started 1964
- Two different companies operating Shinkansen services: East Japan Railway Company (Tohoku, Joetsu and Nagano Shinkansen) and Central Japan Railway Company (Tokaido Shinkansen)
- Increased track dedication to HS when incorporating new lines
- High efficiency in cleaning & reversion of trains

Shinkansen train at Tokyo station

Inside of the station

Line	Operator	JRE & JRC
	Services type	Dead End
	Opening date	01-oct-64
	High Speed lines from/to station	6
	High speed total length (Km, country)	2.452
	HS Services a day (both ways)	600
	Passengers a day	450.000
	% city HS trains going through this station	100%
	First destination	Sendai (JRE)
	HS Services a day (both ways)	110
	% city trains going to this destination	18,33%
Trains	Maximum speed (Km/hour)	275 (JRE); 270 (JRC)
	Length (m)	379 (JRE); 400 (JRC)
	Cars per train	16 (JRE and JRC)
	Total seats	1152(JRE); 1323(JRC)
	Platform ocupancy time (min)	10
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	yes

Platform level: 10 High Speed Tracks



Ground platforms

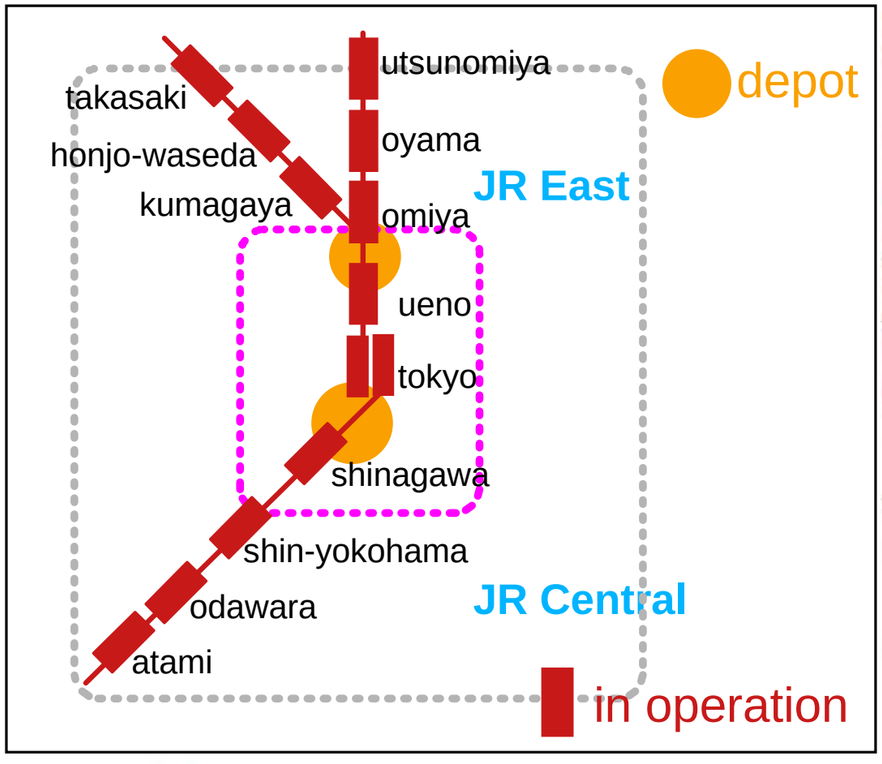
1-2	Chūō Main Line	Shinjuku-Tachikawa-Takao-(Ome Line) Ōme
3	Keihin-Tōhoku Line	Ueno-Ōmiya
4	Yamanote Line	Ueno-Ikebukuro
5	Yamanote Line	Shinagawa-Shibuya
6	Keihin-Tōhoku Line	Shinagawa-Kawasaki-Yokohama-Ōfuna
7-8	Tōkaidō Line	Yokohama-Odawara-Atami-Numazu-(Izu Line)Ito
9-10	Tōkaidō Line	Atami-Shizuoka-Osaka-(Izu Kyuko)Shimoda

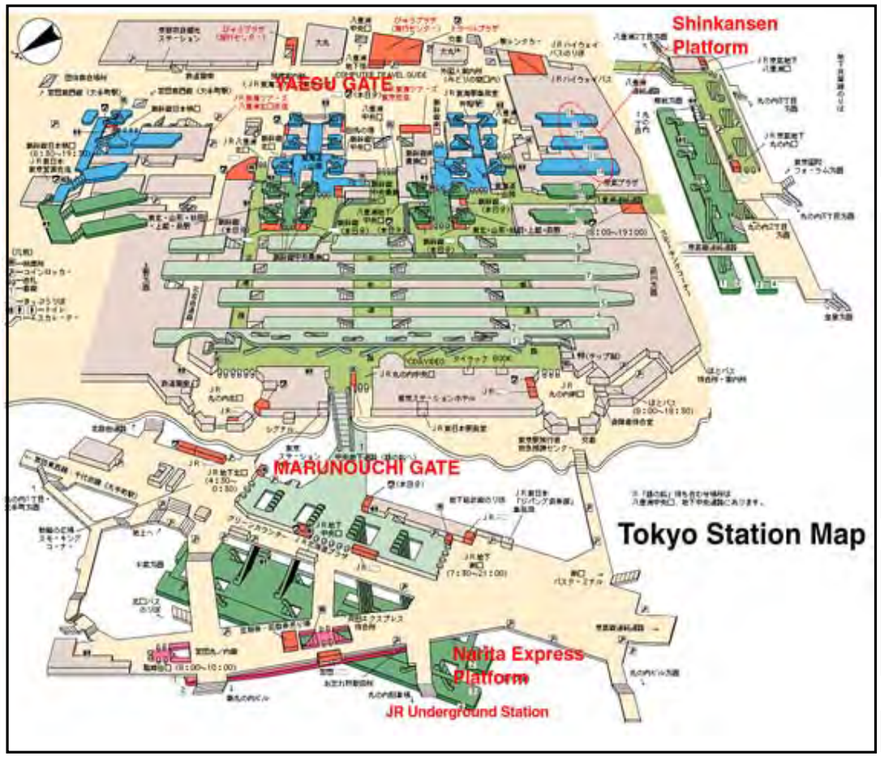
Shinkansen Platforms

14-19	Tōkaidō Shinkansen	Nagoya-Kyoto-Shin-Osaka-Hiroshima-Hakata
20-23	Tōhoku Shinkansen	Fukushima-Morioka-Hachinohe-(Hokkaido Shinkansen)Niigata (Yamagata Shinkansen)Yamagata-Shinjo-(Nagano Shinkansen)Kagano-(Akita Shinkansen)Akita

infra manager

- 3 HS tracks in 1964
- Various enlargments; 1967: 4tracks, 1975: 5 tracks, 1979: 6 tracks
- Changes in HS tracks when incorporating Tohoku line in 1991 (2 tracks), reaching 4 tracks in 1997
- Dead End tracks. Tracks of JR Central and JR East are physically separated and no connection





Tracks	Railway Infra manager	JRE+JRC
	HS tracks yard	Dead End
	Station location	At grade
	Number of tracks	28
	Tracks used for High speed	10
	High Speed trains/day both ways	600
	Length of platforms	410

Data of areas and depots are from JR East

Areas	Station footprint (sq mt)	157.000
	Total area (sq mts)	157.000
	Platforms area (sq mt)	29.000
	Commercial area (sq mt)	16.450
	Number of Shops	
	Offices area (sq mt)	
	waiting area+pax services (sq mt)	52.000
	Parking area (sq mt)	

Depots	Depot footprint (sq mts)	100.000
	Daily movements st-depot	133
	Depot-station distance (Km)	8,5

€	Station construction costs (mill €)	

6.2 Comparison of schemes

Graphs C1 to C7 present the cross comparison of graphical information and schemes of different items on the stations benchmarked.

Graph C1 compares **birdeye views** of the stations (taken from Google Earth) at the same scale for all stations, each one centered on the frame provided. This allows the perception of the urban environment of all stations, except for Paris Charles de Gaulle airport HS station.

Underground stations, such as Barcelona Sants, Berlin Hauptbahnhof lower level, London St Pancras, New York City Penn Station, Paris Charles de Gaulle at Roissy airport, or Taipei Main Station do not allow to perceive the real platform length, appearing smaller than they really are, as it is their urban footprint.

Urban high density around the station is easily appreciated in the cases of Barcelona, London, Madrid-Atocha, New York Penn Station, Paris Lyon and Nord, Roma Termini, Seoul or Tokyo. Smaller densities are appreciated in Berlin, Madrid Chamartín, Paris CDG, Ankara, Beijing, or Taipei.

Graph C2 present **external views ot the façades of HS station buildings**, showing both "modern" architecture buildings in the cases of Barcelona, Berlin, Madrid-Chamartin, New York City Penn Station, Paris CDG, Roma Termini, Beijing South and Seoul.

On the contrary, even with modern building additions or underground extensions, old historic buildings have been preserved for HS stations at London, Madrid Atocha, Paris Lyon and Nord, Ankara Gari, Taipei Main Station or Tokyo station. Therefore, almost 50% share between preservation of historic stations and use of modern stations (some of them 50 years old).

Graph C3 presents the **HS rolling stock at the platforms** of each station, where, the outstanding image of modernity of the rolling stock, sometimes 25 years old, is a prove of good design and maintenance.

The influence of natural light can be perceived on most open air stations, while underground stations platforms, because of strong artificial lighting rarely present an obscure aspect.

Graph C4 presents images of **real estate plans and projects** around or over HS stations, showing the impressive developments based on the attractiveness of accessibility provided by HS for the majority (11 out of 17) of the cases studied, the existence of important pieces of urban centric land, and the revenues expected to compensate for enormous HS investments.

Graph C5 compares the **schemes of HS rail network stations** in the cities and regions studied, showing that almost half of the cities studied (London, New York City, Ankara , Beijing and Taipei) are presently using a single station at the city center, whereas HS stations in the region are present in all cases except Madrid, in a number consistent with the extension and density of the region population, minimal in Barcelona, Roma , Ankara, Beijing, Seoul, and Taipei and maximal in Berlin, New York City, Paris, and Tokyo.

Two or more HS stations at the city center are present in Barcelona, Berlin, Madrid, Paris, Rome, Seoul and Tokyo (roughly the other 50% of the cases studied).

Through schemes are being adopted in all cases, except London, Paris, and Roma (an imperfect scheme with through services but not tracks), although there are not through services even if infrastructure allows for them at Tokyo station.

Graph C6 presents the location of **HS stations on the commuter network** of each city, showing that in all cases but Taipei HS stations are also deserved by the commuter rail network, enhancing accessibility from the region to HS services. In some cases, like London and Seoul, commuter rail lines are marked over the subway networks.

Usually commuter rail tracks are parallel to the HS tracks, at the same or different level, the interchange between both being quite convenient for the passengers.

Graph C7 presents the location of **HS stations on the subway network** of each city, showing that in all cases HS stations are deserved by the subway system, by means of one or more lines.

Connections between subways and HS stations are not always optimal, significant distances having to be walked to reach the HS station from the subway in some cases.


0 250 500 m
BCN-Sants
Google

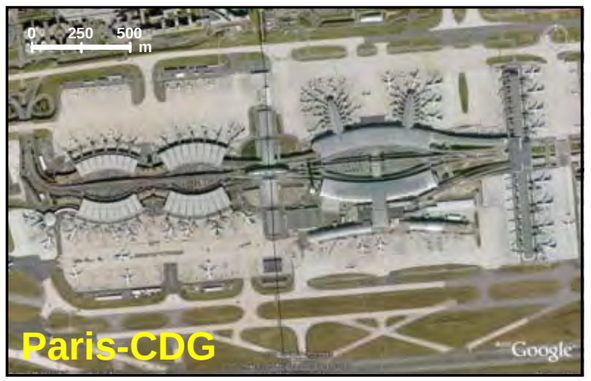

0 250 500 m
Berlin-Hbf
Google


0 250 500 m
London-St Pancras
Google


0 250 500 m
Madrid-Atocha
Google


0 250 500 m
Madrid-Chamartín
Google


0 250 500 m
New York-Penn
Google


0 250 500 m
Paris-CDG
Google


0 250 500 m
Paris-Lyon
Google


0 250 500 m
Paris-Nord
Google


0 250 500 m
Roma-Termini
Google


0 250 500 m
Ankara-Gari
Google


0 250 500 m
Beijing-South
Google


0 250 500 m
Seoul
Google


0 250 500 m
Seoul-Yongsan
Google


0 250 500 m
Taipei-Main
Google


0 250 500 m
Tokyo
Google

BCN-Sants


Berlin-Hbf


London-St Pancras


Madrid-Atocha

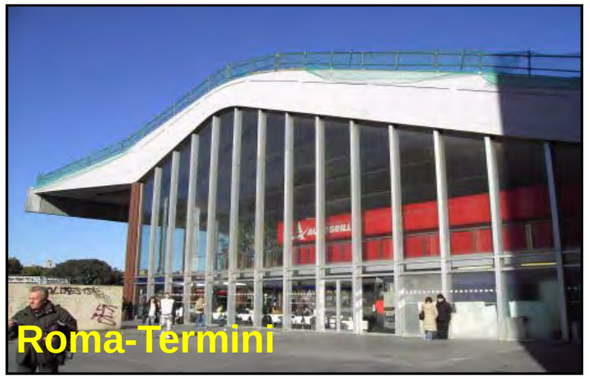
Madrid-Chamartín


New York-Penn


Paris-CDG


Paris-Lyon


Paris-Nord


Roma-Termini

Ankara-Gari

Beijing-South

Seoul


Seoul-Yongsan


Taipei-Main


Tokyo


BCN-Sants


Berlin-Hbf


London-St Pancras


Madrid-Atocha


Madrid-Chamartín


New York-Penn


Paris-CDG


Paris-Lyon


Paris-Nord


Roma-Termini


Ankara-Gari


Beijing-South

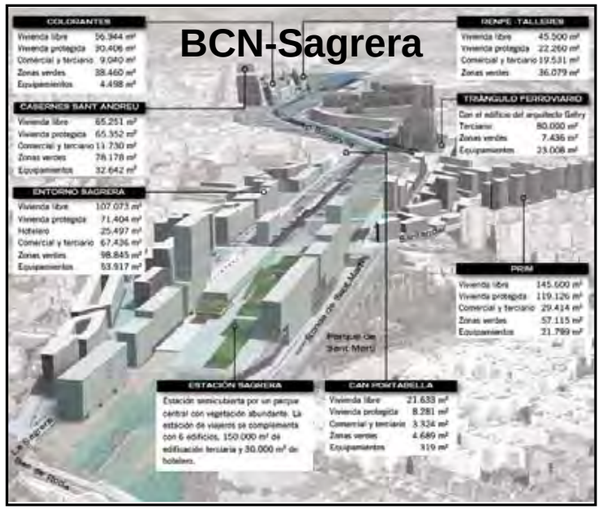

Seoul


Seoul-Yongsan

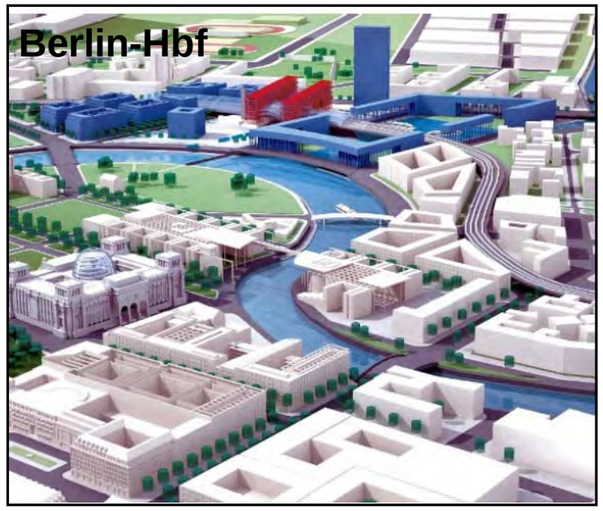

Taipei-Main


Tokyo

BCN-Sagrera

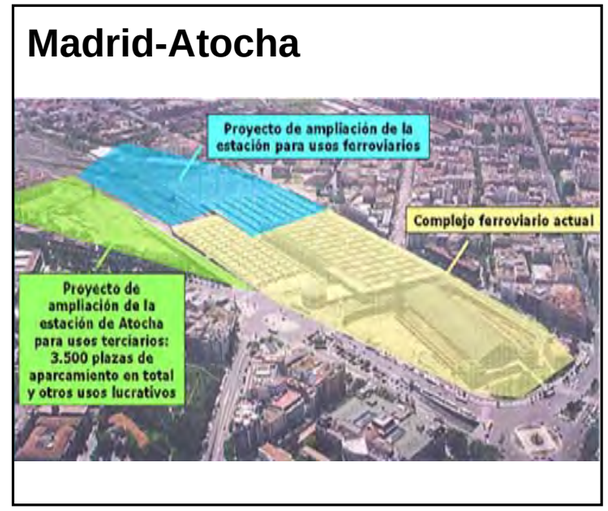


Berlin-Hbf



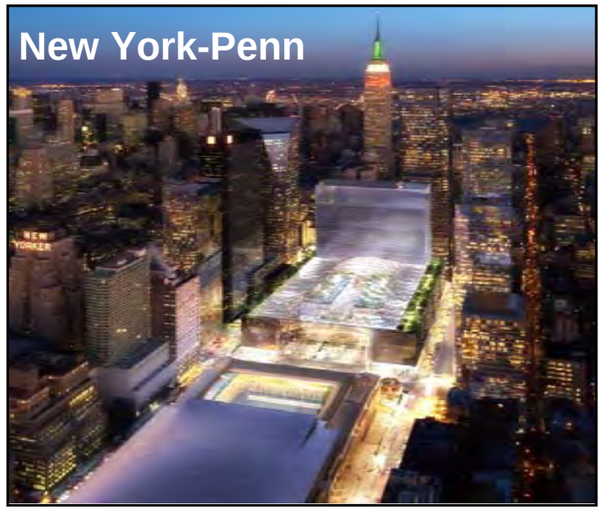
London-St Pancras

Madrid-Atocha



Madrid-Chamartín

New York-Penn

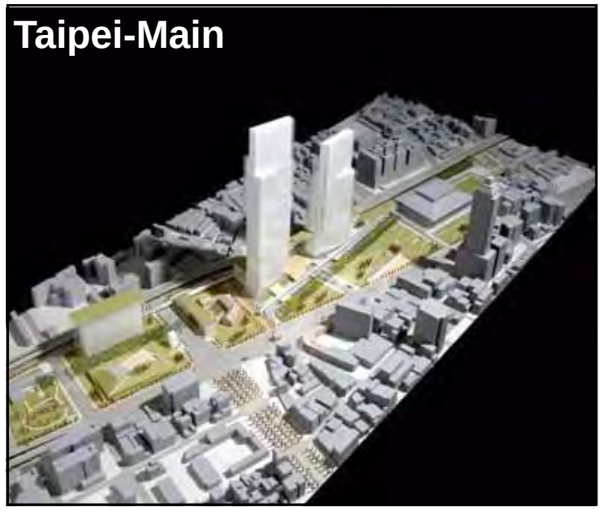


Ankara-Gari

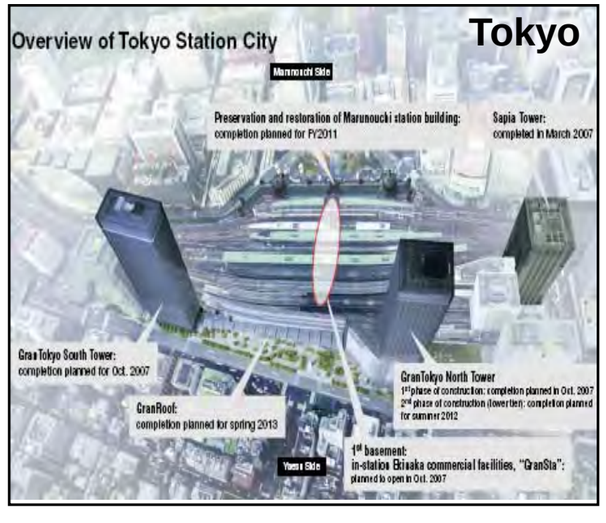
Seoul

Seoul-Yongsan

Taipei-Main

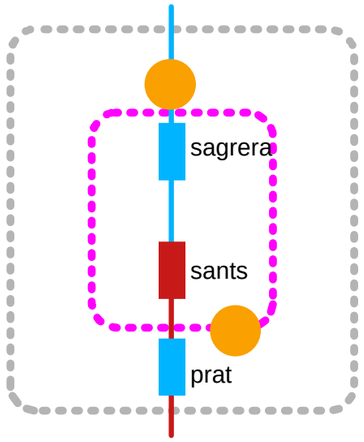


Tokyo

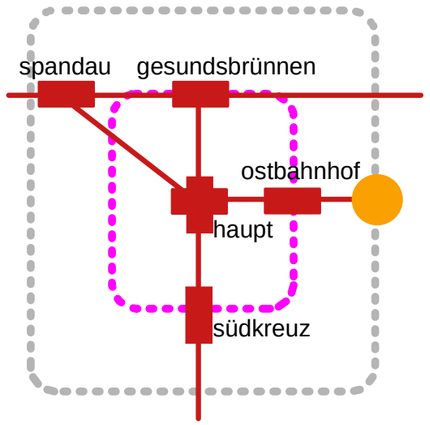


No real estate or urban development plans in the HS station area reported for BCN-Sants, Paris, Rome-Termini or Beijing South Station

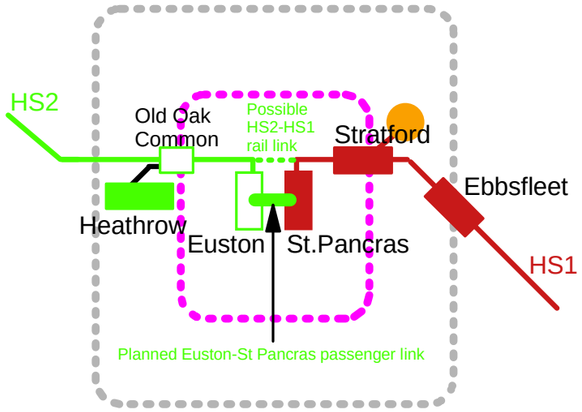
Barcelona



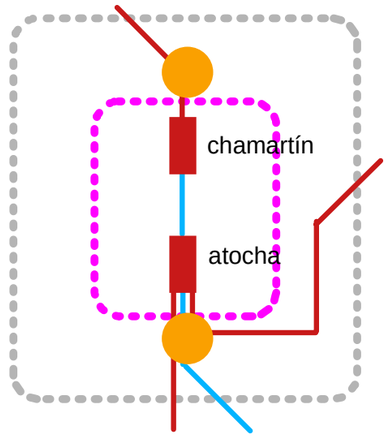
Berlin



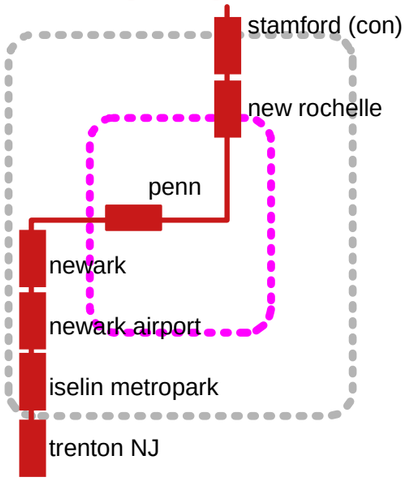
London



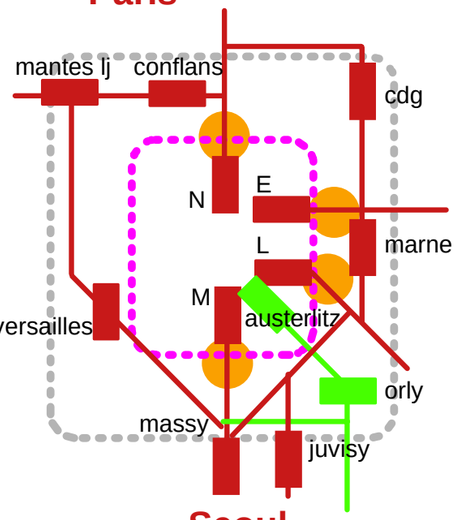
Madrid



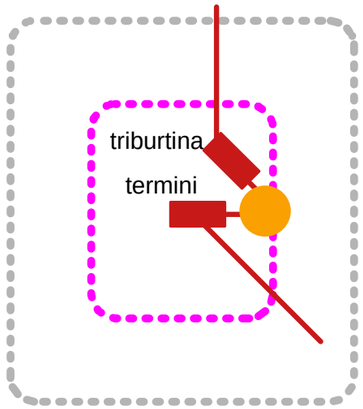
New York



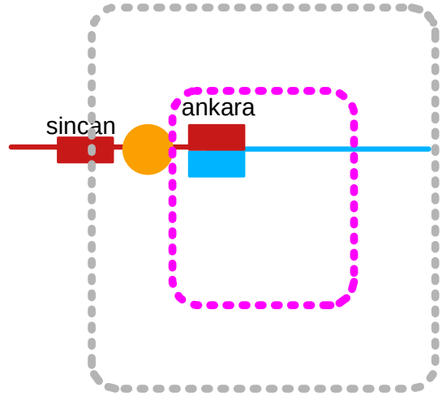
Paris



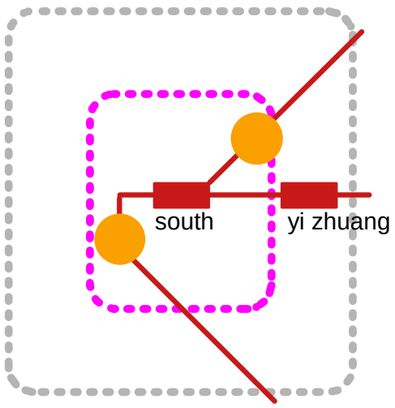
Roma



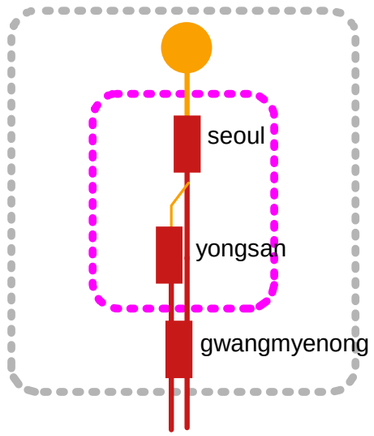
Ankara



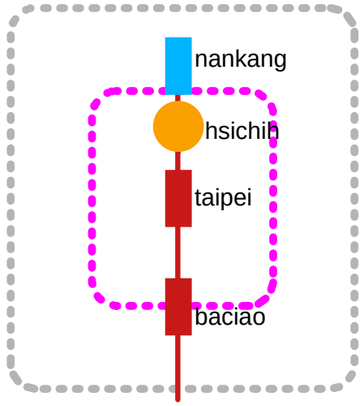
Beijing



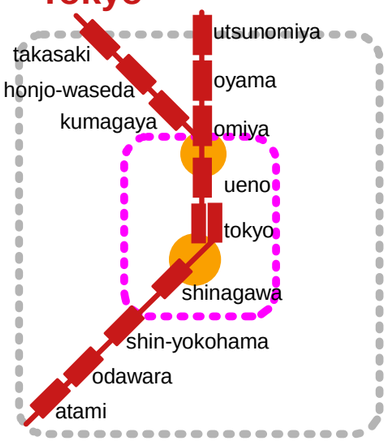
Seoul



Taipei



Tokyo



depot | in operation | under construction | planned

Barcelona

HS stations benchmarked

Other HS stations

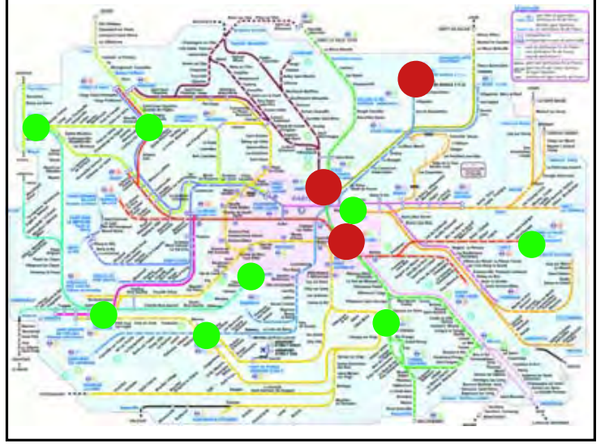
Berlin

London

Madrid

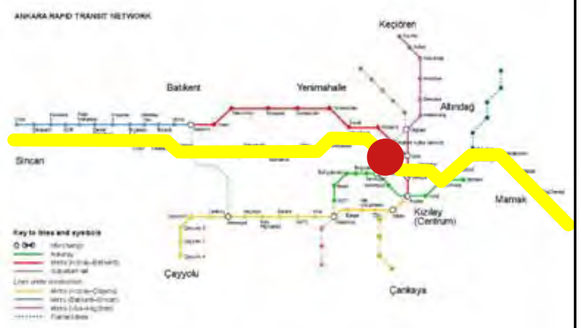
New York

Paris



Roma

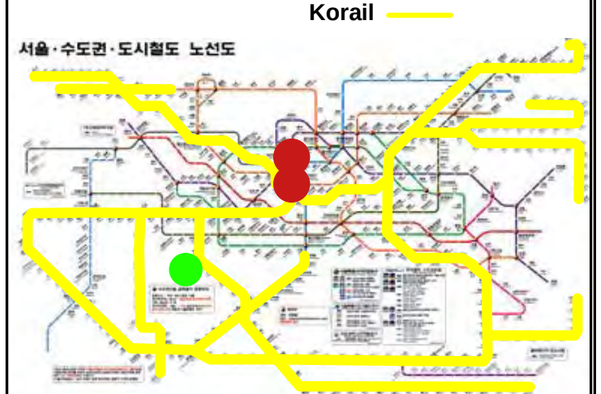
Ankara



Beijing

Seoul

Korail



Taipei

No commuter rail network reported

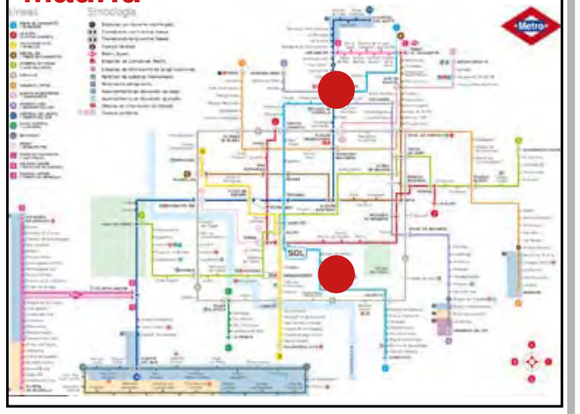
Tokyo

Barcelona

Berlin

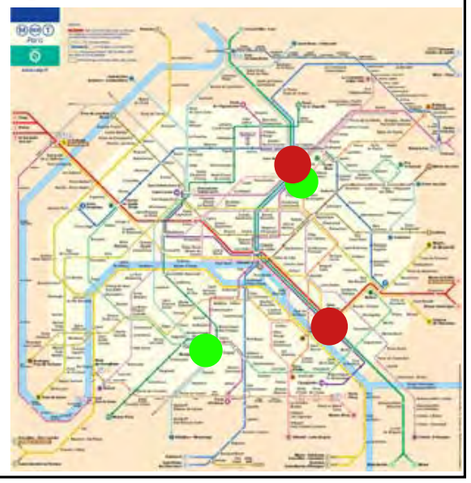
London

Madrid



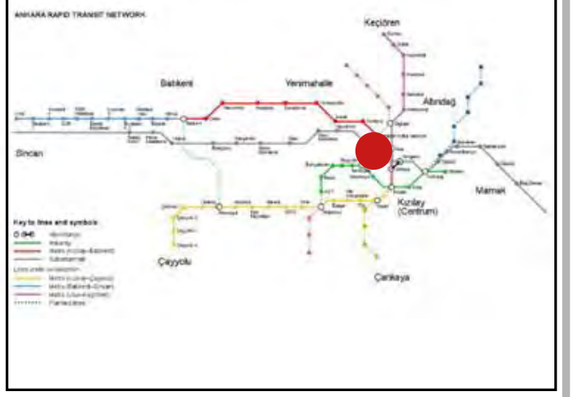
New York

Paris



Roma

Ankara

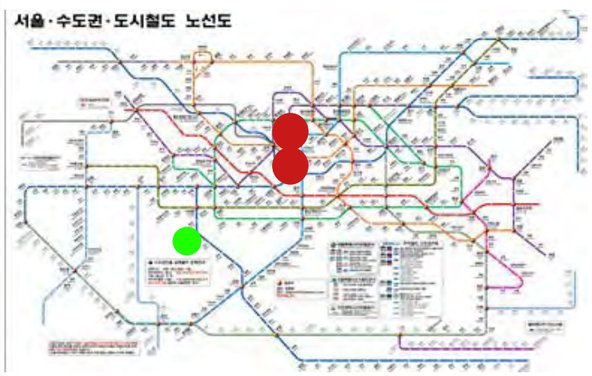


Beijing

Seoul

HS stations benchmarked

Other HS stations



Taipei

Tokyo

6.3 Comparison of indicators and conclusions

Several indicators have been constructed using the values provided by the undertakings in the answers to the questionnaires from the different points of view, in order to facilitate the comparisons.

Graphs C8 to C11 present indicators value for each station and conclusions reached from their analysis.

1. Passenger point of view indicators (graph C8):

- **% High speed stations in the city / total HS region stations**

The majority of HS stations are located in the city center, except New York, Paris and Tokyo with extense region HS networks. Madrid and Roma have no region high speed stations. A movement to decentralize city centers appears in large regions

- **Subway lines at the station**

All urban stations have subway connections, except Paris Cdg and Ankara Gari Station (close, but not at the station). New York and London have 6 subway lines at the HS station, the normal value being two subway lines.

- **Subway stations reached without transfer**

The higher the number lines going through the station, more stations in the city where you can peak direct trains to the HS station, without transfer. This is a measure of accessibility quality, that increase passenger volume. New York and London have over 200 subway stations reached without transfer, the average being around 30 to 50 stations

- **Subway transfer quality**

Measured distance from HS between platforms. Value 1 for more than 500m and 5 for less than 100m. Average quality 3, with exceptional good values for new interchanges like Barcelona Sagrera. Berlin Hbf, Beijng or Taipei.

- **Commuter lines at the station**

Higher numbers than in subway lines, with higher values for Berlin, NYC, and Rome. No commuter lines in Taipei.

- **Commuter stations reached without transfer**

Very high values with ten cities over 100 stations, and two (NYC and Paris Nord) over 150 stations, showing important regional accesibility.

- **Commuter transfer quality**

Better values than on subway transfer quality, due to parallel tracks schemes

- **Parking spaces at the station**

Stations analysed are *city* stations, except Paris CDG. Parking spaces in general below 1000 spaces, except Paris, that computes nearby parking lots. Regional stations with P&R facilities, not appearing in the graph. Paris CDG value is for the total airport.

- **Parking spaces/HS thousand daily passenger**

Generally, not more than 50 places per thousand daily passengers, at city center stations. In Barcelona Sants and Madrid Chamartin low present number of HS passenger gives artificially high ratios, provided for other train services.

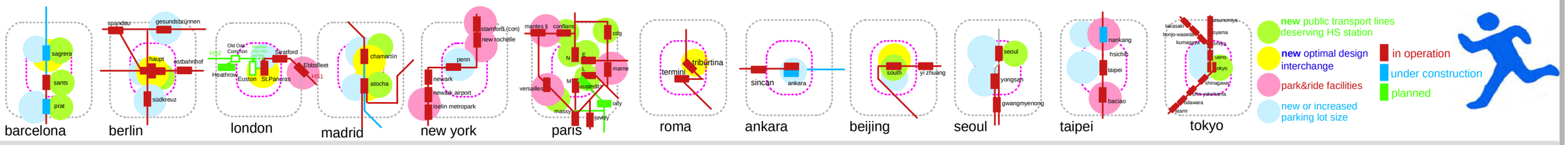
- **Parking fare (E/day)**

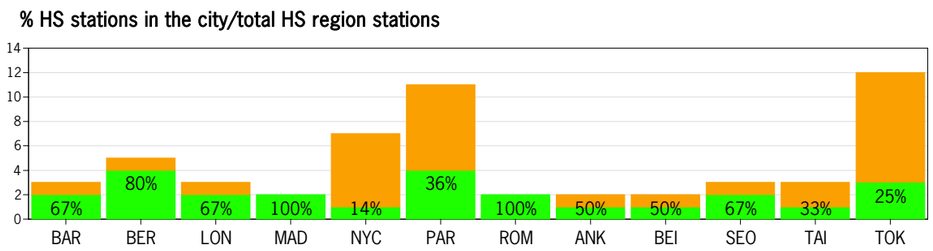
Parking fares between 20 / 30 euros per day, climbing to 50 in Paris CDG and Tokyo, and to 80 in London. No figure provided for NYC, even higher than London in the station area.

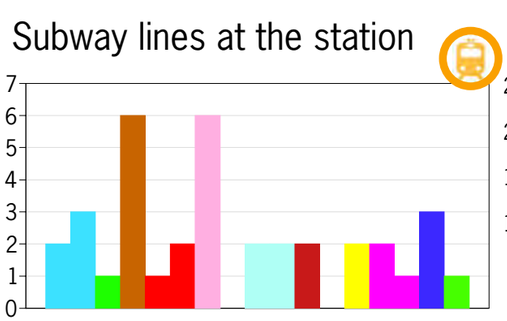
Some **conclusions from the passenger point of view** about the convenience of an old station location for a new HS station are presented in graph C8, based in the cases analysed, and the need of a good connection to public transport networks. New locations require huge additional investments in providing these networks access, but can optimise interchanges.

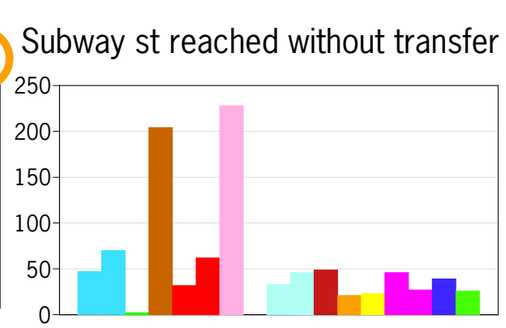
Huge parking lots are not compulsory at city center HS stations, but they are strongly needed at region HS stations.

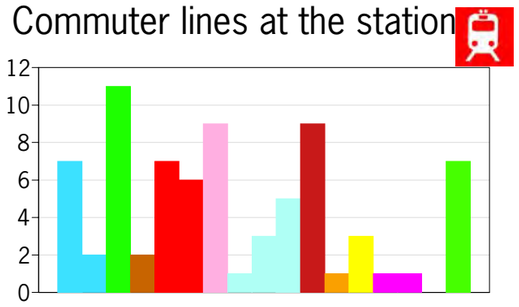
From the passenger point of view, security and ticket control should not result in queuing and congestion before boarding the train.

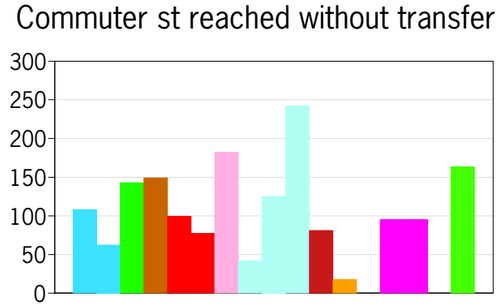


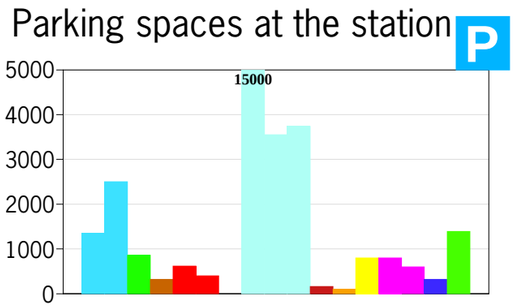


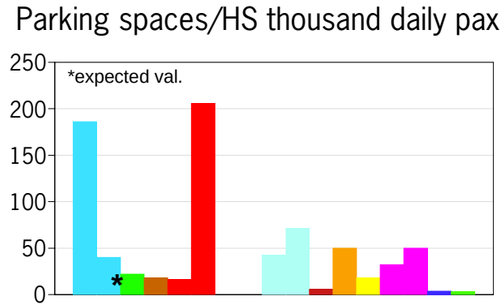


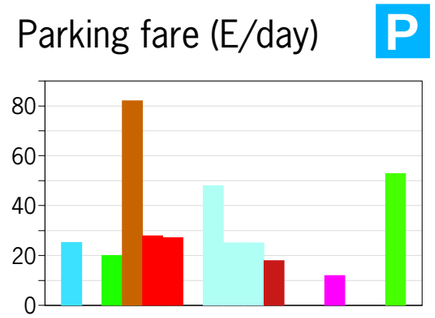












BAR-S BAR-Sag BER-H LON-Sp MAD-A MAD-Ch NYC-P PAR-Cdg PAR-L PAR-N ROM-T ANK BEI-S SEO SEO-Y TAI TOK

- **HS location: based on old stations, or new?**
  - keeping the old station location usually means excellent connections to commuter and subway lines (9 out of 17 cases analysed)
  - choosing a new location requires huge investments to change the rail scheme in order to allow for connections (BCN, BER, BEI, ROM)
  - a second station with through services increases the accesibility, inducing access time savings
  - new locations allow for optimal design interchanges that reduce transfer time
  - parking lots at city stations: low share of HS pax, P&R facilities at region stations,
  - Security and ticket control often results in queueing and congestion

2. City point of view indicators (graph C9)

- **Population city/region (%)**

Shows significant variation in the cities studied

- **City density**

High values, over 10 thousands inhabitants per sq. km in 6 of the cities studied : Barcelona, NYC, Beijing, Seoul, Taipei and Tokyo. All the others less than 5.000.

- **Tourism. Visitors/year**

Over 20 million visitors/yr for London, NYC, Paris, Beijing and Tokyo. Less than 10 million for all the remaining

- **Urban plans around the station (Ha)**

Extensive real state operations, over 100 Ha in Barcelona, Madrid- Chamartin, and Seoul. More moderate operations, with less than 50 Ha in the remaining cities.

- **Subway daily passengers**

More than 6 million daily for Beijing and Tokyo, between 2 and 4 million for the others, with low figures for Ankara and Taipei

- **Commuter daily passengers**

More than 2 million daily in London, Paris, and 30 million in Tokyo, around 1 million in Berlin, Madrid, NYC and less than 500.000 in Barcelona, Rome and Ankara. No data available in Beijing and Seoul, probably included in subway figures.

- **Bus daily passengers**

Over 10 million in Beijing, around 4 million in London, Seoul, and Tokyo,less than 1 million in the remaining.

- **Subway passengers a year/population city**

Shows how many trips makes a citizen in subway during one year. Values around 200 in most cities, reaching 600 trips per year in Paris, (small city population).

- **Commuter passengers a year/population city**

Same indicator but for commuters, shows around 100 trips in a year per citizen, with the exceptions of Paris and Tokyo, with more than 400 and 1300 trips per year, due to relatively small city population when compared to region.

- **Bus passengers a year/population city**

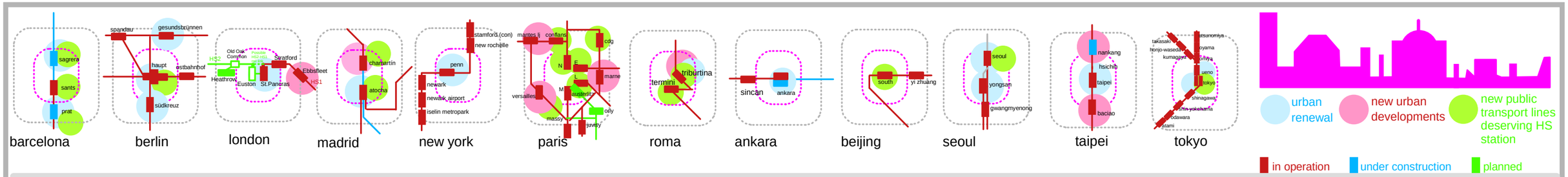
Same indicator for buses, gives an average of 150 trips per year, with higher values for London, Beijing and Tokyo

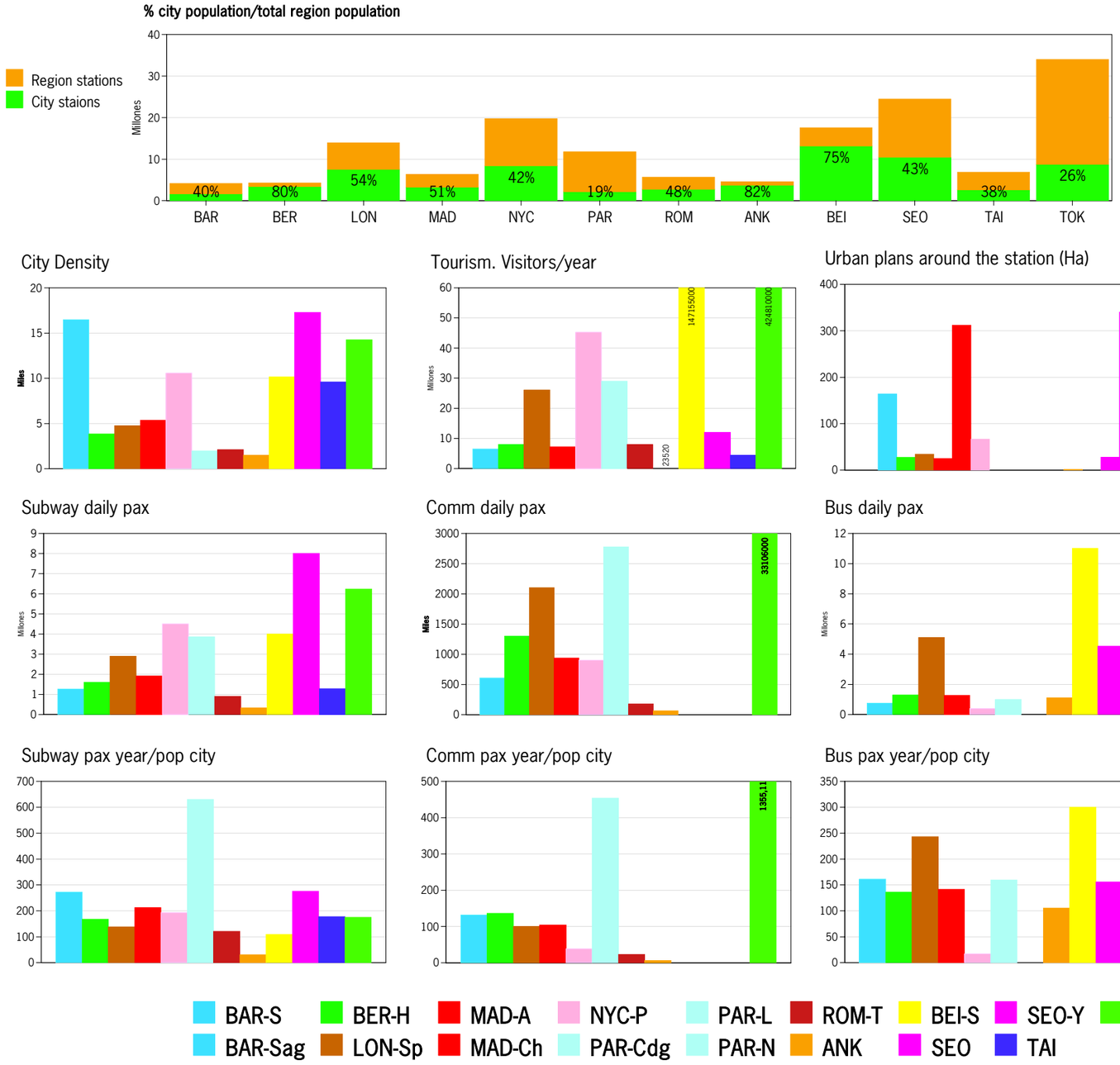
Some **conclusions from the city point of view** included in graph C9, reflect that real estate operations and urban redevelopment are growing in the majority of stations analysed in the city center, with a trend moving from station building design to neighbourhood design.

In the HS stations located in the region, outside the city center, new urban developments, and huge parking lots to promote P&R are common. They are identified in the upper part of the graph for the stations analysed.

In many cases, also identified in the upper part of the graph, new public transport lines have been built to deserve HS stations.

As a complement to public transport deserving of the station based on commuter lines, subway lines , tramway lines or bus lines, preferably organised in efficient interchanges, attention must be paid to taxi stands and holding lines, as well as boarding procedures, to avoid time consuming long lines, not compatible with the spare of access time needed for the passenger to choose HS services.





- **HS arrival has originated urban planning changes, real estate operations, and new public transport lines**
  - station footprint gets bigger
  - in the city stations, growing urban renewal and/or new real estate projects
  - in the region stations, new urban developments
  - in most cases, new Public Transport lines to deserve HS stations
    - commuter lines
    - subway lines
    - tramway lines
    - bus lines
  - taxi stands capacity and boarding procedure requires careful design to save precious time
  - trend from the station building design to the station neighborhood design

3. Operator point of view indicators (graph C10)

- **% of city HS trains deserving the HS station**

This indicator is useful to reflect that a city with several HS stations may not provide a better accesibility to passengers, if HS services do not deserve the different destinations.

Through schemes provide values of 100% (all HS trains, and therefore HS destinations from the city are present at the station) as seen in most cases, while dead end schemes with dedicated stations for different lines give low values, as it is the case presently at Madrid Chamartin, the Paris stations analysed, or Seoul.

- **Years of high speed in the city**

It shows how mature are the HS services at the station, and reflects the HS "history", with Tokyo leading with more than 40 years, Paris about to reach 30 years at Gare de Lyon, and Madrid and the other two Paris station about to reach 20 years of HS operation at the station. Remaining cases show values around 5 years.

- **Number of HS lines to/from the station**

It reflects the maturity of the system and its development, as well as the structure of the HS network and services. High values again for Tokyo station, with 6 lines, London, with domestic and international services, followed by Berlin , Paris, and Madrid. All the remaining cases have but a single line.

- **HS Daily services**

The 600 HS services at Tokyo station are the top figure, with around 200 daily services at Berlin, Madrid Atocha, and the three Paris stations analysed, the remaining slightly around 100 daily services

- **High speed daily passengers**

Far from the 450.000 daily passengers of Tokyo station, Paris Gare de Lyon, and Taipei exceed the 80.000 daily passengers, and several stations are between 30.000 and 60.000, lower figures smaller than 10.000 for Barcelona Sants, Madrid Chamartín, NYCity, Paris Charles de Gaulle and Ankara.

- **High speed passengers a year/population city**

Higher values again for Tokyo, with almost 30 trips per year, followed y Paris stations, that alltogether add up to a similar number, and Taipei ,12 expected for Barcelona Sagrera, in construction, and all the remaining below 5 HS trips per year.

- **High speed passengers a year/population region**

Around 8 trips per habitant of the region in Tokyo, 5 in Taipei, and around 2 in Madrid Atocha, Berlin and Paris stations. Less than one in the others.

- **High speed passegers a year/city visitors**

Around 2 trips per visitor and year in Berlin, Madrid, Ankara (due to low number of visitors), Paris (adding stations) and Taipei, with less than 0,5 values for the remaining.

- **Station footprint (sq m)/daily high speed passengers**

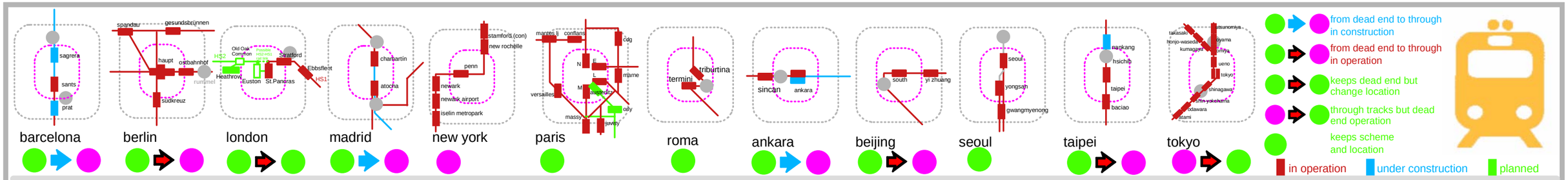
Huge values for Madrid Chamartin due to small number of passenger and consolidated commuter and conventional rail station, with averagae values around 5 square meters per daily passenger.

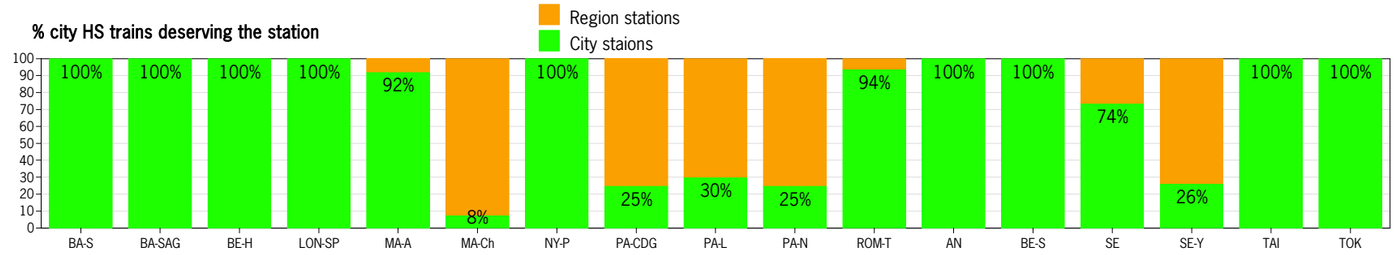
- **Station footprint (sq m)/High speed daily services**

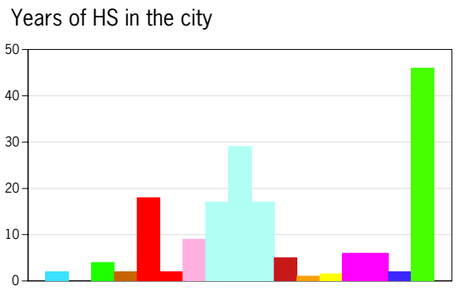
Again high values for Madrid Chamartín for the aforesaid reason, with an average around 1 square meter per daily service

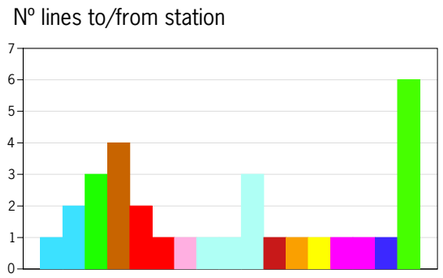
Some **conclusions from the operator point of view**, presented in graph C10, reflect the changes in the operator production system occurred with the HS arrival, often with independent tracks, change in many cases to through services, split of services between different stations, and introduction of security and ticket control in some cases leading to queuing and congestion.

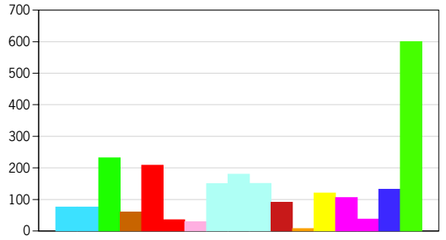
Depots have also been refurbished or reconstructed to accommodate HS. A dilemma exists between servicing trains for cleaning and catering operations at station platform or doing so at maintenance yards, as well as worries for increases in walking distances due to higher number of tracks and platform size.

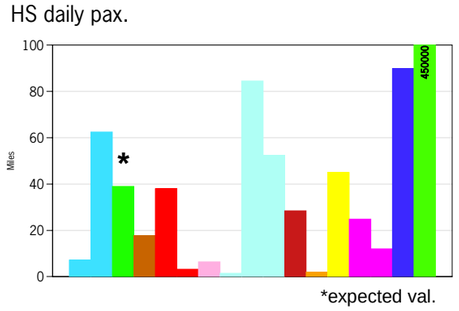


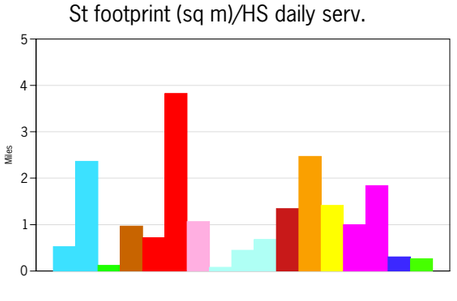


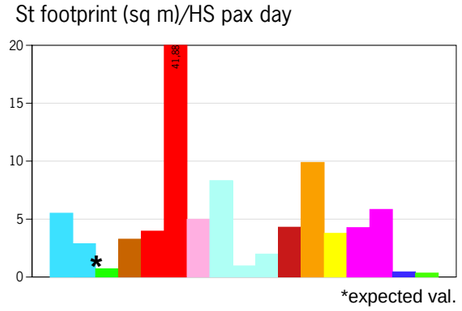


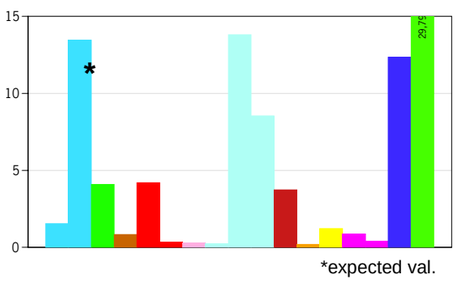


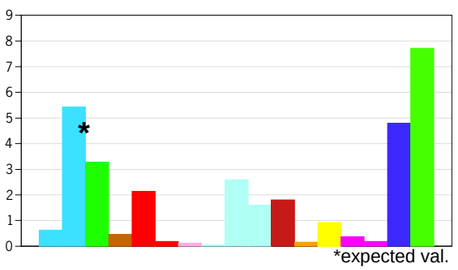


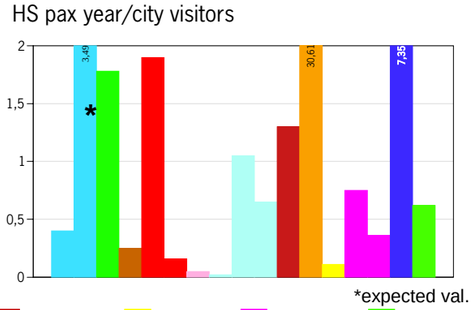












- **HS arrival has induced changes in operator production system for more efficient provision of services in all cases**
  - new stations or remodelling existing ones in all cases
  - new independent tracks in most cases (all except NY)
  - change from dead end to through services in BER (pfilzkonzept)
  - change for through services in construction MAD, BCN, ANK, TAI
  - new scheme of lines and station origins in SEO, TOK
  - introduction of security passenger and ticket control in most cases, leading to congestion and queueing
  - new depot and maintenance concept in all cases
  - no need of operational train preparation at station in through service schemes
  - increase in walking distances within stations with higher number of tracks and dimension of platforms
  - dilemma between servicing trains at platform station or maintenance yards

4. Infrastructure manager point of view indicators (graph C11)

- **High speed tracks / total station tracks (%)**

Shows progressive enlargement of the high speed stations. Conventional tracks going through remodelations with the high speed arrival. Most of the cities with more than half high speed tracks.New stations like Beijing have been provided with all high speed tracks, because the city is planned to have a very extense high speed network in the next years (most of the tracks are now out of service)

- **High speed tracks**

Variable number at the stations, usually between 6 and 10, with Beijing South Station leading with 24 HS tracks.

Dead end stations require comparatively more tracks.

- **High speed daily services / high speed tracks**

It measures the efficiency of use of HS tracks. Values between 5 and 20 daily services / track have been reported, reaching 30 at Taipei station, and 60 at Tokyo station. Through schemes like Berlin, or Paris CDG are on the high rank, but some dead end stations like Tokyo prove that a super efficient operation is possible.

- **Station footprint (sq m)**

An important fact for the infrastructure manager as well as the city, specially for stations located in the city center, where land occupation has significant value.

Normally in excess of 100.000 sq mt, but future Sagrera station will ocuppy 180.000 sq m, similar to Beijing or Seoul stations. Lower values for partially underground stations like Sants, Berlin, NY city or Ankara.

- **Number of shops**

Stations provide shopping and commerce not just for travellers but also for the neighbourhood . Stations selected include normally shopping centers that hold around 50 shops reaching 128 at Roma Termini

- **Commercial areas (sq m)**

Commercial dedicated areas in the stations benchmarked are around 10.000 sq mt reaching more than 30.000 sq m at Seoul station. Revenues can generate substantial aditional income for the infra manager

- **Sq m of shops/high speed daily passengers**

Usually around 0,5 sq mt per daily HS passenger, it doubles this figure in Rome and Seoul, and goes up to 2 sq meter per passenger in Chamartin and Ankara due to yet small number of HS passenger

- **Station construction costs (mill E)**

Some respondents are reluctant to provide financial data. New York remodelling of Penn station, with a construction cost of 1.863 million €, is the most expensive station benchmarked. The plan for a huge remodelation (The Moynihan Project) involves 40 blocks (66.7 Ha).

Other construction costs provided oscillate between 500 and 1.000 million euro

- **Distance station-depot**

Values provided show distances between 2 and 20 km

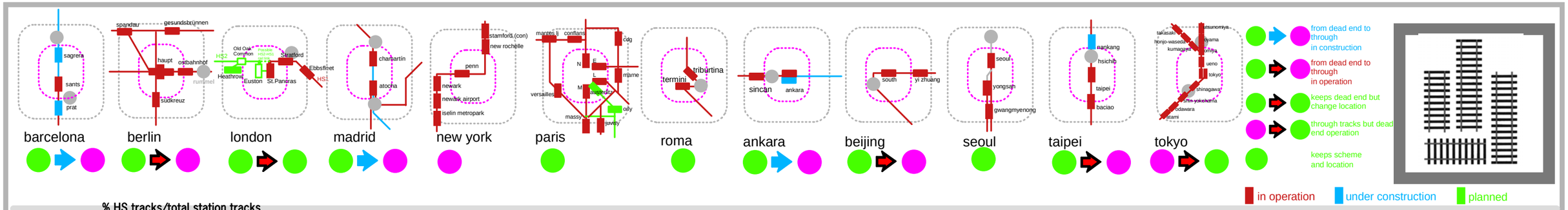
- **Depot sq m / high speed daily services**

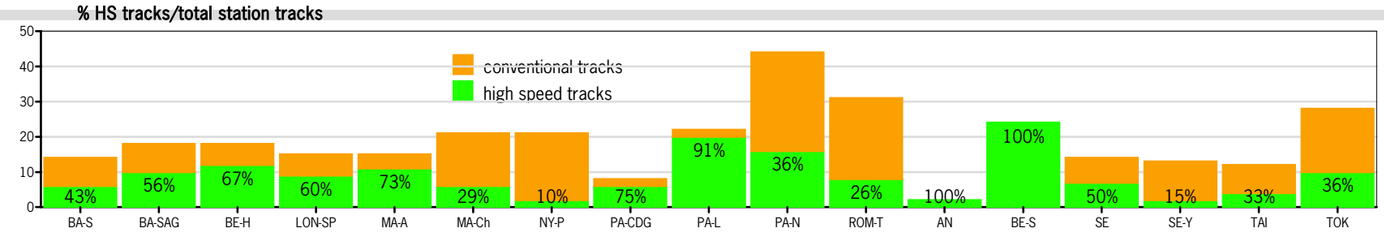
Very erratic results, between 2.000 and 30.000 sq mt per service, probably resulting from figures considering just HS services or all trains serviced

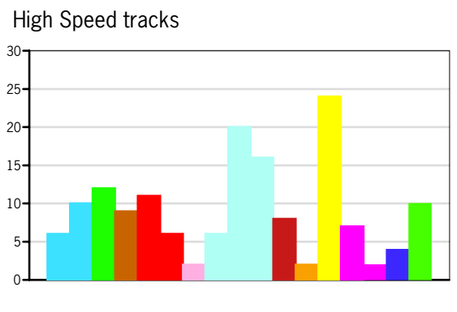
Some **conclusions from the infrastructure manager point of view** are included in graph C11, showing the trends for independent HS lines, not servicing stations of the conventional network, with a trend to convert dead end schemes into through schemes, in all cities but London and Paris.

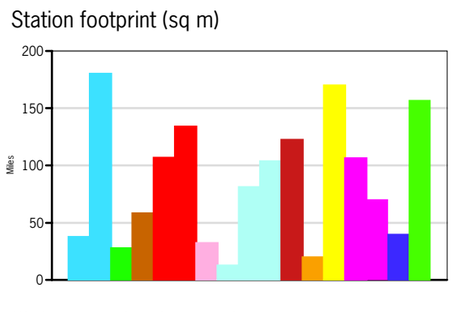
New depots and connections to stations in almost all cases, and HS city terminals either new or remodelled, with enhanced interchanges with public transport systems and including commercial centers and offices, not only for passengers but citizens.

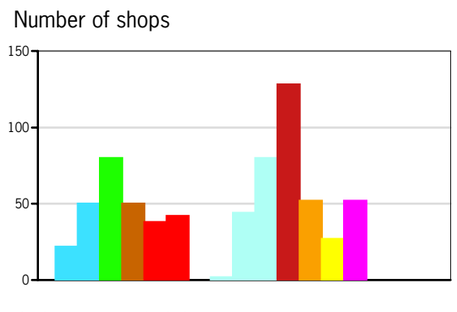
Trend to complementary new HS stations outside the city in all cases except Madrid with extensive Park and Ride provision (thousand of places)

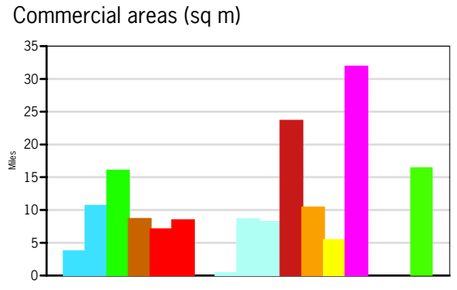


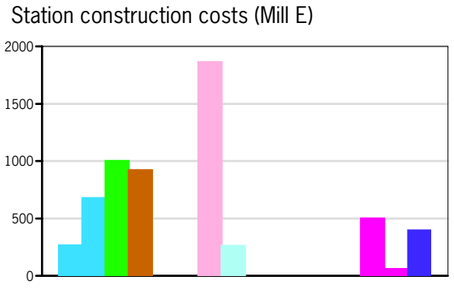


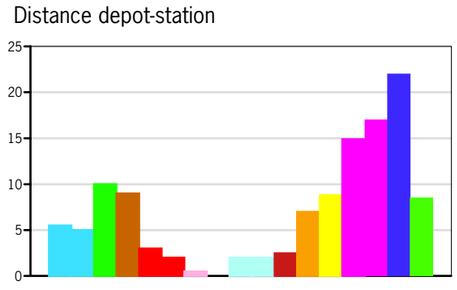


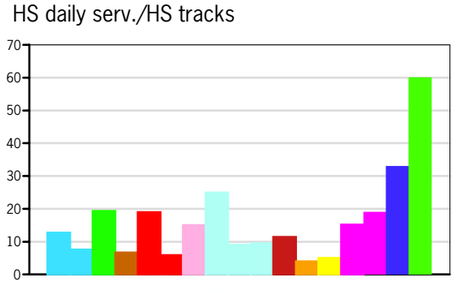


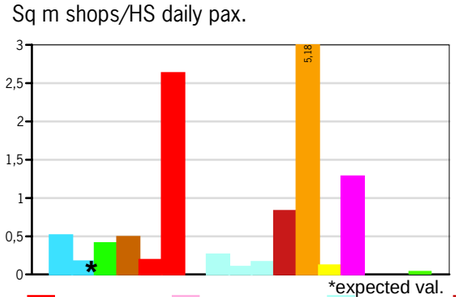


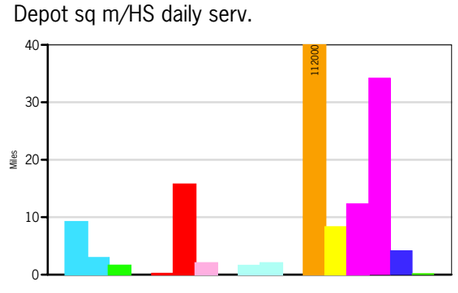


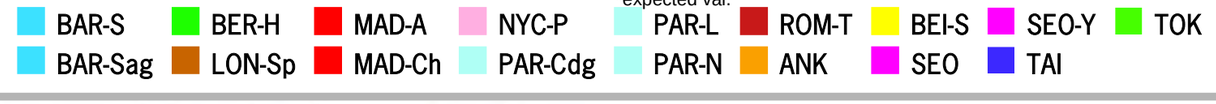












- **HS arrival has implied a restructuration of rail network achieving higher efficiency in all cases**
  - most new HS lines are completely independent
  - HS lines skip almost all stations of the conventional network
  - change from dead end to through schemes in all but LON and PAR
  - new depots and connections in almost all cases
  - city terminals, new or remodelled with enhanced interchange with PuTr and commercial centers and offices, for city neighbours, not only for pax
  - new HS stations outside the city, except MAD, in correlation with population and activity ratio region/ city, with extensive P&R

7. Recommendations: Lessons from HS experience

The following recommendations are made on the different items analysed along the study, in order to provide some guidance for the planning of HS station(s) in cities on a new high speed line:

- **number of stations**
    - look at the city / region size and population to plan for one or more stations
    - one station at the city center is a must
    - plan next stations according to urban / regional plan and accesibility (commuter lines, highways)

- **functional scheme**
    - avoid dead end schemes for new stations. Plan for a through scheme even when having initially only one single HS line. Shunt schemes more suitable at new intermediate stations
    - platform width is important. The only measure that cannot be enlarged in the future
    - locate depot with easy movements from station. Trade off between new depot or updating old one
    - decide operations to be performed at the depot or station, and provide enough space for them (cleaning, catering,..)

- **accessibility**
    - plan for new public transport lines optimally integrated at the new HS station, deserving city and region, in order to minimize access time. It is essential in passenger choice
    - testimonial parking lots (hundreds) at city centers are usually sufficient. Dimension taxi hold lines and boarding procedure to avoid long queuing times
    - in region stations, plan for commuter line access and interchange, and substantial P&R (thousands)

- **interchange / transfer**
    - optimize interchange from/to access modes at the new station: the minimum the distance, the better
    - simplicity and transfer time is also essential for HS competitivity

- **ticketing and security control**
    - reduce as much as possible. Provide units always in excess. Significant waiting areas required.
    - queueing time and passenger accumulation increases access time and space required

- **commercial center at the station**
    - think more on the neighborhood and access, as important as the passenger
    - revenues from commercial / office space might be substantial (one third or more)

- **urban and real estate operations around the station**
    - high accesibility at regional, national, or international level provided by a HS station allows for new urban operations or models to be planned with city/region
    - substancial revenues may contribute to HS construction and/or maintenance costs

8. Acknowledgements

Study authors wish to thank warmly the different UIC members and undertakings that have filled the questionnaires, provided and reviewed data, essential for the completion of the study.

- **Recommendations for stations on a new high speed line**
  - number of stations
    - look at the city / region size and population to plan for one or more stations
    - one station at the city centre is a must
    - plan next stations according to urban / regional plan and accesibility (commuter lines, highways)
  - functional scheme
    - avoid dead end schemes for new stations. Plan for a through scheme even when having initially only one single HS line. Shunt schemes more suitable at new intermediate stations
    - platform width is important. The only measure that cannot be enlarged in the future
    - locate depot with easy movements from station. Trade off between new depot or updating old one
    - decide operations to be performed at the depot or station, and provide enough space for them (cleaning, catering..)
  - accesibility
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    - testimonial parking lots (hundreds) at city centers are usually sufficient. Dimension taxi hold lines
    - in region stations, plan for commuter line access and interchange, and substantial P&R (thousands)
  - interchange / transfer
    - optimize interchange from/to access modes at the new station: the minimum the distance, the better
    - simplicity and transfer time is also essential for HS competitivity
  - ticketing and security control
    - reduce as much as possible. Provide units always in excess. Significant waiting areas required.
    - queueing time and passenger accumulation increases access time and space required
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    - think more on the neighborhood and accesses, as important as the passenger
    - revenues from commercial / office space might be substantial (one third or more)
  - urban and real estate operations around the station
    - high accesibility at regional, national, or international level provided by a HS station allows for new urban operations or models to be planned with city/region
    - substancial revenues may contribute to HS construction and/or maintenance costs

Annex: abstract of HS station cases graphs

For easier consultation, data and information for the four points of view considered at each station are condensed in a single sheet for each station, following the same order of presentation, (first Europe and America, then Asia) of the study.

Condensed graphs presented are:

E.1 Barcelona Sants
E.2 Barcelona Sagrera
E.3 Berlin Hauptbahnhof
E.4 London-St Pancras
E.5 Madrid-Atocha
E.6 Madrid-Chamartin
E.7 New York
E.8 Paris-Charles de Gaulle
E.9 Paris-Gare de Lyon
E.10 Paris-Gare du Nord
E.11 Roma-Termini
E.12 Ankara
E.13 Beijing-South
E.14 Seoul-Seoul Station
E.15 Seoul-Yongsan
E.16 Taipei-Main Station
E.17 Tokyo

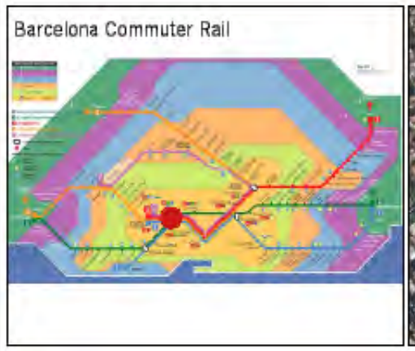
passenger

- Same accesibility to HS, the station keeping its location
- Station hall redesigned
- Easy/fast transfer to commuter rail, not so good to metro
- New additional services appeared with HS arrival: vip lounge, new boarding area for HS (60 sq m), new services center, 12 autochecking machines...
- Access mode of HS passengers: 23.7% taxi, 19.7% metro, 13.2% commuter, 11% walking.

Accessibility	High Speed stations in the city	2
	Total Region High Speed stations	3
	Nr of subway lines at the station	2
	Nr of commuter lines at the station	7
	Nr of bus routes at the station	9
	Subway st reached without transfer	47
	Commuter st reached without transfer	108
	Nr of public parking lot spaces	1.345
	Car parking fare (€/day)	25,25
	Bike renting fare (€/day)	30 €/year
	Rent a car companies	5
	Security Control?	yes
	Ticket control?	yes
Travel fares	First city	Madrid
	travel fare by High Speed train (€)	54
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	83
	travel fare by plane (€)	41

city

- Arrival of HS contributed to new development of the city, with more shopping/restaurant areas
- Urban landscaping of Sants Plaza
- Plans for huge urban renewal on Sagrera station
- Through tunnel under construction

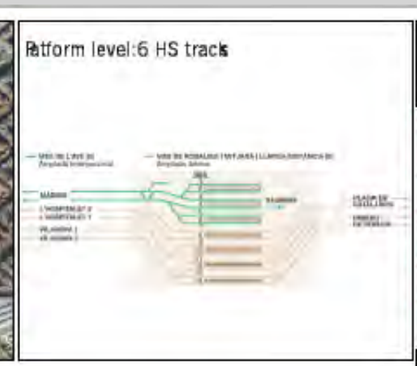


City numbers	City population	1.621.537
	City area (Km2)	101,4
	City density (hab/Km2)	16.000,00
	Region population	4.150.000
	Region area (Km2)	620
	Distance City Hall-Station (Km)	4
	International visitors a year	6.455.000
	Domestic visitors a year	
PUT	Metro ridership in the city area (pax/day)	1.266.000
	Comm ridership in the city area (pax/day)	650.000
	Bus ridership in the city area (pax/day)	748.333
	Tram ridership in the city area (pax/day)	80.000
Travel time	First destination	Madrid
	travel time by High Speed train	2hr40min
	travel time by Conventional train	9hr(bef HS)
	travel time by Car	6hr30min
	travel time by plane*	1hr15min
	*only travel time	
	Urban develop. Total area planned (Ha)	-

operator

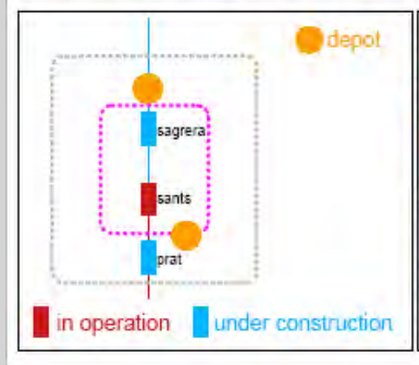
- High Speed services started in 2008
- Rearrangment of station hall and platforms to dedicate 6 for HS (UIC gage)
- New tunnel to Sagrera will change operation
- Operator must paid a toll of 0.83 € per traveller to infrastructure manager for use of the station

Line	Operator	RENFE
	Services type	Dead End
	Opening date	20-feb-08
	High Speed lines from/to station	1
	High speed total length (Km, country)	1.599
	HS Services a day (both ways)	76
	Passengers a day	7.224
	% city HS trains going through this station	100
	First destination	Madrid
	HS Services a day (both ways)	54
	% city trains going to this destination	71,05%
Trains	Maximum speed (Km/hour)	300
	Length (m)	200
	Cars per train	8
	Total seats	404
	Platform occupancy time (min)	46
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	-



infra manager

- High Speed arrival required exclusive dedication of 6 tracks (UIC gage)
- Capacity increase supoused two more tracks for travellers
- Ticket hall and security: control rearranged
- New Sagrera and Prat stations under construction
- There will be a commercial/offices surfaces increase to 72.800 sq m.

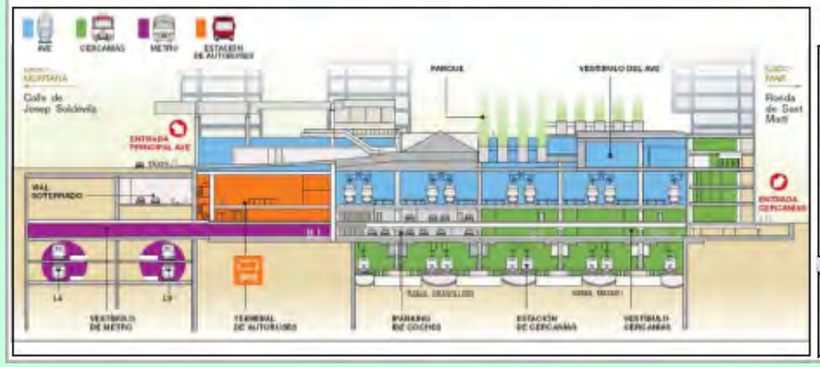


Tracks	Railway infra manager	ADIF
	HS tracks yard	Through
	Station location	Underground
	Number of tracks	14
	Tracks used for High speed	6
	High Speed trains/day both ways	76
	Length of platforms	442
Areas	Station footprint (sq mt)	39.728
	Total area (sq mts)	108.900
	Platforms area (sq mt)	16.304
	Commercial area (sq mt)	3.685
	Number of Shops	22
	Offices area (sq mt)	15.276
	waiting area+pax services (sq mt)	13.000
	Parking area (sq mt)	29.832
Depots	Depot footprint (sq mts)	695.000
	Daily movements at depot	102
	Depot-station distance (Km)	5,5
	Station construction costs (mill €)	264

passenger

- Station under construction
- Vertical services will provide easier movements and transfers
- Subway line L4 and future L9
- Station expected passenger volume:

	ENTRADAS
CERCANIAS	39.000.000
AVE	22.500.000
METRO	15.500.000
BUS	9.200.000
TAXI	5.000.000
COCHES	500.000
MOTOS	200.000

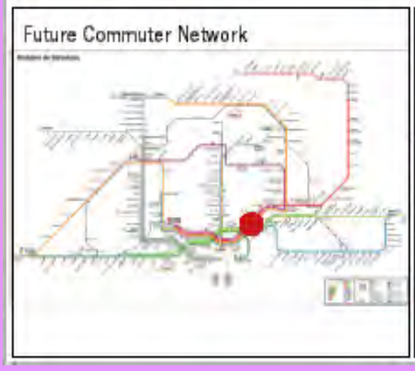


Accessibility	
High Speed stations in the city	2
Total Region High Speed stations	3
Nr of subway lines at the station	3
Nr of commuter lines at the station	2
Nr of bus routes at the station	2
Subway st reached without transfer	70
Commuter st reached without transfer	62
Nr of public parking lot spaces	2.509
Car parking fare (€/day)	-
Bike renting fare (€/day)	30€/year
Rent a car companies	-
Security Control?	yes
Ticket control?	yes

Travel fares	
First city	Madrid
travel fare by High Speed train (€)	54
travel fare by Conventional train (€)	-
travel fare by Car (€)	83
travel fare by plane (€)	41

city

- Station under construction
- Excellent connections with commuter, subway and bus
- Will be the biggest building in the city
- Huge urban development Sant Andreu-la Sagrera
- Rail infrastructure will be covered by a big park (40 Ha)
- City will have two HS stations:
  - ✔Better accessibility
  - ✔Lower number of car movements
  - ✔Better connections with bus and subway networks



City numbers	
City population	1.675.075
City area (Km2)	101,4
City density (hab/Km2)	16.499,80
Region population	4.150.000
Region area (Km2)	636
Distance City Hall-Station (Km)	5
International visitors a year	6.655.000
Domestic visitors a year	

PUT	
Metro ridership in the city area (pax/day)	1.266.000
Commuter ridership in the city area (pax/day)	610.000
Bus ridership in the city area (pax/day)	748.333
Tram ridership in the city area (pax/day)	86.000

Travel time	
First destination	Madrid
travel time by High Speed train	2hr40min
travel time by Conventional train	
travel time by Car	6hr10min
travel time by plane*	1hr15min
*only travel time	
Urban develop. Total area planned (Ha)	164

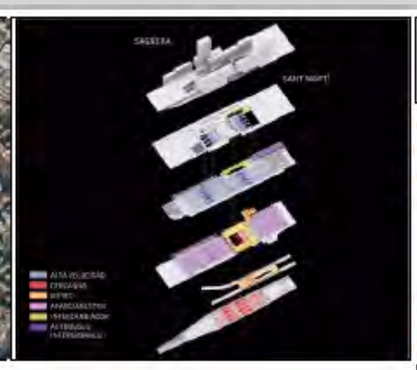
operator

- Station under construction
- Future high speed line through Figueres to France
- Termini station for all trains comming from the peninsula
- All trains will stop at both stations
- New tunnel linking both stations will increase capacity considerably, with more trains a day

Line	
Operator	RENFE
Services type	Through
Opening date	-
High Speed lines from/to station	2
High speed total length (Km, country)	1.599
HS Services a day (both ways)	76
Passengers a day	62.300*
% city HS trains going through this station	100
First destination	Madrid
HS Services a day (both ways)	54
% city trains going to this destination	71,05%
	*expected val

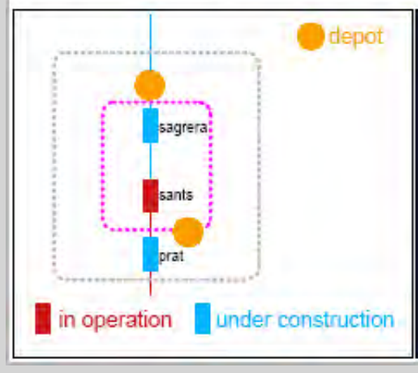
Trains	
Maximum speed (Km/hour)	300
Length (m)	200
Cars per train	8
Total seats	406
Platform occupancy time (min)	-

Station	
Info panels	yes
Automatic ticket machine	yes
Lockers	yes
Turnstile/entrance	-



infra manager

- Station under construction
- 10 tracks for high speed lines
- total project area: 164 Ha
- future city business center:
  - ✔150.000 sq m offices and commerce
  - ✔30.000 sq hotels
- Sants and Sagrera stations linked by a 5.6 Km tunnel through the city
- Old tunnel only for Cercanias services



Tracks	
Railway Infra manager	ADIF
HS tracks yard	Through
Station location	At grade
Number of tracks	18
Tracks used for High speed	10
High Speed trains/day both ways	76
Length of platforms	400

Areas	
Station footprint (sq mt)	180.000
Total area (sq mts)	320.000
Platforms area (sq mt)	36.920
Commercial area (sq mt)	10.507
Number of Shops	50
Offices area (sq mt)	6.422
waiting area+pax services (sq mt)	24.373
Parking area (sq mt)	75.000

Depots	
Depot footprint (sq mts)	218.700
Daily movements st-depot	202
Depot-station distance (Km)	5

Station construction costs (mill €)	677

passenger

- Better accessibility from S-Bahn and Regional trains
- Only one short metro line U55
- Perfect and convenient transfer
- Reduced access and transfer time

Accessibility		
	High Speed stations in the city	4
	Total Region High Speed stations	5
	Nr of subway lines at the station	1
	Nr of commuter lines at the station	11
	Nr of bus routes at the station	7
	Subway st reached without transfer	2
	Commuter st reached without transfer	145
	Nr of public parking lot spaces	350
	Car parking fare (€/day)	20
	Bike renting fare (€/day)	9
	Rent a car companies	4
	Security Control?	no
	Ticket control?	no

Travel fares		
	First city	Hannover
	travel fare by High Speed train (€)	61
	travel fare by Conventional train (€)	41
	travel fare by Car (€)	65
	travel fare by plane (€)	-

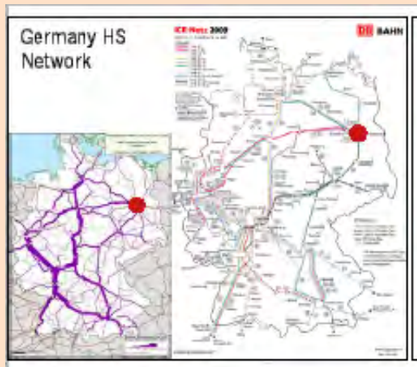
city

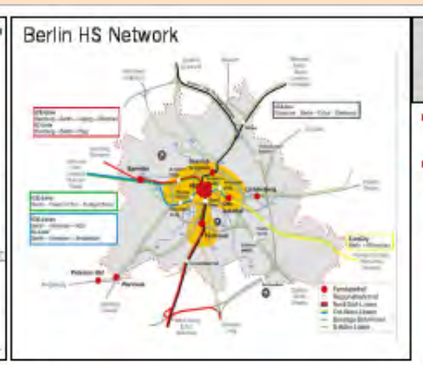
- Urban renewal around the station area and Spree river
- Only a hotel building built yet
- One short metro line U55 to be connected to line U5 by 2013

City numbers		
	City population	3.431.700
	City area (Km2)	892
	City density (hab/Km2)	3.848
	Region population	4.300.000
	Region area (Km2)	5.370
	Distance City Hall-Station (Km)	3
	International visitors a year	2.750.000
	Domestic visitors a year	5.150.000

PLT		
	Metro ridership in the city area (pax/day)	1.600.000
	Comm ridership in the city area (pax/day)	1.300.000
	Bus ridership in the city area (pax/day)	1.300.000
	Tram ridership in the city area (pax/day)	560.000

Travel time		
	First destination	Hannover
	travel time by High Speed train	1hr30min
	travel time by Conventional train	5hr
	travel time by Car	2hr30min
	travel time by plane*	-
	*only travel time	
	Urban develop. Total area planned (Hs)	27





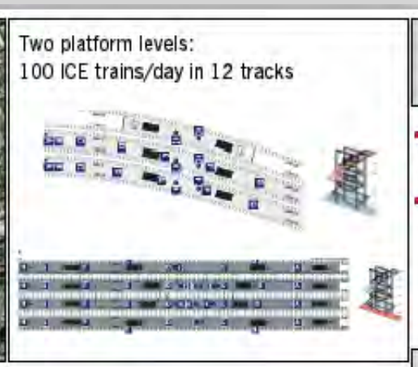
operator

- Complete services change after new station built (2006)
- Through HS services with three stops in Berlin

Line		
	Operator	DB
	Services type	Through
	Opening date	12-dec-06
	High Speed lines from/to station	3
	High speed total length (Km, country)	1.285
	HS Services a day (both ways)	232
	Passengers a day	39.000
	% city HS trains going through this station	100
	First destination	Hannover
	HS Services a day (both ways)	100
	% city trains going to this destination	43,10%

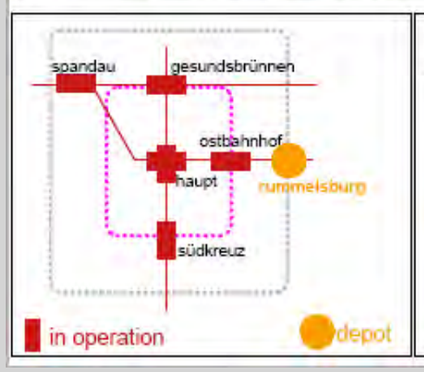
Trains		
	Maximum speed (Km/hour)	300
	Length (m)	200
	Cars per train	8
	Total seats	415
	Platform occupancy time (min)	15

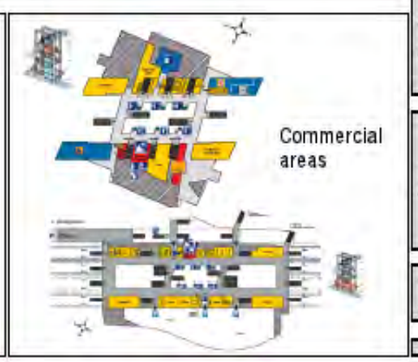
Station		
	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	no



infra manager

- Change of rail network scheme moving to more efficient through Pfilzconcept
- New office buildings and shops





Tracks		
	Railway infra manager	DB
	HS tracks yard	Through
	Station location	Elev/underg
	Number of tracks	12
	Tracks used for High speed	12
	High Speed trains/day both ways	100
	Length of platforms	430

Areas		
	Station footprint (sq mt)	27.500
	Total area (sq mts)	70.000
	Platforms area (sq mt)	27.000
	Commercial area (sq mt)	16.000
	Number of Shops	80
	Offices area (sq mt)	40.000
	waiting area+pax services (sq mt)	15.000
	Parking area (sq mt)	

Depots		
	Depot footprint (sq mts)	370.000
	Daily movements st-depot	75
	Depot-station distance (Km)	10

€	Station construction costs (mill €)	1.000

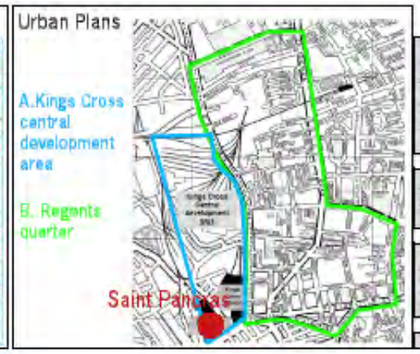
passenger

- Better accessibility by underground in St Pancras than Waterloo: connection with 6 subway lines instead of 4 in Waterloo.
- Shorter transfer time
- More services and shops
- Eurostar check-in must be done at least 30 minutes before train departure

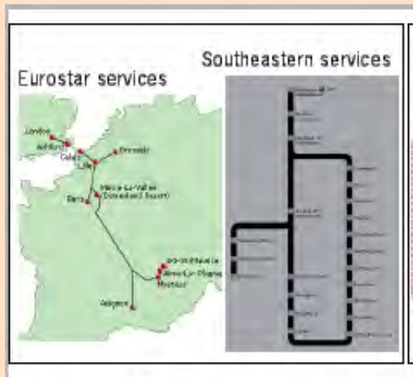
Accessibility	High Speed stations in the city	1
	Total Region High Speed stations	3
	Nr of subway lines at the station	6
	Nr of commuter lines at the station	2
	Nr of bus routes at the station	13
	Subway st reached without transfer	204
	Commuter st reached without transfer	148
	Nr of public parking lot spaces	322
	Car parking fare (€/day)	6,84/hour
	Bike renting fare (€/day)	-
	Rent a car companies	no
	Security Control?	yes
	Ticket control?	yes
Travel fares	First city	Ashford
	travel fare by High Speed train (€)	30
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	20
	travel fare by plane (€)	-

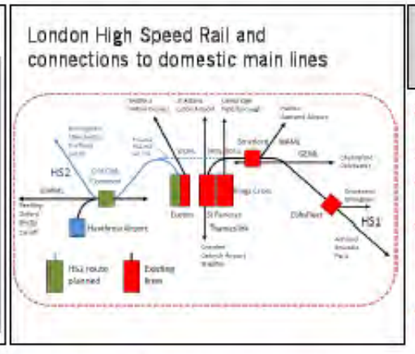
city

- Two huge urban renewal and development operation (34 Ha)
- Revitalization of the station quarter
- Ebbsfleet development for P&R



City members	City population	7.555.900
	City area (Km2)	1.570
	City density (hab/Km2)	4.791
	Region population	13.945.000
	Region area (Km2)	16.543
	Distance City hall-Station (Km)	2,5
	International visitors a year	26.100.000
	Domestic visitors a year	
PU T	Metro ridership in the city area (pax/day)	2.900.000
	Comm. ridership in the city area (pax/day)	2.100.000
	Bus ridership in the city area (pax/day)	5.100.000
	Tram ridership in the city area (pax/day)	100.000
Travel time	First destination	Ashford
	travel time by High Speed train	40min
	travel time by Conventional train	
	travel time by Car	1hr10min
	travel time by plane*	-
	*only travel time	
	Urban develop. Total area planned (Ha)	56

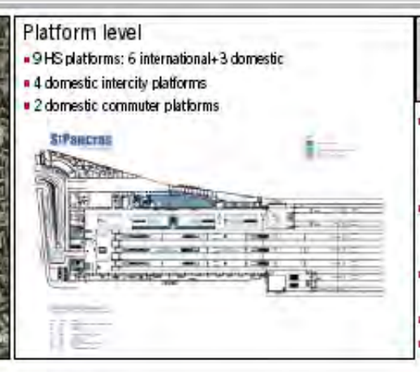




operator

- Initial HS services from Waterloo station
- Change to St Pancras in 2007
- Better quality of service (punctuality increased)
- New domestic HS services started in Dec 2009, going from St Pancras to the medway towns, stopping at Stratford and Ebbsfleet international
- Eurostar operates international HS services and Southeastern operates domestic HS services

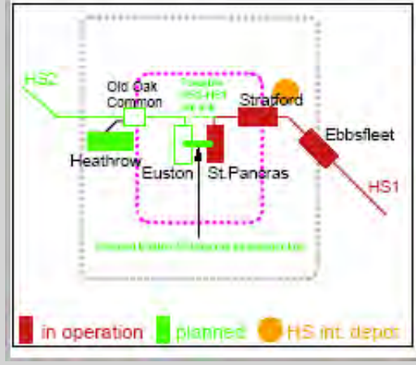
Line	Operator	Eurost&Southeast
	Station type (services)	Dead End
	Opened date	14-nov-07
	High Speed lines from/to station	4
	High speed total length (Km, country)	113
	HS Services a day (both ways)	60
	Passengers a day	17.778
	% city HS trains going through this station	100
	First destination	Ashford
	HS Services a day (both ways)	34
	% city trains going to this destination	56,67%
Trains	Maximum speed (Km/hour)	300
	Length (m)	394
	Cars per train	18
	Total seats	750
	Platform occupancy time (min)	22
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	
	Turnstile/entrance	yes



- 9 HS platforms: 6 international+3 domestic
- 4 domestic intercity platforms
- 2 domestic commuter platforms

infra manager

- Terminal station owned and managed by HS1 Ltd, railway infrastructure operated, controlled and maintained by Network Rail
- Station used by international HS, domestic HS, domestic intercity and commuter trains
- Different depots for international and domestic HS trains
- Passenger link with Kings Cross station
- Passenger link between HS1 and HS2 terminals in study



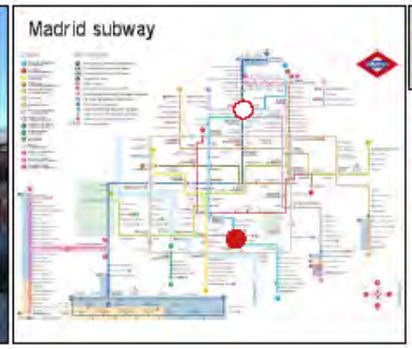
Tracks	Railway infra manager	Network Rail
	HS tracks yard	Dead End
	Station location	At grade
	Number of tracks	13
	Tracks used for High speed	8
	High Speed trains/day both ways	106
	Length of platforms	400-295
Areas	Station footprint (sq mt)	58.144
	Total area (sq mts)	98.788
	Platforms area (sq mt)	17.300
	Commercial area (sq mt)	8.634
	Number of Shops	50
	Offices area (sq mt)	-
	waiting areas+pax services (sq mt)	22.700
	Parking area (sq mt)	8.000
Depots	Depot footprint (sq mts)	101.690-71.747
	Daily movements at depot	8
	Depot-station distance (Km)	120-9
	Station construction costs (mill €)	920

passenger

- Excellent accessibility from commuter rail (all stations without transfer)
- Not so good from metro (only 1 line)
- Good transfer time (5 min)
- Crowded exit hall, station being enlarged
- New additional services appeared with HS arrival: vip lounge, HS boarding area, services center, autocheck-in machines...
- Access mode of HS passengers: 26.9% taxi, 13.6% metro, 12% commuter, 8.9% walking.

Accessibility	
High Speed stations in the city	2
Total Region High Speed stations	2
Nr of subway lines at the station	1
Nr of commuter lines at the station	7
Nr of bus routes at the station	9
Subway st reached without transfer	32
Commuter st reached without transfer	99
Nr of public parking lot spaces	615
Car parking fare (€/day)	27,95
Bike renting fare (€/day)	-
Rent a car companies	4
Security Control?	yes
Ticket control?	yes

Travel fares	
First city	Barcelona
travel fare by High Speed train (€)	54
travel fare by Conventional train (€)	-
travel fare by Car (€)	83
travel fare by plane (€)	41



city

- Atocha area revitalization
- No real estate proyects
- All surfaces commercial, parking... within station footprint
- Station being enlarged and parking lot extended

City numbers	
City population	3.255.944
City area (Km2)	607
City density (hab/Km2)	5.364
Region population	6.386.932
Region area (Km2)	10.506
Distance City Hall-Station (Km)	2
International visitors a year	7.195.179
Domestic visitors a year	

PUT	
Metro ridership in the city area (pax/day)	1.916.607
Comm ridership in the city area (pax/day)	940.000
Bus ridership in the city area (pax/day)	1.277.770
Tram ridership in the city area (pax/day)	

Travel time	
First destination	Barcelona
travel time by High Speed train	2hr40min
travel time by Conventional train	9hr[bef 05]
travel time by Car	6hr30min
travel time by plane*	1hr15min
*only travel time	
Urban develop. Total area planned (Ha)	25,05

operator

- Started HS 1992
- Increased services to Málaga, Toledo, Barcelona 2009
- Valencia starts 2010
- Through services planned 2013
- Big increase in quality of service and efficiency
- Operator must paid a toll of 0.83 € per traveller to infrastructure manager for use of the station

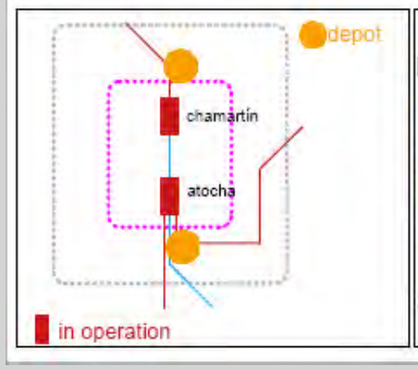
Line	
Operator	RENFE
Services type	Dead End
Opening date	21-apr-92
High Speed lines from/to station	2
High speed total length (Km, country)	1.599
HS Services a day (both ways)	209
Passengers a day	38.000
% city HS trains going through this station	85,66%
First destination	Barcelona
HS Services a day (both ways)	54
% city trains going to this destination	25,84%

Trains	
Maximum speed (Km/hour)	300
Length (m)	200
Cars per train	8
Total seats	404
Platform occupancy time (min)	30

Station	
Info panels	yes
Automatic ticket machine	yes
Lockers	yes
Turnstile/entrance	-

infra manager

- Change rail scheme 1992 (new UIC gage)
- Subsequent HS lines Barcelona and Valencia required change gage of tracks
- Station enlargment and conversion to through scheme in progress



Tracks	
Railway Infra manager	ADIF
HS tracks yard	Dead End
Station location	At grade
Number of tracks	15
Tracks used for High speed	11
High Speed trains/day both ways	209
Length of platforms	410

Areas	
Station footprint (sq mt)	150.000
Total area (sq mts)	156.375
Platforms area (sq mt)	35.625
Commercial area (sq mt)	7.044
Number of Shops	38
Offices area (sq mt)	3.950
waiting area+pax services (sq mt)	10.762
Parking area (sq mt)	18.750

Depots	
Depot footprint (sq mts)	29.463
Daily movements at depot	50
Depot-station distance (Km)	3

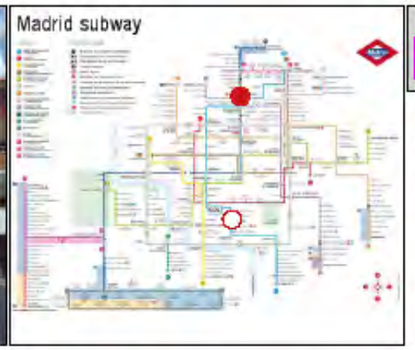
Station construction costs (mill €)	-

passenger

- Good accessibility to commuter rail and metro (2 lines)
- Big interchange buses-metro adjacent (4 levels)
- Short transfer time
- Access mode of HS passengers: 21.2% taxi, 22.3% metro, 10.2% commuter, 12.4% walking, 5% bus
- Not many changes took place in the station building when the HS arrived

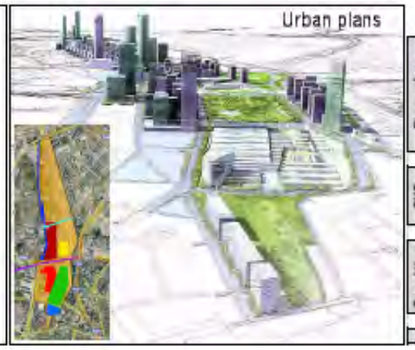
Accessibility		
	High Speed stations in the city	2
	Total Region High Speed stations	2
	Nr of subway lines at the station	2
	Nr of commuter lines at the station	6
	Nr of bus routes at the station	3
	Subway st reached without transfer	62
	Commuter st reached without transfer	77
	Nr of public parking lot spaces	658
	Car parking fare (€/day)	27,15
	Bike renting fare (€/day)	-
	Rent a car companies	4
	Security Control?	yes
	Ticket control?	yes

Travel fare (€)		
	First city	Valladolid
	travel fare by High Speed train (€)	20
	travel fare by Conventional train (€)	16
	travel fare by Car (€)	29
	travel fare by plane (€)	-



city

- Big Urban development project over rail footprint (station yard and depot)
- Nearby 4 towers (outside rail land) 250 m high
- New metro lines to station and interchange



City numbers		
	City population	3.255.944
	City area (Km2)	607
	City density (hab/Km2)	5.366
	Region population	6.386.932
	Region area (Km2)	10.506
	Distance City Hall-Station (Km)	6
	International visitors a year	7.193.179
	Domestic visitors a year	

PUT		
	Metro ridership in the city area (pax/day)	1.316.957
	Cercanías ridership in the city area (pax/day)	960.000
	Bus ridership in the city area (pax/day)	1.277.778
	Train ridership in the city area (pax/day)	

Travel time		
	First destination	Valladolid
	travel time by High Speed train	1hr
	travel time by Conventional train	2hr40min
	travel time by Car	2hr15min
	travel time by plane*	-
	*only travel time	
	Urban develop. Total area planned (Ha)	312

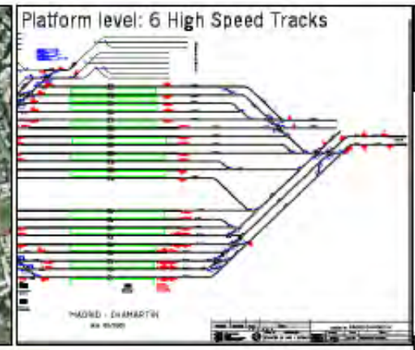
operator

- Services on HS north line started 2008
- Dedicated HS tracks (UIC gage)
- Security control of platforms
- Short distance to depot (2 Km)

Line		
	Operator	RENFE
	Services type	Dead End
	Opening date	23-dec-07
	High Speed lines from/to station	1
	High speed total length (Km, country)	1.599
	HS Services a day (both ways)	35
	Passengers a day	3.200
	% city HS trains going through this station	14,54%
	First destination	Valladolid
	HS Services a day (both ways)	32
	% city trains going to this destination	91,43%

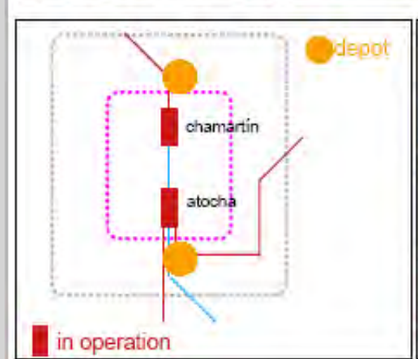
Trains		
	Maximum speed (Km/hour)	300
	Length (m)	200
	Cars per train	12
	Total seats	318
	Platform occupancy time (min)	60

Station		
	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	-



infra manager

- Dedicated HS tracks (UIC gage) connecting to new north line
- No specific commercial area for HS, sharing station area

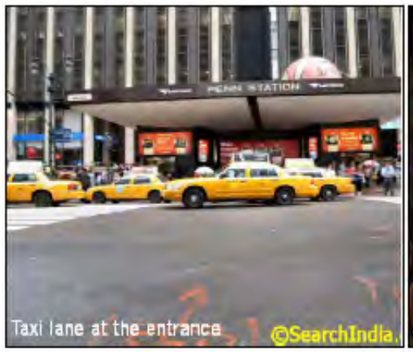


Tracks		
	Railway infra manager	ADIF
	HS tracks yard	Dead End
	Station location	At grade
	Number of tracks	23
	Tracks used for High speed	6
	High Speed trains/day both ways	16
	Length of platforms	480-510

Areas		
	Station footprint (sq mt)	134.000
	Total area (sq mts)	231.500
	Platforms area (sq mt)	87.500
	Commercial area (sq mt)	8.400
	Number of Shops	42
	Offices area (sq mt)	17.833
	waiting area+pax services (sq mt)	31.673
	Parking area (sq mt)	24.000

Depots		
	Depot footprint (sq mts)	550.000
	Daily movements st-depot	2
	Depot-station distance (Km)	2

	Station construction costs (mill €)	-



passenger

- Good accessibility from commuter and subway lines (same as before High Speed)
- Succesive concourse and interchange renewals of the different operators

Accessibility	High Speed stations in the city	1
	Total Region High Speed stations	6
	Nr of subway lines at the station	6
	Nr of commuter lines at the station	9
	Nr of bus routes at the station	8
	Subway at reached without transfer	228
	Commuter at reached without transfer	182
	Nr of public parking lot spaces	-
	Car parking fare (€/day)	-
	Bike renting fare (€/day)	-
	Rent a car companies	no
	Security Control?	yes
	Ticket control?	yes

Travel fares	First city	Washington
	travel fare by High Speed train (€)	101
	travel fare by Conventional train (€)	37
	travel fare by Car (€)	33
	travel fare by plane (€)	60

city

- Historic station (1906) demolished and rebuilt with Madison Square Garden on top (1962)
- New Grand Moynihan station redevelopment project involving 67 Ha. (40 blocks)

City numbers	City population	8.363.710
	City area (km2)	790
	City density (hab/km2)	10.587
	Region population	19.750.000
	Region area (km2)	17.894
	Distance City Hall-Station (km)	4,5
	International visitors a year	8.600.000
	Domestic visitors a year	35.650.000
PUT	Metro ridership in the city area (pax/day)	4.500.000
	Commuter ridership in the city area (pax/day)	900.300
	Bus ridership in the city area (pax/day)	333.931
	Tram ridership in the city area (pax/day)	
Travel time	First destination	Washington
	travel time by High Speed train	2hr47min
	travel time by Conventional train	3hr15min
	travel time by Car	4hr30min
	travel time by plane*	1hr10min
	*only travel time	
	Urban develop. Total area planned (Ha)	66,7

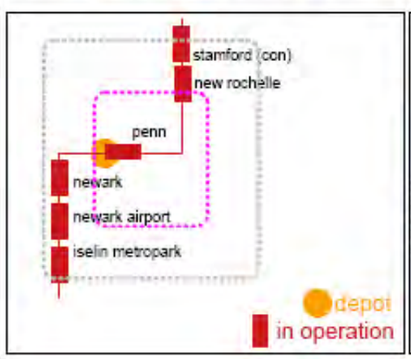
operator

- Acela HS services on the corridor Boston-NYC-Philadelphia-Washington DC started 1999
- Is the only high speed line in the United States
- Coexisting with conventional long distance services, LIRR, and NJT at the station

Line	Operator	AMTRAK
	Services type	Through
	Opening date	11-dec-00
	High Speed lines from/to station	1
	High speed total length (Km, country)	362
	HS Services a day (both ways)	30
	Passengers a day	6.443
	% city HS trains going through this station	100
	First destination	Washington
	HS Services a day (both ways)	28
	% city trains going to this destination	93,33%
Trains	Maximum speed (Km/hour)	240
	Length (m)	200
	Cars per train	8
	Total seats	304
	Platform occupancy time (min)	
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	
	Turnstile/entrance	

infra manager

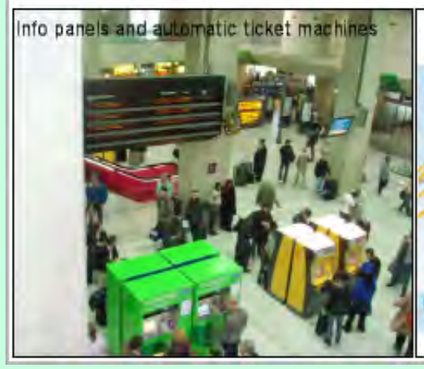
- Rail scheme change with Grand Central station only for commuting trains and Penn station covering both HS, long distance and LIRR
- Powerful P&R schemes in stations outside NYC



Tracks	Railway infra manager	Amtrack
	HS tracks yard	Through
	Station location	Underground
	Number of tracks	21
	Tracks used for High speed	2
	High Speed trains/day both ways	30
	Length of platforms	
Areas	Station Footprint (sq mt)	32.000
	Total area (sq mts)	
	Platforms area (sq mt)	
	Commercial area (sq mt)	
	Number of Shops	
	Offices area (sq mt)	
	waiting area+pax services (sq mt)	
	Parking area (sq mt)	
Depots	Depot footprint (sq mts)	60.000
	Daily movements st-depot	
	Depot-station distance (Km)	0,5
	Station construction costs (mill €)	1.863

passenger

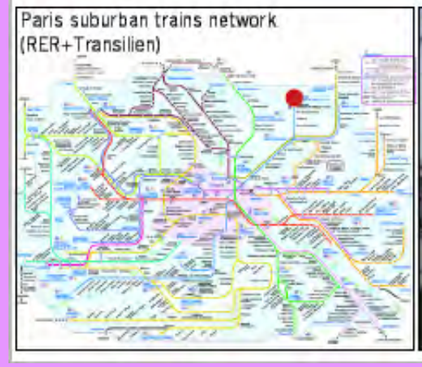
- Average of 10 minutes walking to Charles de Gaulle airport terminals
- Connection with RER line B. RER tracks adyacent to TGV tracks
- Not connections with metro system
- Huge parking shared with airport passengers with 15.000 spaces
- Large ticket booths, with long waiting time
- Direct access via the A1 Autoroute
- Taxis are available in front of the RER station



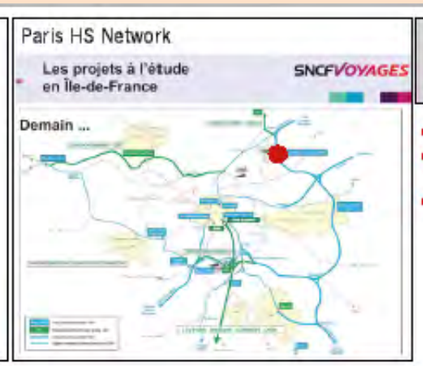
Accessibility	High Speed stations in the city	4
	Total Region High Speed stations	11
	Nr of subway lines at the station	0
	Nr of commuter lines at the station	1
	Nr of bus routes at the station	12
	Subway st reached without transfer	0
	Commuter st reached without transfer	42
	Nr of public parking lot spaces	15.000
	Car parking fare (€/day)	48
	Bike renting fare (€/day)	1
	Rent a car companies	1
	Security Control?	no
	Ticket control?	yes
Travel fares	First city	Lyon
	travel fare by High Speed train (€)	65
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	72
	travel fare by plane (€)	200

city

- In the center of Charles de Gaulle Airport Terminal 2
- Modern building, integrated in the airport



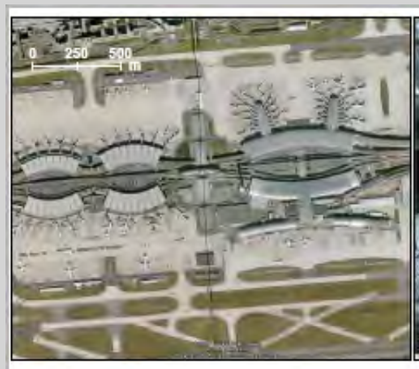
City members	City population	2.203.817
	City area (Km2)	1.118
	City density (hab/Km2)	1.971
	Region population	11.769.413
	Region area (Km2)	14.518
	Distance City Hall-Station (Km)	25
	International visitors a year	17.600.000
	Domestic visitors a year	11.600.000
PUT	Metro ridership in the city area (pax/day)	3.855.556
	Comm ridership in the city area (pax/day)	2.777.778
	Bus ridership in the city area (pax/day)	1.000.000
	Tram ridership in the city area (pax/day)	180.000
Travel time	First destination	Lyon
	travel time by High Speed train	2hr10min
	travel time by Conventional train	-
	travel time by Car	4hr20min
	travel time by plane*	1hr15min
	*only travel time	
	Urban develop. Total area planned (Ha)	-



operator

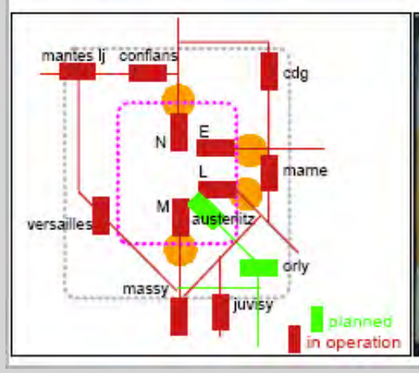
- HS started operation in 1994
- Intermediate station in the LGV Interconnexion Est line
- SNCF operates direct TGV services to several French stations

Line	Operator	SNCF
	Services type	Through
	Opening date	1994
	High Speed lines from/to station	1
	High speed total length (Km, country)	1.872
	HS Services a day (both ways)	150
	Passengers a day	1.500
	% city HS trains going through this station	25,00%
	First destination	Lyon
	HS Services a day (both ways)	24
	% city trains going to this destination	16,00%
Trains	Maximum speed (Km/hour)	300
	Length (m)	400
	Cars per train	20
	Total seats	1.020
	Platform occupancy time (min)	5-6
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	no
	Turnstile/entrance	no



infra manager

- 6 high speed tracks; 2 of them through tracks



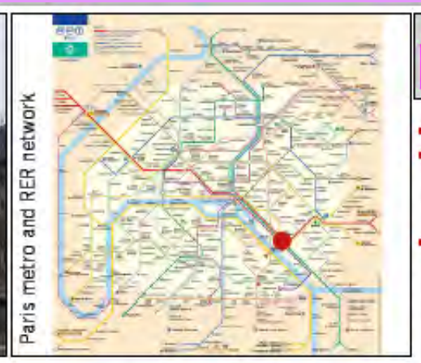
Tracks	Railway Infra manager	RFF
	HS tracks yard	Through
	Station location	Underground
	Number of tracks	8
	Tracks used for High speed	6
	High Speed trains/day both ways	61
	Length of platforms	480
Areas	Station footprint (sq mt)	12.476
	Total area (sq mts)	13.469
	Platforms area (sq mt)	10.511
	Commercial area (sq mt)	390
	Number of Shops	2
	Offices area (sq mt)	2.239
	waiting area+pax services (sq mt)	5.198
	Parking area (sq mt)	-
Depots	Depot footprint (sq mts)	-
	Daily movements at depot	-
	Depot-station distance (Km)	-
	Station construction costs (mill €)	260

passenger

- Good connections with bus, metro lines 1 and 14 and RER A and E services
- Lots of public parkings around the station

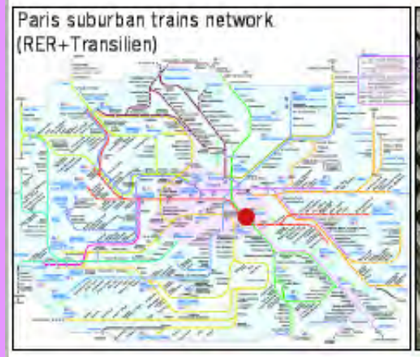
Accessibility	
High Speed stations in the city	4
Total Region High Speed stations	11
Nr of subway lines at the station	2
Nr of commuter lines at the station	2
Nr of bus routes at the station	8
Subway st reached without transfer	33
Commuter st reached without transfer	105
Nr of public parking lot spaces	3,355
Car parking fare (€/day)	25
Bike renting fare (€/day)	1
Rent a car companies	6
Security Control?	no
Ticket control?	Yes

Travel fares	
First city	Lyon
travel fare by High Speed train (€)	56
travel fare by Conventional train (€)	-
travel fare by Car (€)	72
travel fare by plane (€)	200



city

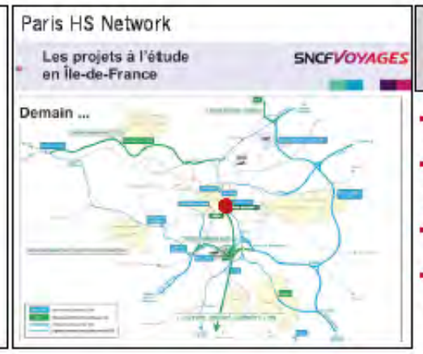
- No real estate projects
- Station was built for the World Exposition of 1900. On multiple levels, it is considered a classic example of the architecture of its time
- Despite the classic architecture, the station has been modernized to accommodate the high-speed TGV trains that whisk travelers throughout France.



City numbers	
City population	2.203.817
City area (Km2)	1.119
City density (hab/Km2)	1.971
Region population	11.769.433
Region area (Km2)	14.518
Distance City Hall-Station (Km)	2.2
International visitors a year	17.400.000
Domestic visitors a year	11.000.000

PUT	
Metro ridership in the city area (pax/day)	3.855.556
Comm ridership in the city area (pax/day)	2.777.778
Bus ridership in the city area (pax/day)	1.000.000
Tram ridership in the city area (pax/day)	140.000

Travel time	
First destination	Lyon
travel time by High Speed train	1hr57min
travel time by Conventional train	-
travel time by Car	4hr20min
travel time by plane*	1hr15min
*only travel time	
Urban develop. Total area planned (Ha)	-



operator

- Started HS September 1981 with line LGV SudEst
- The inauguration marked the beginning of the re-invigoration of French passenger rail service
- The line was 87 Km shorter than the regular line
- The station is one of the 4 HS railway termini in Paris and runs all services to the south and east of France

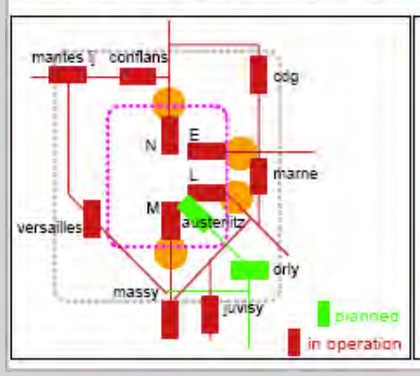
Line	
Operator	SNCF
Services type	Dead End
Opening date	27-sep-81
High Speed lines from/to station	1
High speed total length (Km, country)	1.872
HS Services a day (both ways)	180
Passengers a day	84.560
% city HS trains going through this station	30,00%
First destination	Lyon
HS Services a day (both ways)	44
% city trains going to this destination	24,44%

Trains	
Maximum speed (km/hour)	320
Length (m)	400
Cars per train	16
Total seats	1010
Platform ocupancy time (min)	20

Station	
Info panels	yes
Automatic ticket machine	yes
Lockers	yes
Turnstile/entrance	no

infra manager

- 20 high speed tracks
- Dead end squeme configuration
- Huge offices area (almost half of the station area)



Tracks	
Railway infra manager	RFF
HS tracks yard	Dead End
Station location	At grade
Number of tracks	22
Tracks used for High speed	20
High Speed trains/day both ways	210
Length of platforms	400

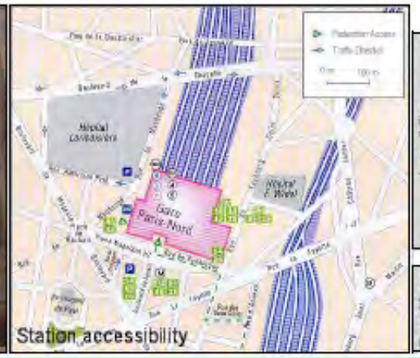
Areas	
Station footprint (sq mt)	81.000
Total area (sq mts)	110.813
Platforms area (sq mt)	47.954
Commercial area (sq mt)	8.600
Number of Shops	46
Offices area (sq mt)	47.975
waiting area+pax services (sq mt)	18.234
Parking area (sq mt)	-

Depots	
Depot footprint (sq mts)	280.000
Daily movements at depot	-
Depot-station distance (Km)	2

Station construction costs (mill €)	-

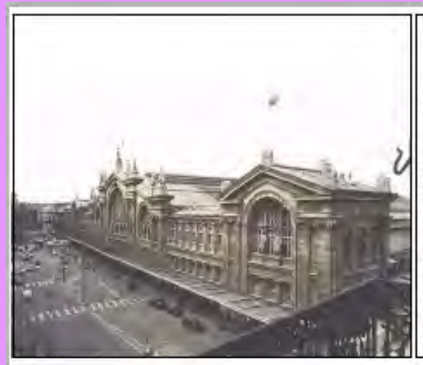
passenger

- Connections with several urban transportation lines, including metro and RER
- Busiest railway station in Europe
- Huge security for the station due to the position of the station as a gateway to the northern suburbs of Paris.



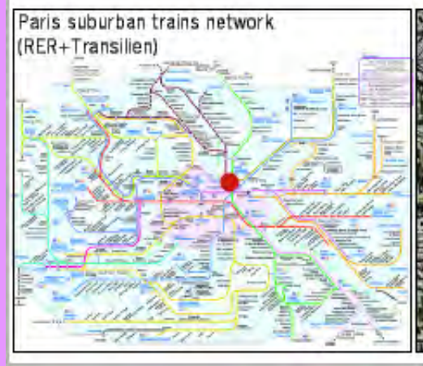
Accessibility		
	High Speed stations in the city	4
	Total Region High Speed stations	11
	Nr of subway lines at the station	2
	Nr of commuter lines at the station	6
	Nr of bus routes at the station	10
	Subway st reached without transfer	46
	Commuter st reached without transfer	242
	Nr of public parking lot spaces	3.737
	Car parking fare (€/day)	25
	Bike renting fare (€/day)	1
	Rent a car companies	5
	Security Control?	no
	Ticket control?	yes

Travel fares		
	First city	Lille
	travel fare by High Speed train (€)	40
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	35
	travel fare by plane (€)	-



city

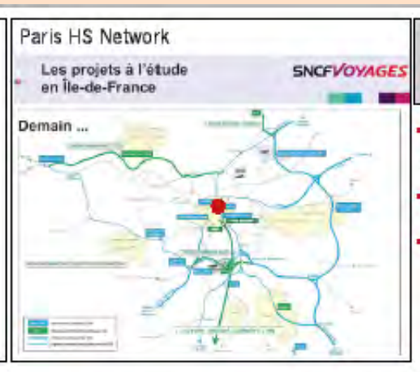
- Historic building, built in 1864
- Completely rebuilt in 1889
- More expansion work was carried out between the 1930s and the 1960s
- There is a project to build a connecting hallway between Gare Du Nord and Gare de L'Est, wich is projected to open around the time when the new LGV Est begins serving the station.



City numbers		
	City population	2.203.817
	City area (Km2)	1.128
	City density (hab/Km2)	1.971
	Region population	11.769.433
	Region area (Km2)	14.518
	Distance City Hall-Station (Km)	2,7
	International visitors a year	17.600.000
	Domestic visitors a year	11.600.000

PUT		
	Metro ridership in the city area (pax/day)	3.855.356
	Comm ridership in the city area (pax/day)	2.777.778
	Bus ridership in the city area (pax/day)	1.000.000
	Tram ridership in the city area (pax/day)	140.000

Travel time		
	First destination	Lille
	travel time by High Speed train	1hr
	travel time by Conventional train	-
	travel time by Car	2hr15min
	travel time by plane*	-
	*only travel time	
	Urban develop. Total area planned (Ha)	-



operator

- Started HS 1993 with the arrival of LGV-Nord, wich connects Paris with Belgian border and the Channel tunnel
- The line sees the widest variety of high-speed rolling stock
- Three different services:
  - Eurostar to London
  - TGV to northern France, operated by SNCF
  - Thalys to Belgium, Germany and Netherlands

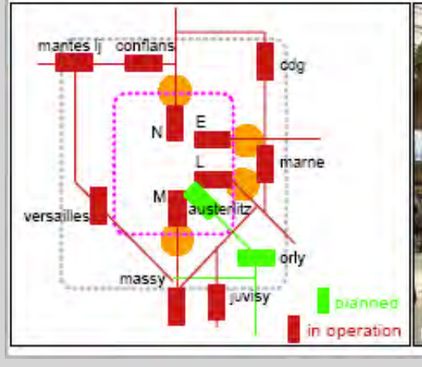
Line		
	Operator	SNCF, Thalys, Eurost
	Services type	Dead End
	Opening date	1993
	High Speed lines from/to station	3
	High speed total length (Km, country)	1.872
	HS Services a day (both ways)	151
	Passengers a day	52.301
	% city HS trains going through this station	25,00%
	First destination	Lille
	HS Services a day (both ways)	46
	% city trains going to this destination	29,14%

Trains		
	Maximum speed (Km/hour)	300
	Length (m)	400
	Cars per train	18 (Eurostar)
	Total seats	772
	Platform occupancy time (min)	20

Station		
	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	yes (Eurostar)

infra manager

- The arrival of Eurostar trains required a reorganisation of the rail tracks
- 44 tracks, 16 HS tracks:
  - 4 tracks for Eurostar
  - 2 tracks for Thalys services
  - 10 tracks for TGV trains



Tracks		
	Railway infra manager	RFF
	HS tracks yard	Dead End
	Station location	At grade
	Number of tracks	44
	Tracks used for High speed	16
	High Speed trains/day both ways	156
	Length of platforms	250

Areas		
	Station footprint (sq mt)	103.500
	Total area (sq mts)	105.840
	Platforms area (sq mt)	53.662
	Commercial area (sq mt)	8.169
	Number of Shops	80
	Offices area (sq mt)	21.614
	waiting area+pax services (sq mt)	13.790
	Parking area (sq mt)	-

Depots		
	Depot footprint (sq mts)	300.000
	Daily movements at-depot	-
	Depot-station distance (Km)	2

	Station construction costs (mill €)	-

Ticket boothts

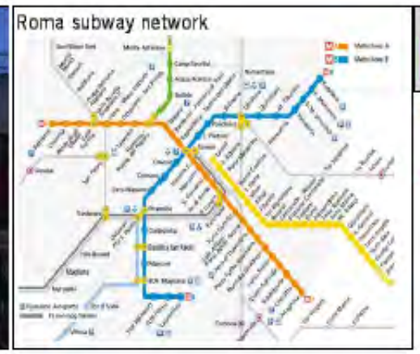
passenger

- Wide and modern commercial area
- Convergence of subway, local, regional and HS services
- Reduced access and transfer time

Access level map

Accessibility	High Speed stations in the city	2
	Total Region High Speed stations	2
	Nr of subway lines at the station	2
	Nr of commuter lines at the station	9
	Nr of bus routes at the station	80
	Subway st reached without transfer	49
	Commuter st reached without transfer	81
	Nr of public parking lot spaces	164
	Car parking fare (€/day)	18
	Bike renting fare (€/day)	-
	Rent a car companies	13
	Security Control?	yes
	Ticket control?	no
Travel fares	First city	Milano
	travel fare by High Speed train (€)	89
	travel fare by Conventional train (€)	46
	travel fare by Car (€)	74
	travel fare by plane (€)	206

Roma subway network



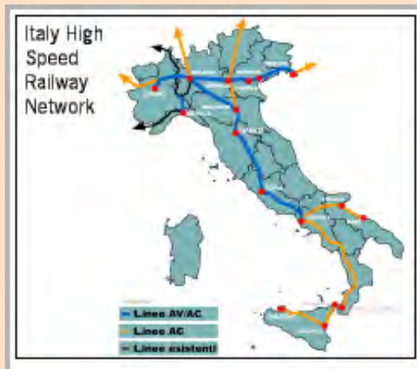
city

- Renewal of the station with a new parking area and photovoltaic panels
- Main hub of the subway

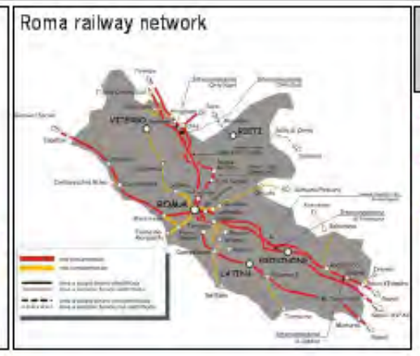
Roma Termini development

City numbers	City population	2.741.095
	City area (Km2)	1.285
	City density (hab/Km2)	2.132
	Region population	5.864.754
	Region area (Km2)	17.203
	Distance City Hall-Station (Km)	2,5
	International visitors a year	4.000.822
	Domestic visitors a year	2.098.728
PUT	Metro ridership in the city area (pax/day)	900.949
	Comm ridership in the city area (pax/day)	180.000
	Bus ridership in the city area (pax/day)	
	Tram ridership in the city area (pax/day)	3.098.930
Travel time	First destination	Milano
	travel time by High Speed train	3hr
	travel time by Conventional train	6hr54min
	travel time by Car	5hr30min
	travel time by plane*	1hr10min
	*only travel time	
	Urban develop. Total area planned (Ha)	-

Italy High Speed Railway Network



Roma railway network



operator

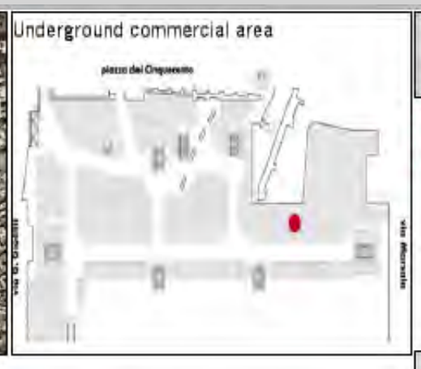
- Main departure and arrival station of the HS services
- "Leonardo Express" service to the Rome Airport
- Main station for the local and regional services

Train at the station

Inside of the station

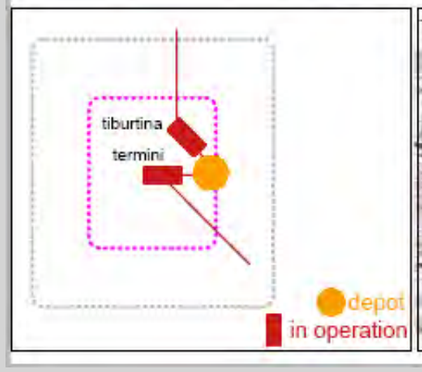
Line	Operator	Trenitalia
	Services type	Dead End
	Opening date	Dec 2005
	High Speed lines from/to station	1
	High speed total length (Km, country)	1.020
	HS Services a day (both ways)	91
	Passengers a day	28.500
	% city HS trains going through this station	94,00%
	First destination	Milano
	HS Services a day (both ways)	70
	% city trains going to this destination	85,00%
Trains	Maximum speed (Km/hour)	300
	Length (m)	328
	Cars per train	11
	Total seats	603
	Platform occupancy time (min)	20
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	no
	Turnstile/entrance	no

Underground commercial area

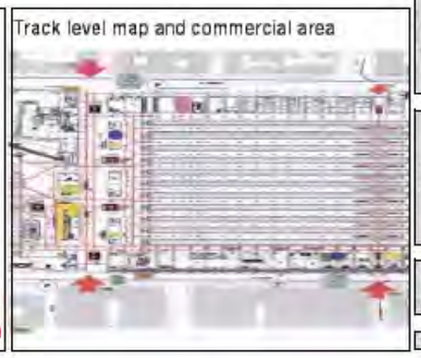


infra manager

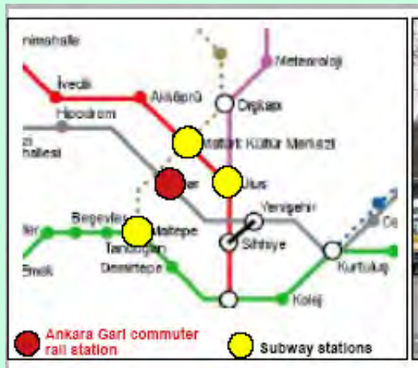
- Started December 2005
- High Speed line northwards
- Future Station Roma Triburtina: meeting place for shopping, to decongest Roma Termini



Track level map and commercial area



Tracks	Railway Infra manager	RFI
	HS tracks yard	Dead End
	Station location	At Grade
	Number of tracks	31
	Tracks used for High speed	8
	High Speed trains/day both ways	140
	Length of platforms	400
Areas	Station footprint (sq mt)	
	Total area (sq mts)	225.000
	Platforms area (sq mt)	50.000
	Commercial area (sq mt)	23.600
	Number of Shops	128
	Offices area (sq mt)	73.400
	Waiting area+pax services (sq mt)	1.600
	Parking area (sq mt)	5.200
Depots	Depot footprint (sq mts)	
	Daily movements st-depot	190
	Depot-station distance (Km)	1,5
	Station construction costs (mill €)	



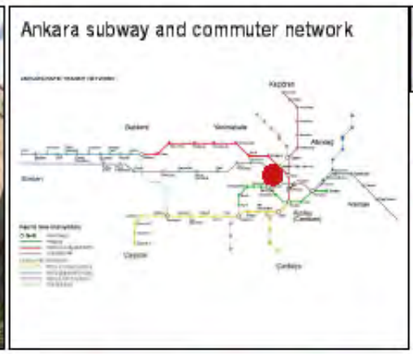

Taxis at the station

passenger

- Good connection with commuter lines
- Lack of good connection with subway
- Relies on buses and taxi


Platforms

Accessibility	High Speed stations in the city	1
	Total Region High Speed stations	2
	Nr of subway lines at the station	-
	Nr of commuter lines at the station	1
	Nr of bus routes at the station	
	Subway st reached without transfer	21
	Commuter st reached without transfer	17
	Nr of public parking lot spaces	100
	Car parking fare (€/day)	
	Bike renting fare (€/day)	
	Rent a car companies	
	Security Control?	no
	Ticket control?	no
Travel fares	First city	Eskisehir
	travel fare by High Speed train (€)	20
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	21
	travel fare by plane (€)	-


Ankara subway and commuter network

city

- Urban renewal linked to new station project
- Regional High Speed station at Sincan
- The station is not well connected with the subway system

New terminal being constructed adjacent to the old one

City numbers	City population	3.763.591
	City area (Km2)	2.516
	City density (hab/Km2)	1.496
	Region population	4.600.000
	Region area (Km2)	
	Distance City Hall-Station (Km)	
	International visitors a year	
	Domestic visitors a year	23.320
PUT	Metro ridership in the city area (pax/day)	320.000
	Comm ridership in the city area (pax/day)	65.000
	Bus ridership in the city area (pax/day)	1.100.000
	Tram ridership in the city area (pax/day)	1.340.000
Travel time	First destination	Eskisehir
	travel time by High Speed train	1hr30min
	travel time by Conventional train	-
	travel time by Car	3hr40min
	travel time by plane *	-
	*only travel time	
	Urban develop. Total area planned (Ha)	1.0


Turkish Railway Network
Ankara Garı station
Eskisehir


ISTANBUL
Ankara
Sincan
ESKISEHIR
AFYON
KONYA

operator

- Services Ankara-Eskisehir
- Second line with through squeme planned


Train at the Station

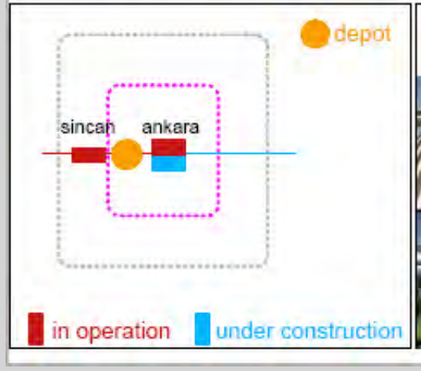

Inside of the station

Line	Operator	TCDD
	Services type	Dead End
	Opening date	13-mar-09
	High Speed lines from/to station	1
	High speed total length (Km, country)	235
	HS Services a day (both ways)	8
	Passengers a day	2.000
	% city HS trains going through this station	100
	First destination	Eskisehir
	HS Services a day (both ways)	7
	% city trains going to this destination	87,50%
Trains	Maximum speed (km/hour)	250
	Length (m)	200
	Cars per train	8
	Total seats	419
	Platform occupancy time (min)	
Station	Info panels	
	Automatic ticket machine	
	Lockers	
	Turnstile/entrance	


ANKARA HIGH-SPEED RAILWAY TRAIN STATION

infra manager

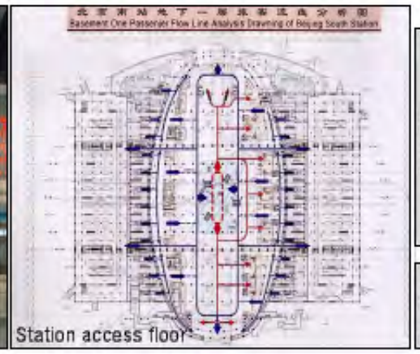
- New station (adjacent) in construction under PPP



Tracks	Railway infra manager	TCDD
	HS tracks yard	Through
	Station location	At grade
	Number of tracks	
	Tracks used for High speed	2
	High Speed trains/day both ways	8
	Length of platforms	300
Areas	Station footprint (sq mt)	19.800
	Total area (sq mts)	123.500
	Platforms area (sq mt)	8.950
	Commercial area (sq mt)	10.555
	Number of Shops	32
	Offices area (sq mt)	
	waiting area+pax services (sq mt)	57.000
	Parking area (sq mt)	
Depots	Depot footprint (sq mts)	896.000
	Daily movements st-depot	
	Depot-station distance (Km)	7
€	Station construction costs (mill €)	

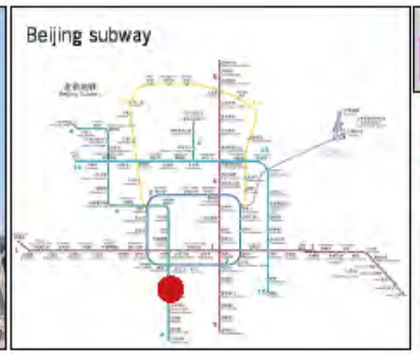
passenger

- Good access time using underground line (second line is planned)
- Excellent transfer time
- Large spaces and services at the station



Accessibility	
High Speed stations in the city	1
Total Region High Speed stations	2
Nr of subway lines at the station	2
Nr of commuter lines at the station	3
Nr of bus routes at the station	2
Subway st reached without transfer	23
Commuter st reached without transfer	-
Nr of public parking lot spaces	800
Car parking fare (€/day)	3,50
Bike renting fare (€/day)	2
Rent a car companies	-
Security Control?	yes
Ticket control?	yes

Travel fares	
First city	Tianjin
travel fare by High Speed train (€)	6
travel fare by Conventional train (€)	2
travel fare by Car (€)	10
travel fare by plane (€)	-



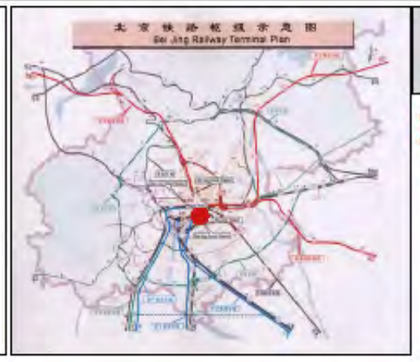
city

- No development area around the station (already built)
- Metro line 1 in service and planned line 14 (station prepared)

City numbers	
City population	13.200.000
City area (Km2)	1.300
City density (heb/Km2)	10.154
Region population	17.550.000
Region area (Km2)	6.562
Distance City Hall-Station (Km)	
International visitors a year	4.555.000
Domestic visitors a year	142.000.000

PuT	
Metro ridership in the city area (pax/day)	4.000.000
Comm ridership in the city area (pax/day)	
Bus ridership in the city area (pax/day)	11.000.000
Tram ridership in the city area (pax/day)	-

Travel time	
First destination	Tianjin
travel time by High Speed train	30min
travel time by Conventional train	1hr
travel time by Car	1hr30min
travel time by plane*	-
*only travel time	
Urban develop. Total area planned (Ha)	



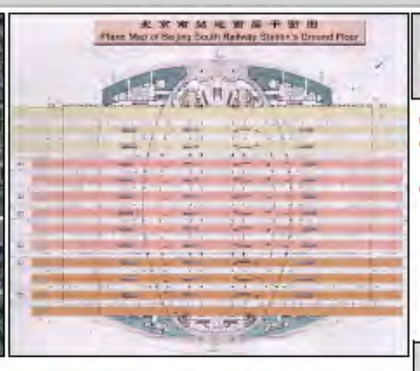
operator

- Enhanced quality of service
- Large spaces, but crowded waiting areas

Line	
Operator	M of R
Station type (services)	Dead End
Years opened High Speed	1,5
High Speed lines from/to station	1
High speed total length (Km, country)	120
Services a day (both ways)	120
Passengers a day	45.000
% city trains going through this station	100
First destination	Tianjin
Services a day (both ways)	120
% city trains going to this destination	100,00%

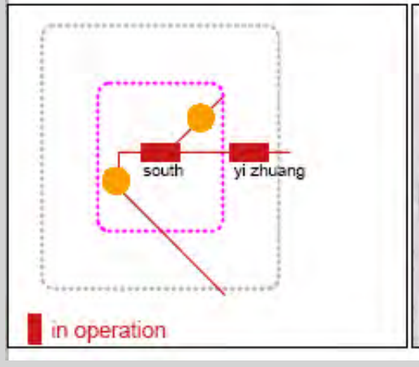
Trains	
Maximum speed (Km/hour)	350
Length (m)	200
Cars per train	8
Total seats	572
Platform occupancy time (min)	3-15

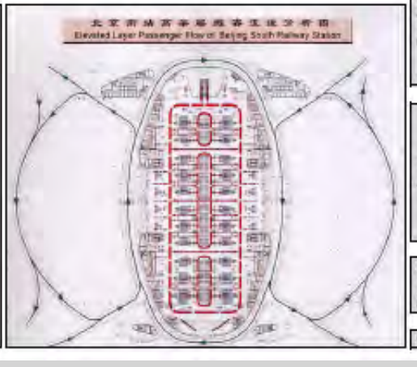
Station	
Info panels	yes
Automatic ticket machine	yes
Lockers	yes
Turnstile/entrance	5



infra manager

- Complete new rail scheme in Beijing
- Through services possible and new Shanghai line prepared
- New depot westwards closer than existing one





Tracks	
Railway Infra manager	Min of Railw
HS tracks yard	Through
Station location	At grade
Number of tracks	24
Tracks used for High speed	24
High Speed trains/day both ways	120
Length of platforms	480

Areas	
Station footprint (sq mt)	170.000
Total area (sq mts)	322.000
Platforms area (sq mt)	127.000
Commercial area (sq mt)	5.400
Number of Shops	
Offices area (sq mt)	2.500
waiting area+pax services (sq mt)	25.600
Parking area (sq mt)	77.500

Depots	
Depot footprint (sq mts)	992.000
Daily movements at depot	
Depot-station distance (Km)	8,8

Station construction costs (mill €)	500

passenger

- Central location with good access time in metro (lines 1 and 4) and commuters (line G)
- Good transfer with adjacent bus interchage

Accessibility	
High Speed stations in the city	2
Total Region High Speed stations	3
Nr of subway lines at the station	2
Nr of commuter lines at the station	1
Nr of bus routes at the station	28
Subway st reached without transfer	46
Commuter st reached without transfer	95
Nr of public parking lot spaces	800
Car parking fare (€/day)	12
Bike renting fare (€/day)	-
Rent a car companies	
Security Control?	no
Ticket control?	no

Travel fares	
First city	Busan
travel fare by High Speed train (€)	17
travel fare by Conventional train (€)	25
travel fare by Car (€)	30
travel fare by plane (€)	53

city

- First remodelation of station: other tracks in service
- Second huge urban project: convention center, new north track yards
- New commuter line in service
- Future commuter line connecting with both airports (Incheon and Gimpo). In construction

City numbers	
City population	10.464.051
City area (Km2)	605
City density (hab/Km2)	17.289
Region population	24.472.063
Region area (Km2)	5.095
Distance City Hall-Station (Km)	1,5
International visitors a year	12.000.000
Domestic visitors a year	

PUT	
Metro ridership in the city area (pax/day)	8.000.000
Comm ridership in the city area (pax/day)	
Bus ridership in the city area (pax/day)	4.531.000
Tram ridership in the city area (pax/day)	-

Travel time	
First destination	Busan
travel time by High Speed train	2hr50min
travel time by Conventional train	5hr
travel time by Car	4hr30min
travel time by plane*	55min
*only travel time	
Urban develop. Total area planned (Ha)	28,05

operator

- Station in origin to Busan trains only to avoid capacity and congestion problems
- HS trains to Mokpo from Yongsan station

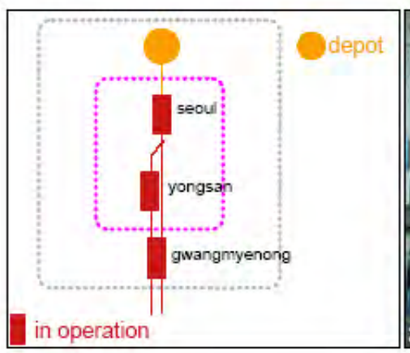
Line	
Operator	KORAIL
Services type	Dead End
Opening date	01-apr-04
High Speed lines from/to station	1
High speed total length (Km, country)	330
HS Services a day (both ways)	106
Passengers a day	24.900
% city HS trains going through this station	73,81%
First destination	Busan
HS Services a day (both ways)	74
% city trains going to this destination	69,81%

Trains	
Maximum speed (Km/hour)	300
Length (m)	388
Cars per train	20
Total seats	935
Platform occupancy time (min)	20

Station	
Info panels	yes (10)
Automatic ticket machine	yes (38)
Lockers	yes (23)
Turnstile/entrance	no

infra manager

- Keeps the same through squeme with depot at north
- Shared lines by HS and conventional trains



Tracks	
Railway infra manager	KR
HS tracks yard	Through
Station location	At grade
Number of tracks	14
Tracks used for High speed	7
High Speed trains/day both ways	106
Length of platforms	450

Areas	
Station footprint (sq mt)	106.256
Total area (sq mts)	240.023
Platforms area (sq mt)	27.500
Commercial area (sq mt)	31.854
Number of Shops	52
Offices area (sq mt)	16.143
waiting area+pax services (sq mt)	
Parking area (sq mt)	20.680

Depots	
Depot footprint (sq mts)	1.300.470
Daily movements st-depot	104
Depot-station distance (Km)	14,9
Station construction costs (mill €)	64,9

passenger

- Good connection to metro line 1 and commuter Jungan line

Accessibility	
High Speed stations in the city	2
Total Region High Speed stations	3
Nr of subway lines at the station	1
Nr of commuter lines at the station	1
Nr of bus routes at the station	6
Subway st reached without transfer	27
Commuter st reached without transfer	95
Nr of public parking lot spaces	600
Car parking fare (€/day)	6,6
Bike renting fare (€/day)	-
Rent a car companies	1
Security Control?	no
Ticket control?	no

Travel fares	
First city	Mokpo
travel fare by High Speed train (€)	25
travel fare by Conventional train (€)	12
travel fare by Car (€)	32
travel fare by plane (€)	52

city

- Huge urban operation involving both station and railyard adjacent (old depot) and new transport lines
- Gwanmyeong station on region with P&R
- Future commuter line connecting with both airports (Incheon and Gimpo). In construction

City numbers	
City population	10.466.061
City area (Km2)	605
City density (hab/Km2)	17.288
Region population	24.472.003
Region area (Km2)	5.035
Distance City Hall-Station (Km)	4,7
International visitors a year	12.000.000
Domestic visitors a year	

PU T	
Metro ridership in the city area (pax/day)	8.000.000
Comm ridership in the city area (pax/day)	
Bus ridership in the city area (pax/day)	4.531.000
Trans ridership in the city area (pax/day)	

Travel time	
First destination	Mokpo
travel time by High Speed train	3hr20min
travel time by Conventional train	7hr15min
travel time by Car	4hr
travel time by plane*	55min
*only travel time	
Urban develop. Total area planned (Ha)	340,56

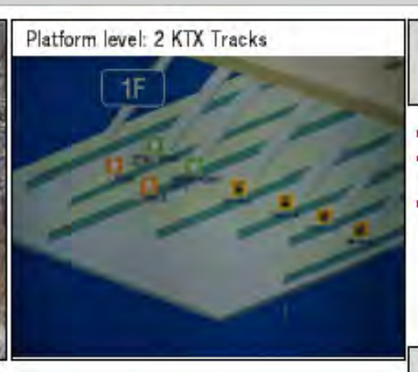
operator

- Station in origin to Mokpo trains only to avoid capacity and congestion problems
- HS trains to Busan from Seoul station

Line	
Operator	KORAIL
Services type	Dead End
Opening date	2006
High Speed lines from/to station	1
High speed total length (Km, country)	330
HS Services a day (both ways)	38
Passengers a day	12.000
% city HS trains going through this station	26,39%
First destination	Mokpo
HS Services a day (both ways)	28
% city trains going to this destination	73,68%

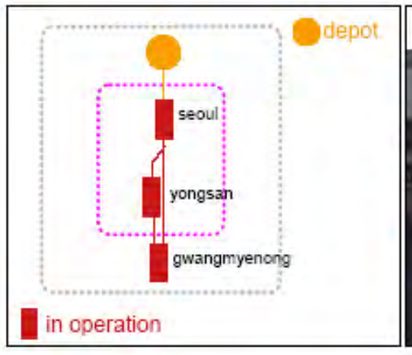
Trains	
Maximum speed (Km/hour)	300
Length (m)	388
Cars per train	20
Total seats	935
Platform occupancy time (min)	20

Station	
Info panels	yes
Automatic ticket machine	yes
Lockers	yes
Turnstile/entrance	no



infra manager

- Through squeme
- New workshop adjacent to depot in service 2010
- Commercial center on top of the station



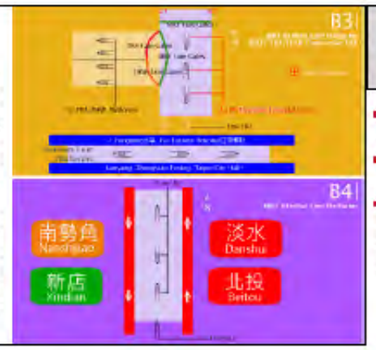
Tracks	
Railway Infra manager	KR
HS tracks yard	Through
Station location	At grade
Number of tracks	13
Tracks used for High speed	2
High Speed trains/day both ways	38
Length of platforms	

Areas	
Station footprint (sq mt)	70.000
Total area (sq mts)	
Platforms area (sq mt)	
Commercial area (sq mt)	
Number of Shops	
Offices area (sq mt)	
waiting areas pax services (sq mt)	
Parking area (sq mt)	

Depots	
Depot footprint (sq mts)	1.300.470
Daily movements at depot	
Depot-station distance (Km)	17

Station construction costs (mill €)	

Conexion with subway lines



passenger

- Keeps the same through squeme with depot at north
- Shared lines by HS and conventional trains
- Future connection with Taoyuan airport by the "Taoyuan airport MRT System" is planned for completion in 2014

Accessibility	High Speed stations in the city	1
	Total Region High Speed stations	3
	Nr of subway lines at the station	3
	Nr of commuter lines at the station	-
	Nr of bus routes at the station	-
	Subway st reached without transfer	39
	Commuter st reached without transfer	-
	Nr of public parking lot spaces	322
	Car parking fare (€/day)	
	Bike renting fare (€/day)	
	Rent a car companies	
	Security Control?	
	Ticket control?	

Travel fares	First city	Zuoying
	travel fare by High Speed train (€)	22,5
	travel fare by Conventional train (€)	-
	travel fare by Car (€)	34
	travel fare by plane (€)	50

city

- Good connection with 3 subway lines
- MRT system linking Taipei City and Taoyuan international airport is planned for 2013
- Plans for urban development area around the station
- Banciao station in the metropolitan area (13 Km away)
- Nangang station (3 Km) in north Taipei (future)

City numbers	City population	2.619.920
	City area (Km2)	271,80
	City density (hab/Km2)	9.639
	Region population	6.752.826
	Region area (Km2)	2.265
	Distance City Hall-Station (Km)	5,2
	International visitors a year	4.400.000
	Domestic visitors a year	

PU T	Metro ridership in the city area (pax/day)	1.286.644
	Comm ridership in the city area (pax/day)	-
	Bus ridership in the city area (pax/day)	2.200.000
	Tram ridership in the city area (pax/day)	-

Travel time	First destination	Zuoying
	travel time by High Speed train	1h/30min
	travel time by Conventional train	4,5h(bet Hs)
	travel time by Car	4hr
	travel time by plane*	50min(Kao)
	*only travel time	
	Urban develop. Total area planned (Ha)	47

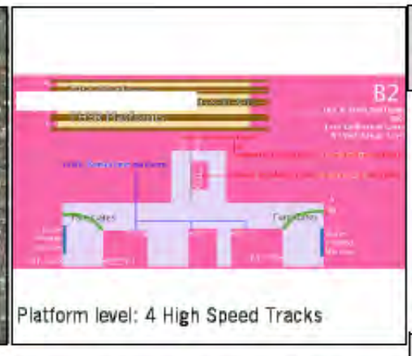
operator

- THSRC services Taipei-Zuoying started in 2007
- All trains stop at Banciao station

Line	Operator	THSRC
	Services type	Dead end
	Opening date	02-mar-07
	High Speed lines from/to station	1
	High speed total length (Km, country)	345
	HS Services a day (both ways)	132
	Passengers a day	89.859
	% city HS trains going through this station	100%
	First destination	Zuoying
	HS Services a day (both ways)	128
	% city trains going to this destination	96,97%

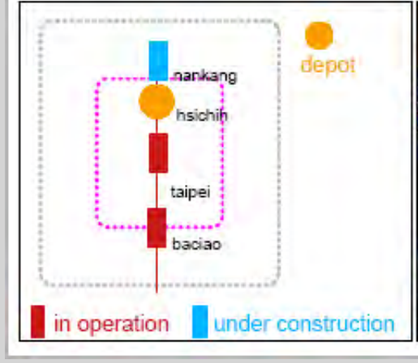
Trains	Maximum speed (Km/hour)	300
	Length (m)	306,7
	Cars per train	12
	Total seats	989
	Platform ocupancy time (min)	

Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	
	Turnstile/entrance	yes



infra manager

- Complete new HS line, with new depot, temporarily using sungshan
- HS underground station (5 levels) connected to Main station



Tracks	Railway infra manager	THSRC
	HS tracks yard	Through
	Station location	Underground
	Number of tracks	12
	Tracks used for High speed	4
	High Speed trains/day both ways	132
	Length of platforms	

Areas	Station footprint (sq mt)	40.000
	Total area (sq mts)	
	Platforms area (sq mt)	
	Commercial area (sq mt)	
	Number of Shops	
	Offices area (sq mt)	
	waiting area+pax services (sq mt)	
	Parking area (sq mt)	8.500

Depots	Depot footprint (sq mts)	350.000
	Daily movements st-depot	
	Depot-station distance (Km)	22

	Station construction costs (mill €)	400

passenger

- Huge complex station difficult to understand
- Excellent access time from city and region
- Good transfer time from metro and commuter

Accessibility	High Speed stations in the city	3
	Total Region High Speed stations	12
	Nr of subway lines at the station	1
	Nr of commuter lines at the station	7
	Nr of bus routes at the station	21
	Subway st reached without transfer	26
	Commuter st reached without transfer	163
	Nr of public parking lot spaces	1,397
	Car parking fare (€/day)	52,8
	Bike renting fare (€/day)	-
	Rent a car companies	1
	Security Control?	no
	Ticket control?	yes
Travel fares	First city	Sendai
	travel fare by High Speed train (€)	81
	travel fare by Conventional train (€)	44
	travel fare by Car (€)	100
	travel fare by plane (€)	139

city

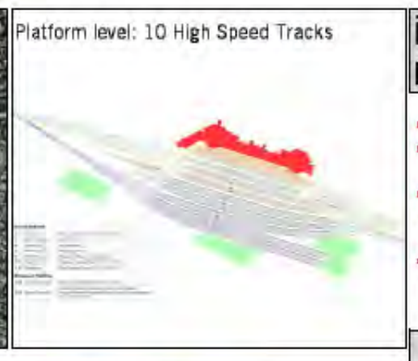
- Historic building and landmark
- High level of activity around the station
- Important urban development plans around the station (high rise)

City numbers	City population	8,793,000
	City area (Km2)	617
	City density (hab/Km2)	14.254
	Region population	34.000.000
	Region area (Km2)	8.014
	Distance City Hall-Station (Km)	7
	International visitors a year	4,850,000
	Domestic visitors a year	420,000,000
PUT	Metro ridership in the city area (pax/day)	6,737,650
	Comm ridership in the city area (pax/day)	33.100.000
	Bus ridership in the city area (pax/day)	5.019.220
	Trans ridership in the city area (pax/day)	319,504
Travel time	First destination	Sendai
	travel time by High Speed train	1hr58min
	travel time by Conventional train	-
	travel time by Car	5hr
	travel time by plane*	1hr
	* only travel time	
	Urban develop. Total area planned (Ha)	35,07

operator

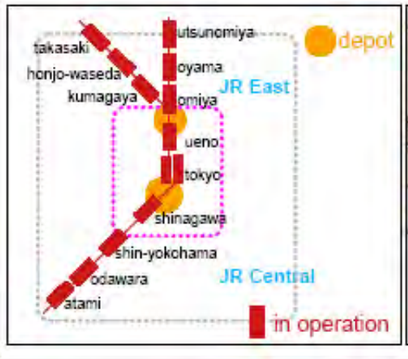
- High speed services started 1964
- Two different companies operating Shinkansen services: East Japan Railway Company (Tohoku, Joetsu and Nagano Shinkansen) and Central Japan Railway Company (Tokaido Shinkansen)
- Increased track dedication to HS when incorporating new lines
- High efficiency in cleaning & reversion of trains

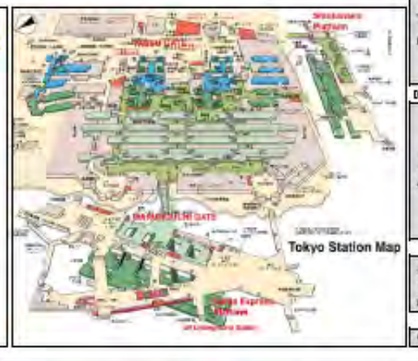
Line	Operator	JR2 & JRC
	Services type	Dead End
	Opening date	01-oct-64
	High Speed lines from/to station	6
	High speed total length (Km, country)	2.452
	HS Services a day (both ways)	600
	Passengers a day	450,000
	% city HS trains going through this station	100%
	First destination	Sendai (JR2)
	HS Services a day (both ways)	110
	% city trains going to this destination	18,33%
Trains	Maximum speed (Km/hour)	275 (JR2); 270 (JRC)
	Length (m)	325 (JR2); 400 (JRC)
	Cars per train	16 (JR2 and JRC)
	Total seats	1154 (JR2); 1323 (JRC)
	Platform occupancy time (min)	10
Station	Info panels	yes
	Automatic ticket machine	yes
	Lockers	yes
	Turnstile/entrance	yes



infra manager

- 3 HS tracks in 1964
- Various enlargments; 1967: 4tracks, 1975: 5 tracks, 1979: 6 tracks
- Changes in HS tracks when incorporating Tohoku line in 1991 (2 tracks), reaching 4 tracks in 1997
- Dead End tracks. Tracks of JR Central and JR East are physically separated and no connection





Tracks	Railway infra manager	JRE+JRC
	HS tracks yard	Dead End
	Station location	At grade
	Number of tracks	28
	Tracks used for High speed	10
	High Speed trains/day both ways	600
	Length of platforms	410
Data of areas and depots are from JR East		
Areas	Station footprint (sq mt)	157.000
	Total area (sq mts)	157.000
	Platforms area (sq mt)	29.000
	Commercial area (sq mt)	16.450
	Number of Shops	
	Offices area (sq mt)	
	waiting area+pax services (sq mt)	52.000
	Parking area (sq mt)	
Depots	Depot footprint (sq mts)	100.000
	Daily movements st-depot	133
	Depot-station distance (Km)	8,5
€	Station construction costs (mill €)	

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