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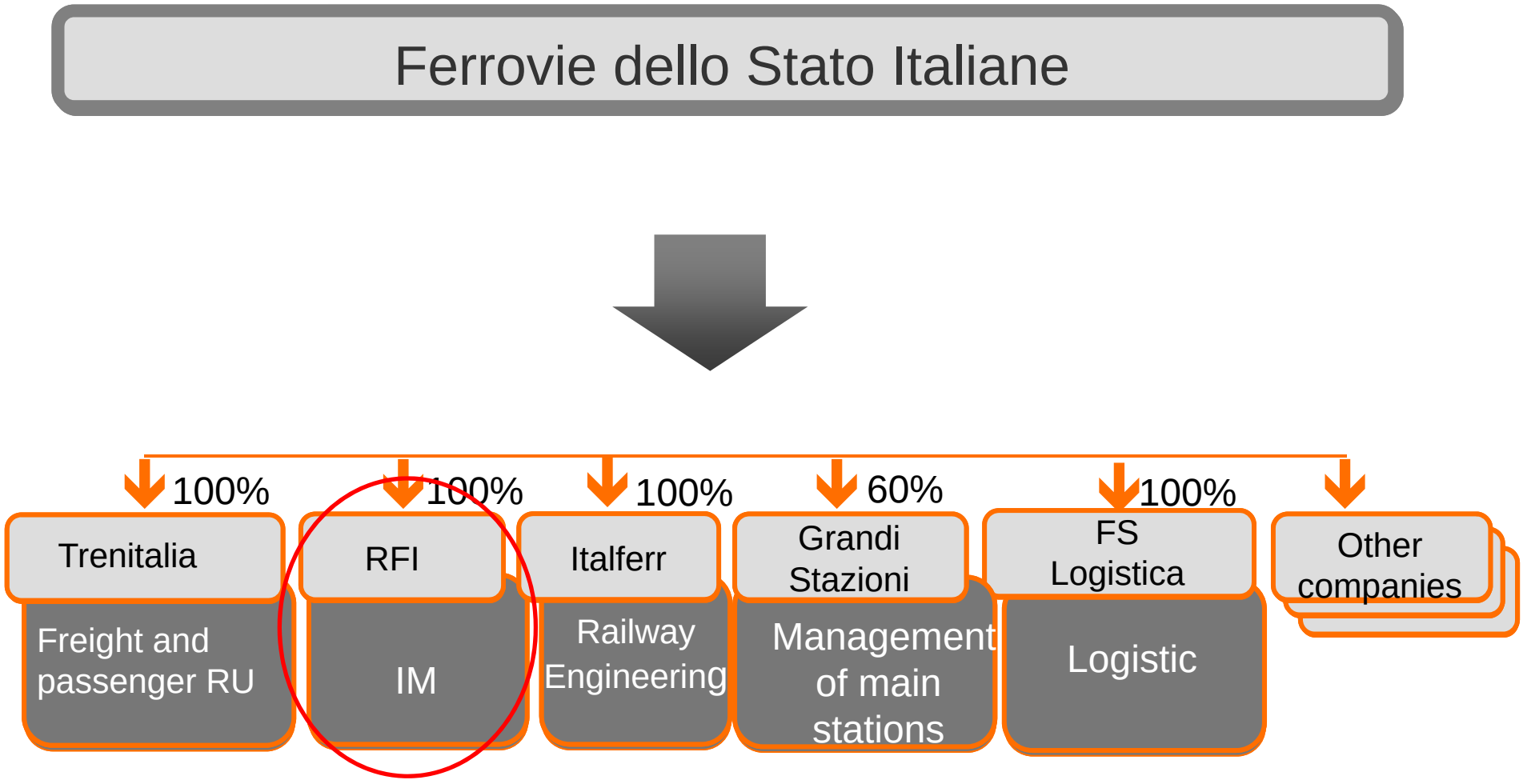
Conference Vision 2030

Experience from implementation of high speed rail in Italy

Brno, 12th September 2013

Giulia Costagli – Strategic Planning Rete Ferroviaria Italiana

“Ferrovie dello Stato Italiane”



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IM: framework, mission and strategies

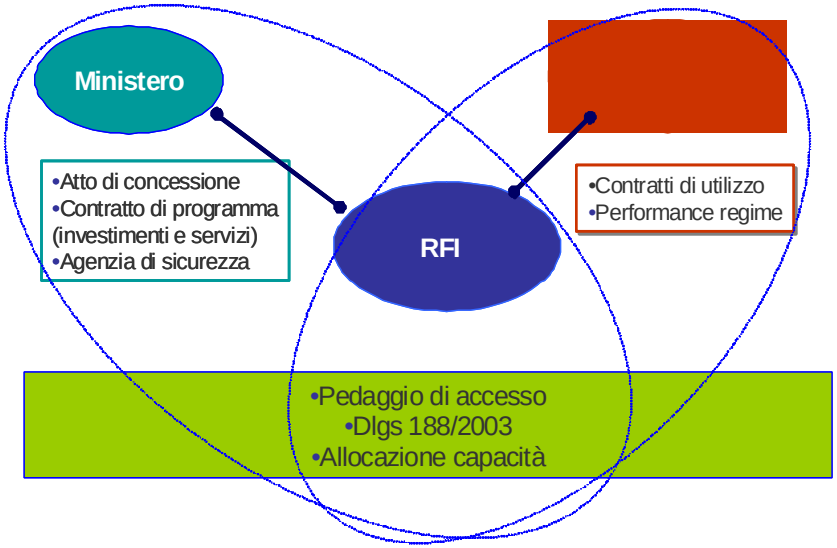
RFI has the task of planning, building, operating and managing the national railway infrastructure;

→ guaranteeing safe circulation on the whole network;

→ assuring maintenance in efficiency;

→ developing systems' technology and

→ assuring the access to the network for RU



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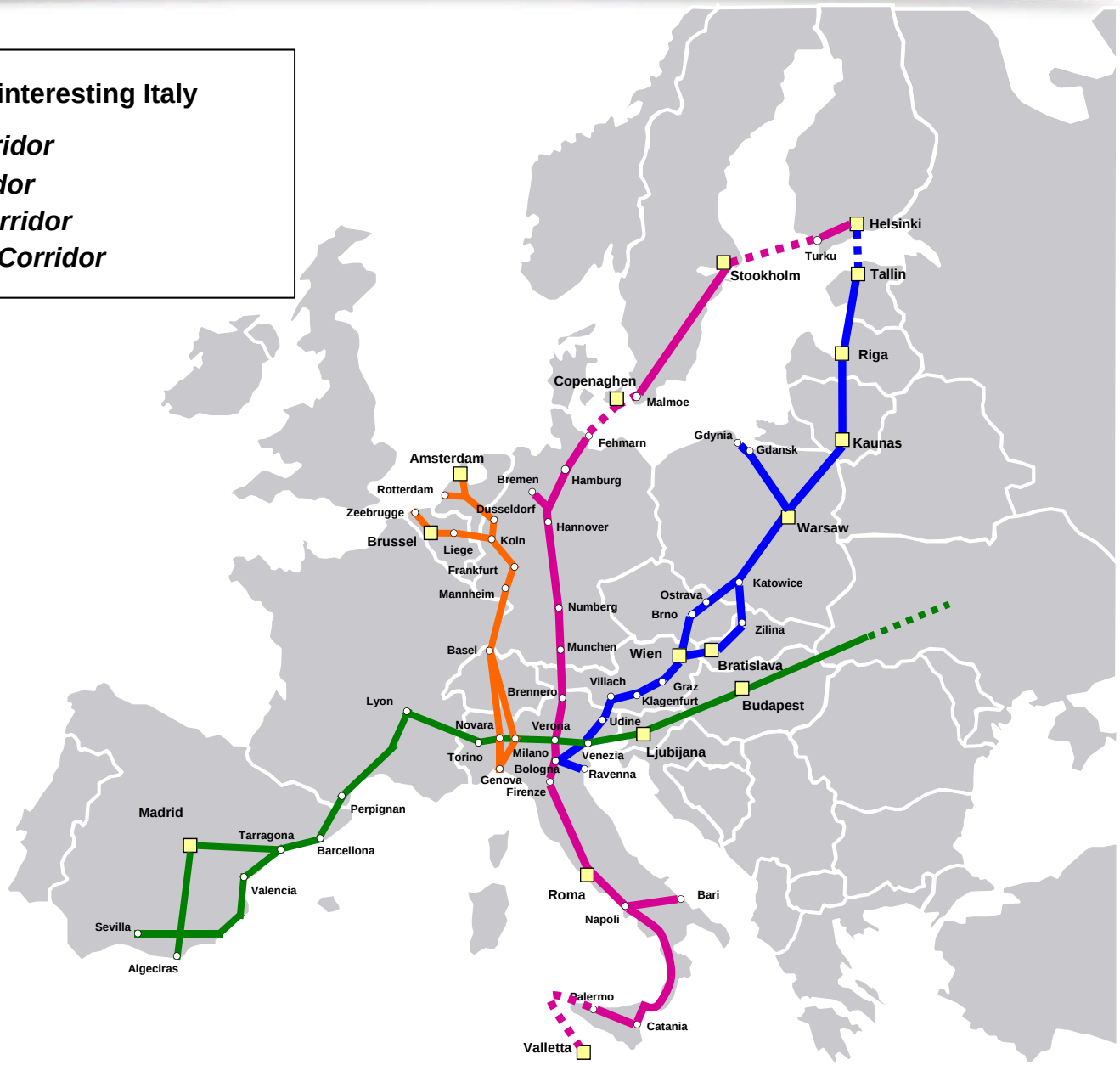
The Italian Core Corridors

***Core Networks Corridors* interesting Italy**

- ***Baltic – Adriatic Corridor***
- ***Mediterranean Corridor***
- ***Helsinki - Velletta Corridor***
- ***Genova - Rotterdam Corridor***



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RFI: the network

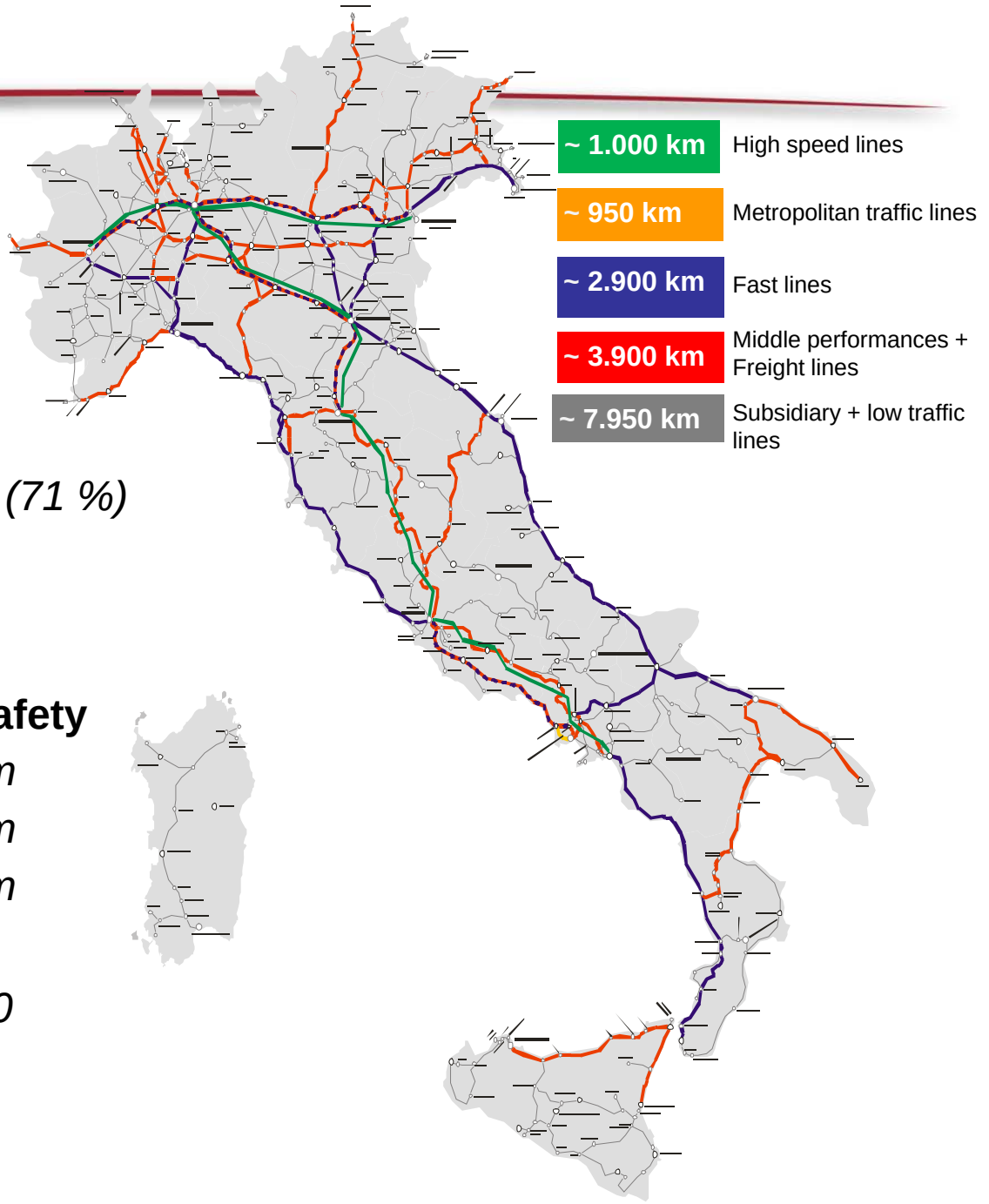
… a great resource

***RFI network*:**	***16.742 km***
Double track:	*7.536 km*
Single track:	*9.206 km*
Electric traction:	*11.959 km (71 %)*
Passenger stations:	2.260

Innovative technologies for safety

SCMT – SSC	*15.893 km*
ERTMS	*650 km*
GSM-R	*9.000 km*

Total RFI Staff *about 27.000*



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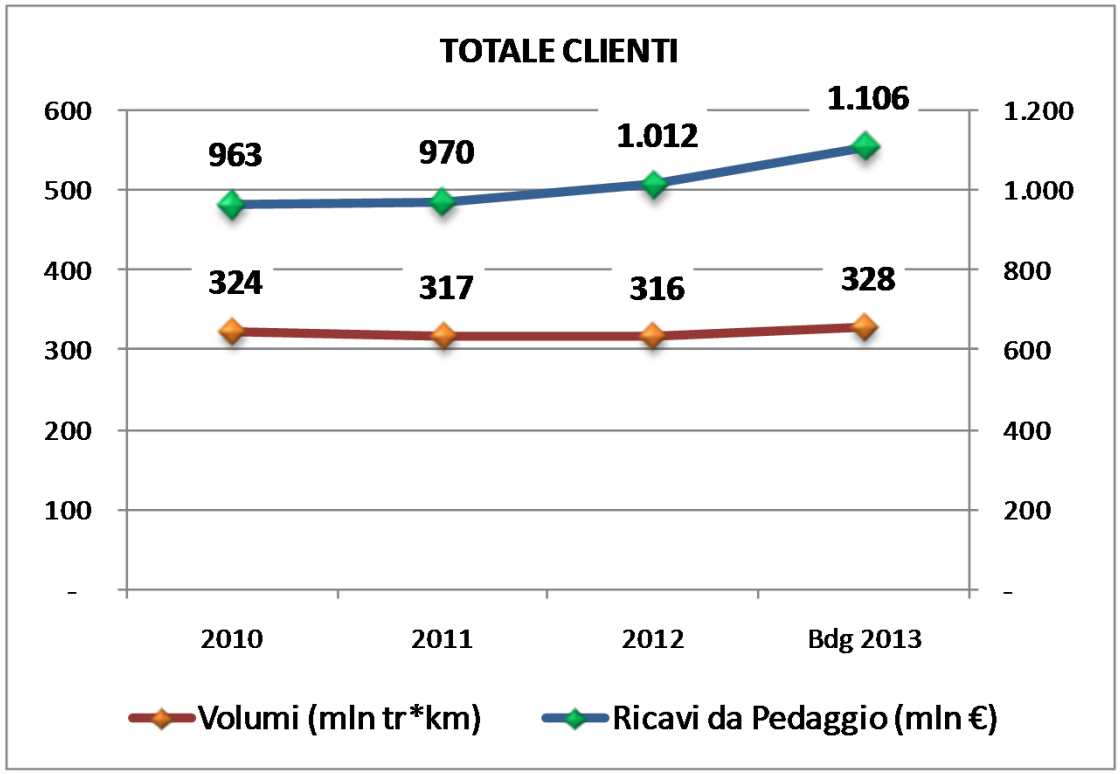
Volumes evolution and revenues from access charge



32 Railway Undertakings*

40 Contracts

21	freight
16	Passengers
2	Freight test trains
1	Rolling stock transfer

** Rus number for 2012-2013 timetable*

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Punctuality

	within	2012	2013	Volumes: Tr./day 2013
Eurostar market	15'	94,5%	94,9%	263
Universal service	15'	92,7%	89,9%	184
Regional	5'	90,4%	90,3%	7.082
Freight	30'	72,1%	72,5%	398

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DATA REFERRED TO STANDARD B – TRAINS OF ALL RUs

Contracts with the State

In recent years RFI began an improvement process that allowed economical results of tendential balance with good performance indicators.
The macroeconomic crisis, involving the market and the public finance, can result in further improvement margins.

The lack of resources imposes some choices also through:

- ***Review of the investments portfolio***
- ***Review of availability levels of the managed network***

Programme contract / Services

Integrated regulation of maintenance activities (ordinary and extraordinary)

Economically sustainable performances and penalties on performances

«Market oriented» maintenance offer

Programme contract / Investments

Selective concentration with focus on Corridors and on light investments to remove bottlenecks

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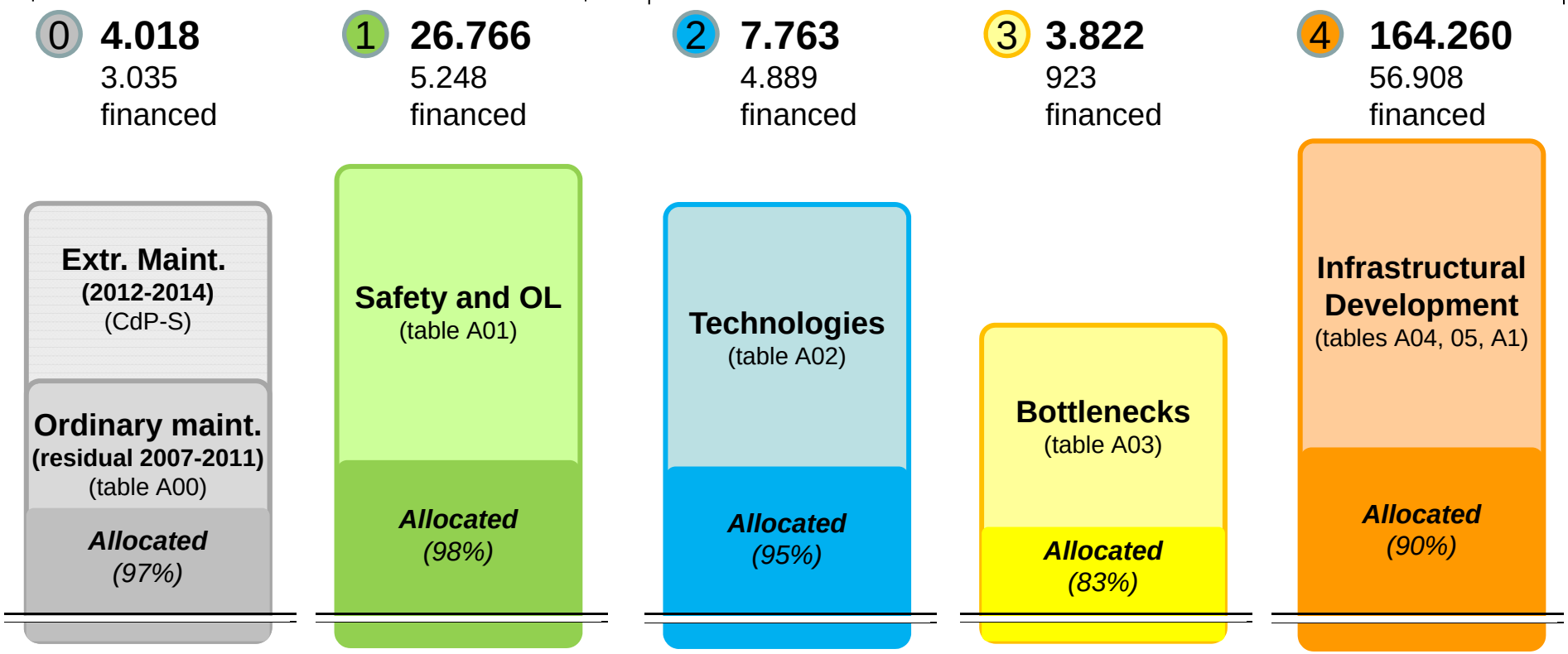
Investments distribution

The **investment portfolio of the Programme Contracts** is about **206,6 billion**, **71,0** of which are already financed. The investments are divided into following classes:

Mandatory investments
(requirement 22,5 billion)

Investments for development
(requirement 113,1 billion)



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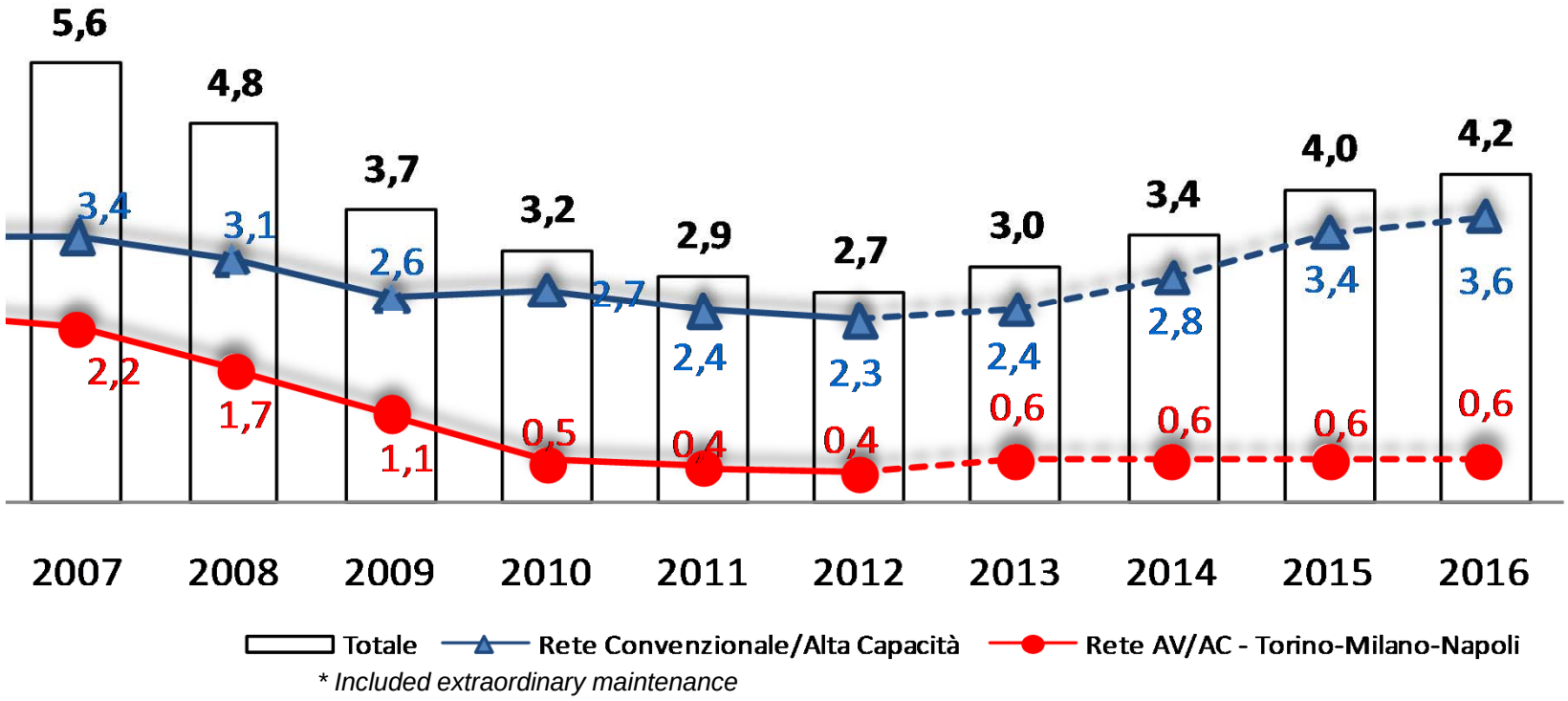
The expenditure for investments

Production volumes*

Billion Euros



** Included extraordinary maintenance*

Provisions of Programme Contract 2012-2016 - part investments

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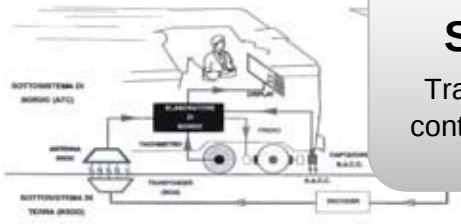
Technological innovation

Operations

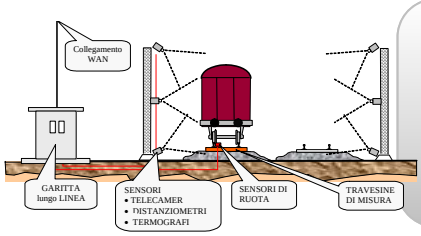
SCC
Command & Control System



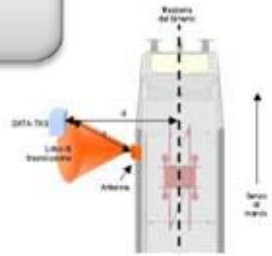
SCMT
Train running control system

Safety

GSM-R
Global Switching Mobile - Railway

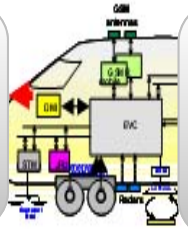


TdS infrastructure
RTB, Multifunction portals, level crossings safety improvement



SSC
Support system for train driving

TdS Rolling Stock
AV - SCMT - SSC



ERTMS
European Railway Traffic Management System

Efficiency & development

ACC Multistation
Central computerized device

Diagnostic trains

Systems for high density traffic

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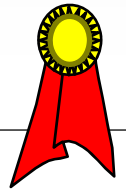
WHY HIGH SPEED?

"…Imbalances in terms of disproportionate mobility by road, excessive traffic and congestion, uncoordinated infrastructure planning as well as inefficient use of existing transport capacity are symptomatic for the transport market…. Present trends in road and air transport are all leading towards even greater inefficiency, congestion, pollution,waste of time and value, damage to health, danger to life and general economic loss."
(Council of European Communities, 1993)



White Paper "European Transport Policy for 2010 time to decide"

REVITALISATION OF RAILWAYS AS A KEY ELEMENT FOR A SUSTAINABLE MOBILITY STRATEGY

OPEN RAIL TRANSPORT MARKET

ACHIEVE INTEROPERABILITY

PROMOTING PHYSICAL INFRASTRUCTURE

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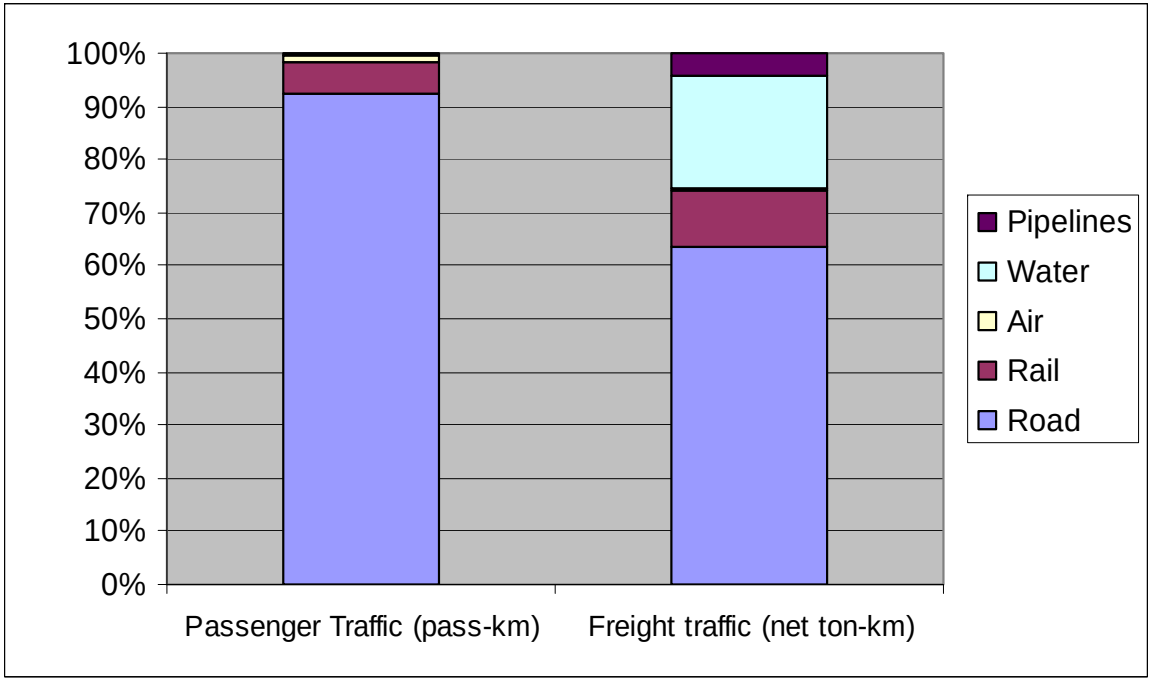
WHY HIGH SPEED?

Modal share of Italian internal transport market (2001)



A NEED AROSE FOR THE CREATION OF A NEW WAY (SAFE, FAST AND ENVIRONMENTALLY SOUND) TO MEET THE MOBILITY NEEDS OF PASSENGERS AND FREIGHT, MAKING AT THE SAME TIME BETTER USE OF EXISTING TRANSPORT INFRASTRUCTURE.

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THE ITALIAN CHOICE

1991

START-UP OF THE “HIGH SPEED” PROJECT, MEANT AS A NETWORK FOR A FAST TRANSPORTATION OF PASSENGERS

1997-98

REVISION INTO “HIGH CAPACITY” PROJECT MEANT AS A SYSTEM INTEGRATED WITH THE EXISTING NETWORK, ABLE TO IMPROVE THE PERFORMANCE OF BOTH LONG-DISTANCE AND REGIONAL TRAFFIC

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THE ITALIAN CHOICE

Since 1991, a special purpose Company, TAV (Treno Alta Velocità), is responsible for the design and the implementation of the High Speed/ High Capacity Project.

TAV has been under the control of RFI (Rete Ferroviaria Italiana), the Italian Rail Infrastructure Manager.

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Highlights - Project evolution

1986

...

1991

1992

2002

2009

Start up:

- **1986 State General Transport Plan** foresees the realization of HS Lines
- **1991 Establishment of TAV S.p.A (SPV)** - 40% FS e 60% Private sector
- **1991 TAV - General Contractor agreement** to plan and realise the HS Lines

Definition of Planning Phase:

- Approval process with local authorities: started in 1992 and lasted 13 years with relevant impact on project definition
- Opening of 1° construction works on Rome-Naples Line in 1994
- Total ridefinition of project from High Speed to High Capacity: an integrated network with conventional lines designed also for freight trains
- Revision of TAV- General Contractor agreements.

Consolidation Phase:

- Significant investment production with opening of first Line Rome-Naples in 2005
- Completion of HS/HC Lines in 2009

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Evolution of financing model

(Turin-Milan-Naples HS/HC system)

	State	Private sector
INITIAL PHASE (1991)	40% Equity in TAV through FS	60% Equity in TAV
1998 (TAV 100% controlled by FS)	40% Investiments and 100% interests in costruction phase through grants	60% Investment through Loan
2000 (Hubs 100% State)	100% Hub investments, 40% Line Investments and 100% interests in costruction phase through grants	60% of only Line Investments through Loan
2003 (ISPA - public institution to support the funding of infrastructural projects)	100% interest in construction phase, State intervention during the operational phase as contribution to refund the debt service	From year 2004 100% of funds in construction phase to be raised on the financial market through Ispa intermediation
2007 - nowdays	State taking over of ISPA debts and funding ~ 85% of HS/HC investment costs	The remaing investment to be financed by project cash flows through private loans

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The High Speed / High Capacity system

In order to extend the network of the destinations served by HS services the new lines have been designed for a close interconnection with the traditional lines.

Treviglio-Brescia
Work ongoing (2016)

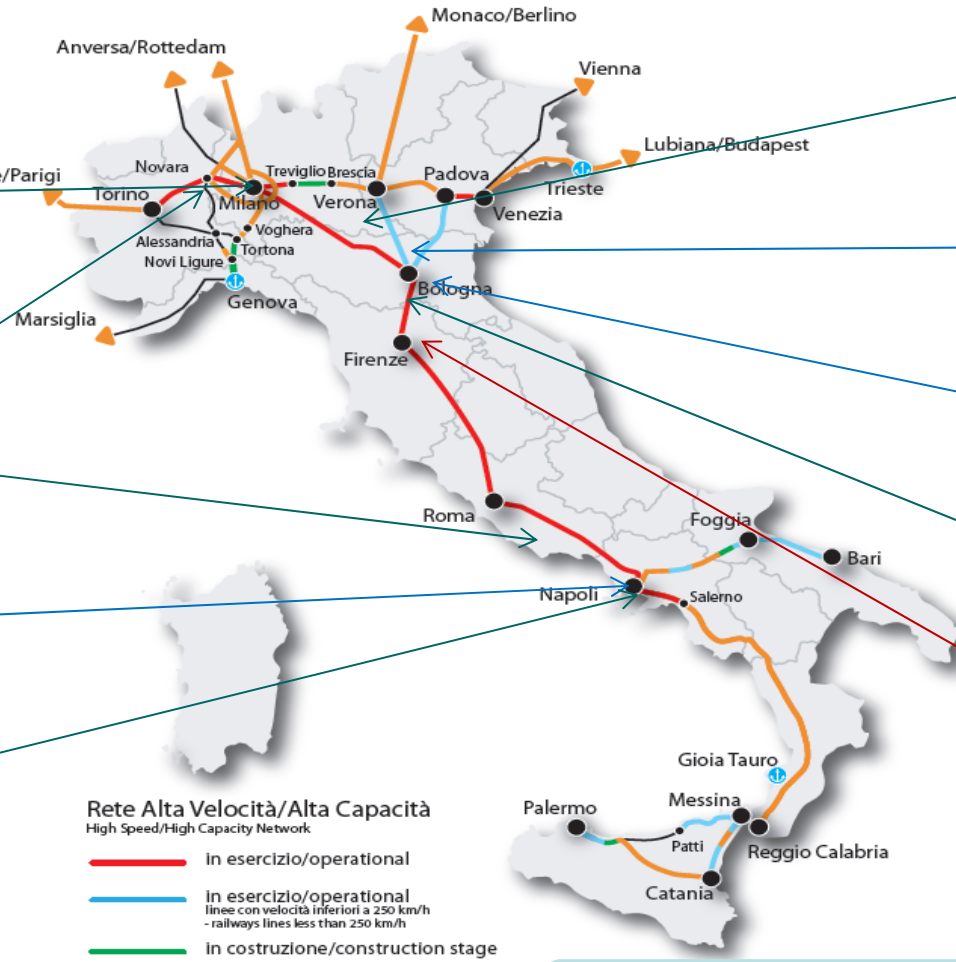
Novara-Milano
- Operating 12/09

Torino-Novara
- Operating 02/06

Roma-Napoli
- Operating 12/05

Napoli Afragola
- 2014: New HS Station

Gricignano-Napoli
- Operating 12/09



Milano-Bologna
- Operating 12/08

Reggio Emilia
- **2013: New HS Station**

Bologna
-**2013: New HS Station**

Bologna-Firenze
- Operating 12/09

Firenze
- **2018: New HS Station**

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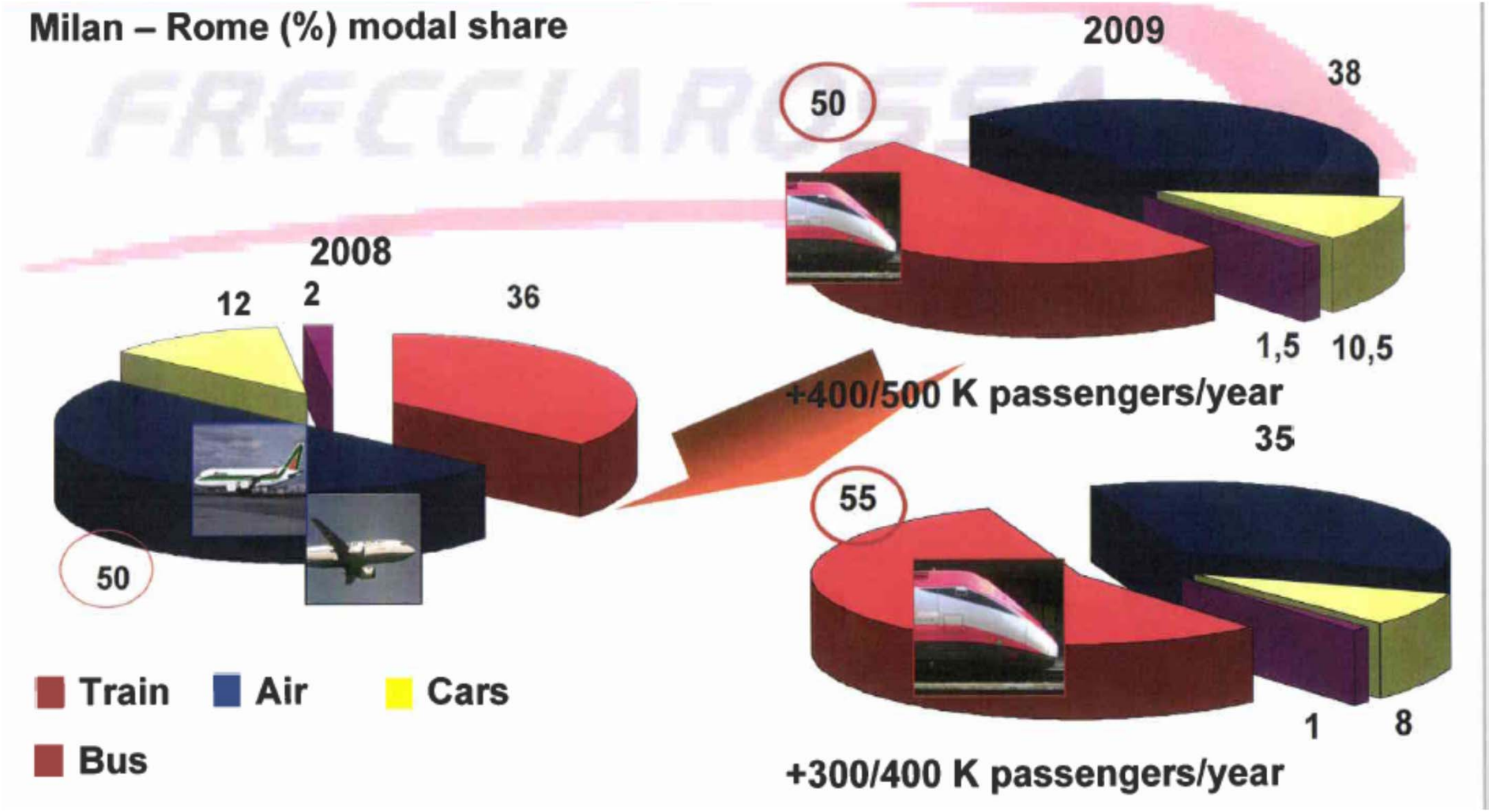
Further investments aims to upgrade the main international corridor.

The modal share



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The High Speed /High Capacity System

HS/HC NETWORK 1000 km

Con la realizzazione della linea AV/Ac Milano-Venezia, il 75% della popolazione italiana sarà servita con linee ad alta velocità

TRAVEL TIMES ON ETR TRAINS

Lines	TO-MI	MI-BO	BO-FI	RM-NA	RM-MI
2013	1: 00’	1: 02’	35’	1: 08’	2:55’ no stop 2:40’ MI Rogoredo RM Tiburtina

FUTURE

RM-MI
2:30’ no stop 2:15’ MI Rogoredo RM Tiburtina

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The High Speed /High Capacity connections

Two competitors

High traffic volumes

→ ***204 tr/day***

→ ***43,68 milion tr*km***

21,2 mil on lines equipped with ERTMS

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Innovation: the new High Speed stations

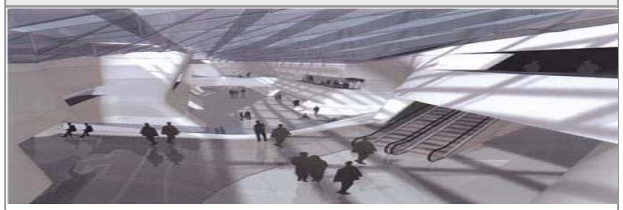
Torino Porta Susa

- **Progetto**: Gruppo AREP
- **Superficie** 47.500 mq
- **Costo**: 40 mln€
- **SAL**: avanzamento lavori al 75% (Passante: interramento e quadruplicamento binari) e 47% (Fabbricato Viaggiatori)
- **Attivazione**: set. 2011 (esercizio parziale F.V.); dic. 2011 (ultimazione F.V.); dic. 2012 (Passante)

Firenze Belfiore

- **Progetto**: Norman Foster & Ove Arup
- **Superficie**: 48.700 mq
- **Costo**: 410 mln€
- **SAL**: attivato set. 2011 lo scavalco; in corso realizzazione Lotto 2 (passante e stazione)
- **Attivazione**: lug. 2015 (passante e stazione)

Napoli Afragola



- **Progetto**: Zaha Hadid Architects
- **Superficie**: 20.000 mq (estendibili di altri 10.00 mq)
- **Costo**: 104 mln€
- **SAL**: avanzamento lavori al 12%
- **Attivazione**: 2013

Bologna Centrale

- **Progetto**: Ove Arup & Partners
- **Superficie** 42.000 mq
- **Costo**: 435 mln€
- **SAL**: avanzamento lavori al 62%
- **Attivazione**: Giugno 2013

Roma Tiburtina

- **Progetto**: ABDR (Paolo Desideri)
- **Superficie**: 50.000 mq
- **Costo**: 322 mln€ (di cui 196 mln €la sola stazione)
- **SAL**: avanzamento lavori al 75%
- **Attivazione**: dicembre 2010 (lato Pietralata); dicembre 2011

Reggio Emilia

- **Progetto**: Santiago Calatrava
- **Superficie**: 8.000 mq
- **Costo**: 79 mln€
- **SAL**: avviati i lavori a marzo 2010
- **Attivazione**: Giugno 2013

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Torino Porta Susa

Quadruplying Torino Porta Susa – Torino Stura

The new station

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HIGH SPEED LINES

High speed lines respect the requirements of the Technical Specification of Interoperability

- **Speed**
  - Maximum speed : 300 km/h
  - Speed on up –down lines connections: 160 km/h
  - Speed on junctions: 160 km/h, 100 km/h
  - Speed on overtaking branches: 60 km/h
- **Maximum axial load**
  - Passenger HS Trains: 170 kN
  - Freight Trains: 225 kN

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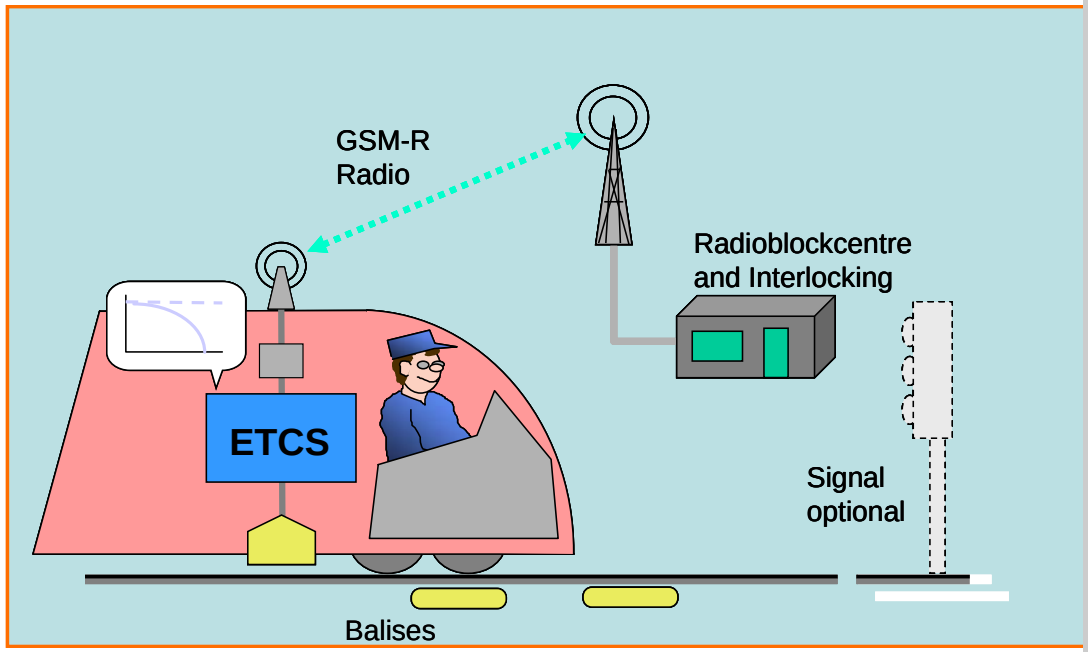
The ETCS/ERTMS level 2 system

Goals

- ❑Realization of a standard signalling system;
- ❑Realization of a standard set of operations rules;
- ❑Establish common safety targets;
- ❑Define common rules for validation and homologation (certification).



Functioning principles:

- ❑System based on continuous radio transmission
- ❑The train runs after receiving a Movement Authority
- ❑MAs are processed by RBC and issued through GSM-R
- ❑The train sends its position report to RBC
- ❑Trackside system is equipped by audiofrequency track circuits
- ❑The confidence interval is verified by on-board odometric system relying on eurobalises detection
- ❑Optional lateral signals

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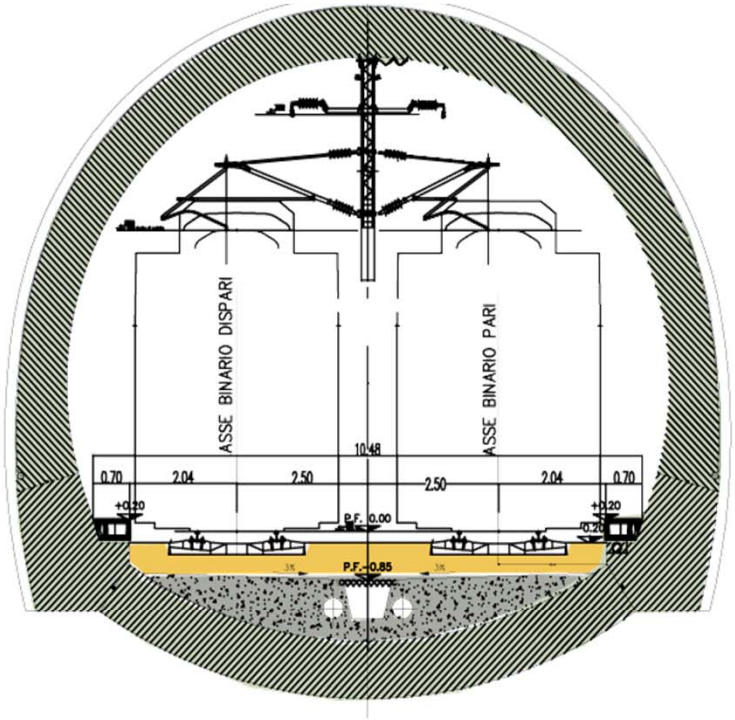
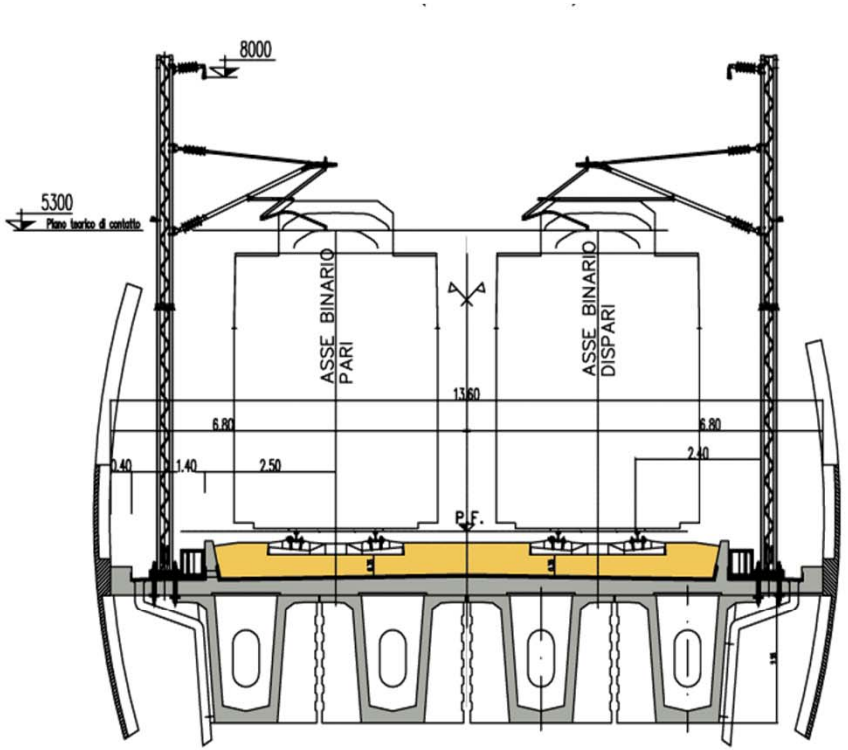
High speed line

Standard section in tunnel



Standard section on viaduct



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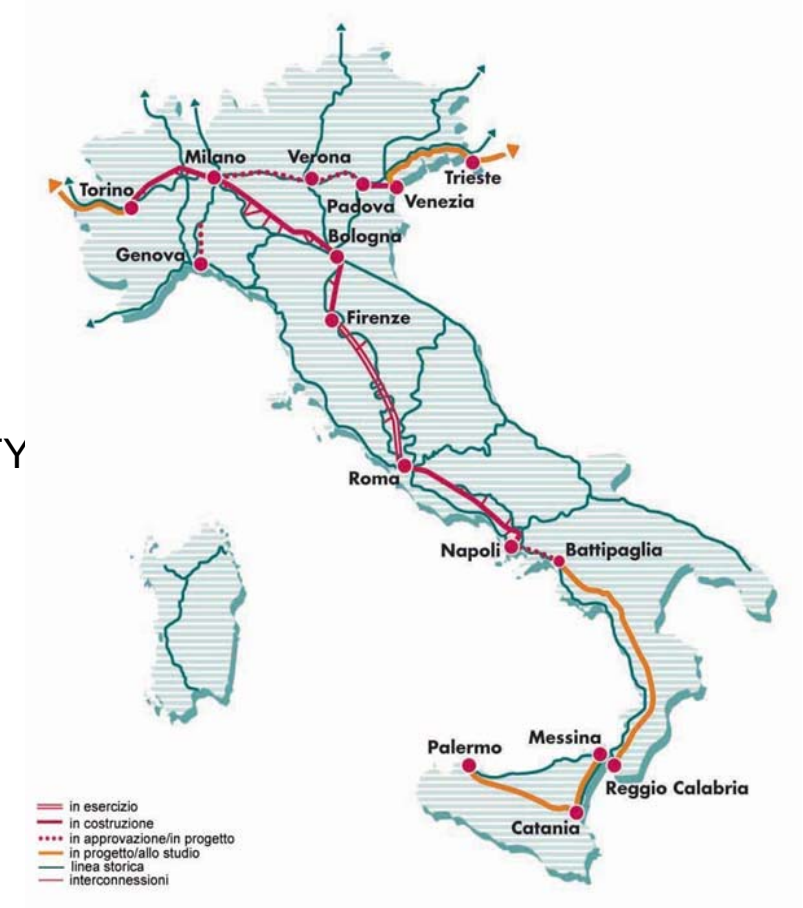
LAND USE ISSUES

8 REGIONS, 18 PROVINCES AND 200 MUNICIPALITIES
OF VARYING SIZES,
DENSITY OF POPULATION AND
DEVELOPMENT CHARACTERISTICS
ARE INVOLVED
IN THE ITALIAN HIGH SPEED/HIGH CAPACITY
PROJECT



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THE BENEFITS OF HIGH SPEED

The High Speed/High Capacity system will transform the way in which people and goods are moved between cities, offering clients the choice of driving, flying or using high speed trains.

Two sets of benefits are to be considered:

- short term benefits generated during the construction stage
- medium-long term benefits accruing during the operational stage

THE BENEFITS OF HIGH SPEED

BENEFITS DURING CONSTRUCTION: INCREASE IN ECONOMIC GROWTH

These benefits are related to the activity generated by firms directly receiving the construction spending, by intermediate purchases and by the spending of increased worker incomes on consumer items.

Estimate of the economic impact on National economy generated by the construction of the High Capacity Railway line Turin-Milan-Naples

Average yearly capital expenditure:	1.5 billion Euro
Increased yearly gross production :	5.2 billion Euro
Increased yearly added value:	2.8 billion Euro
Induced direct and indirect employment:	56.4 permanent and temporary job opportunities per 1 million Euro investment (around 75.000 people/year on average)

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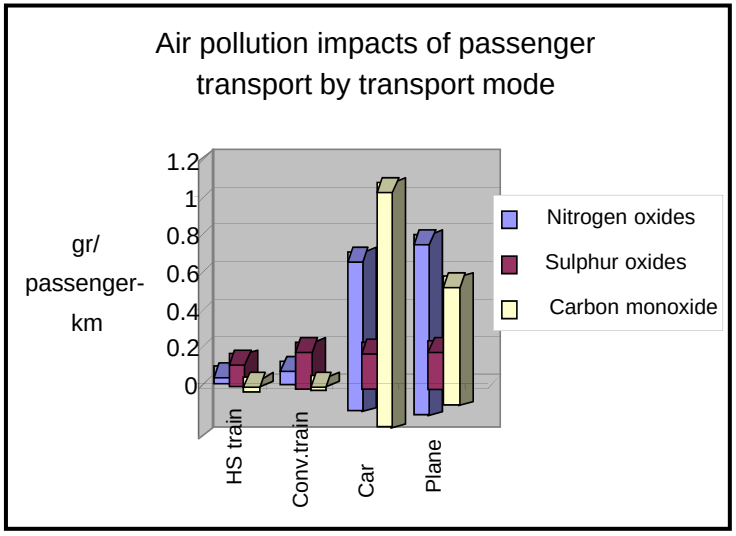
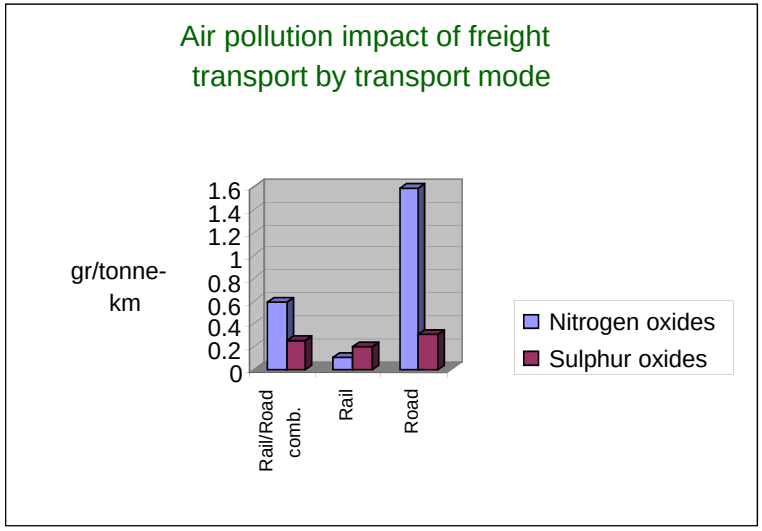
THE BENEFITS OF HIGH SPEED

BENEFITS DURING OPERATION:
NON USER BENEFITS DUE TO THE DIVERSION OF TRAFFIC FROM ROAD TO RAIL (1)

These benefits refer to those people indirectly affected by the project implementation. They are generated by the diversion of traffic from road to rail and result from the reduction of external costs associated to the provision of transport services.





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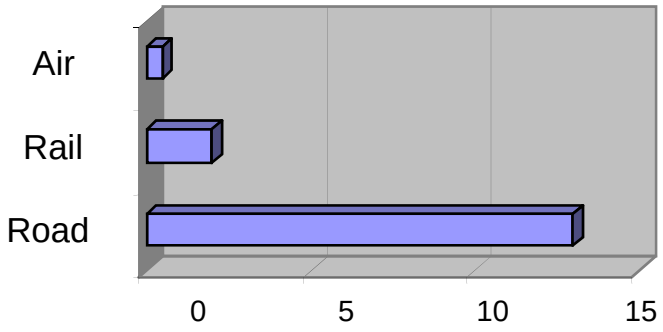
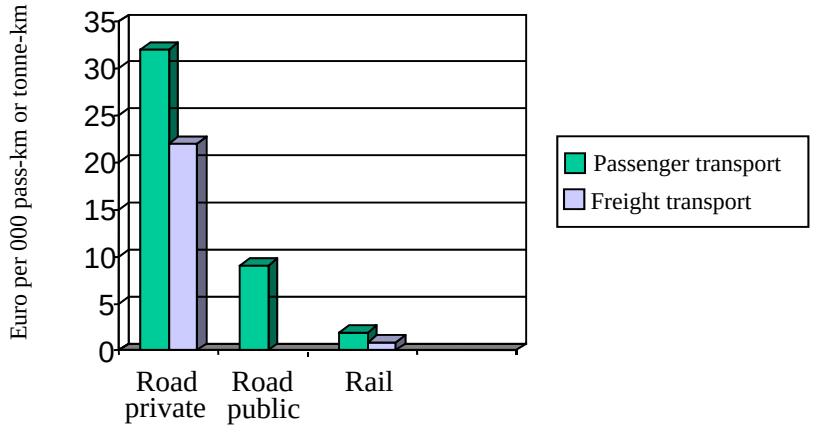
THE BENEFITS OF HIGH SPEED

BENEFITS DURING OPERATION:
NON USER BENEFITS DUE TO THE DIVERSION OF TRAFFIC FROM ROAD TO RAIL (2)

Average number of deaths per billion passenger-km in the EU by transport mode



Average social costs of accidents in EU by transport mode



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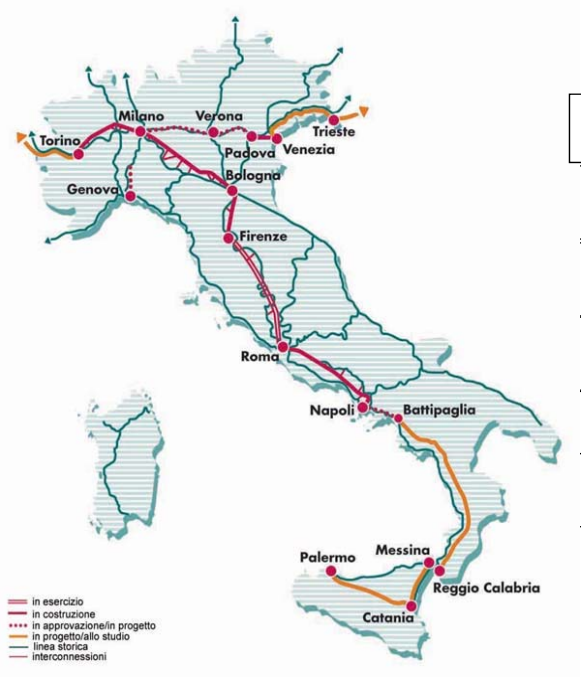
THE BENEFITS OF HIGH SPEED

BENEFITS DURING OPERATION:
USER BENEFITS DUE TO THE IMPROVED PERFORMANCE OF TRANSPORT SERVICES

These benefits relate to the time savings that will be experienced by travellers along the different routes served by High speed trains.



Section	Length	Travel times
Roma - Torino	Km.722	5'55" ⇒ 4'05"
Roma - Milano	Km.569	4'10" ⇒ 2'55"
Roma - Bologna	Km.354	2'28" ⇒ 1'55"
Roma - Firenze	Km.262	1'36" ⇒ 1'31"
Roma - Napoli	Km.214	1'45" ⇒ 1'09"

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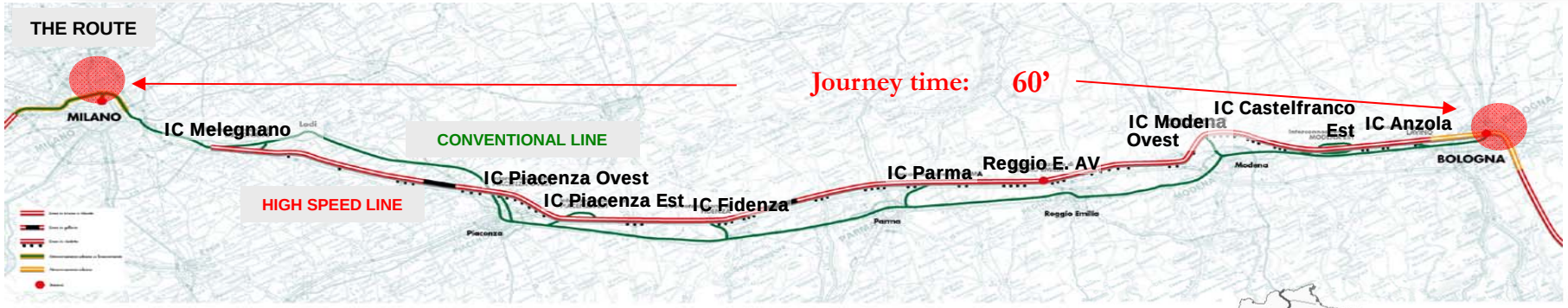
HS Line Milano-Bologna: technical features



- ✓ Lenght = 185 km
- ✓ Power supply = 25 kV a.c. 50Hz
- ✓ Signalling system = ERTMS/ETCS with no lineside signals
- ✓ Maximum speed = 300 km/h
- ✓ N° of connections with the traditional line = 9
- ✓ Peripheral Posts = 19
- ✓ Railway circulation is managed from a Traffic Control Room located in Bologna

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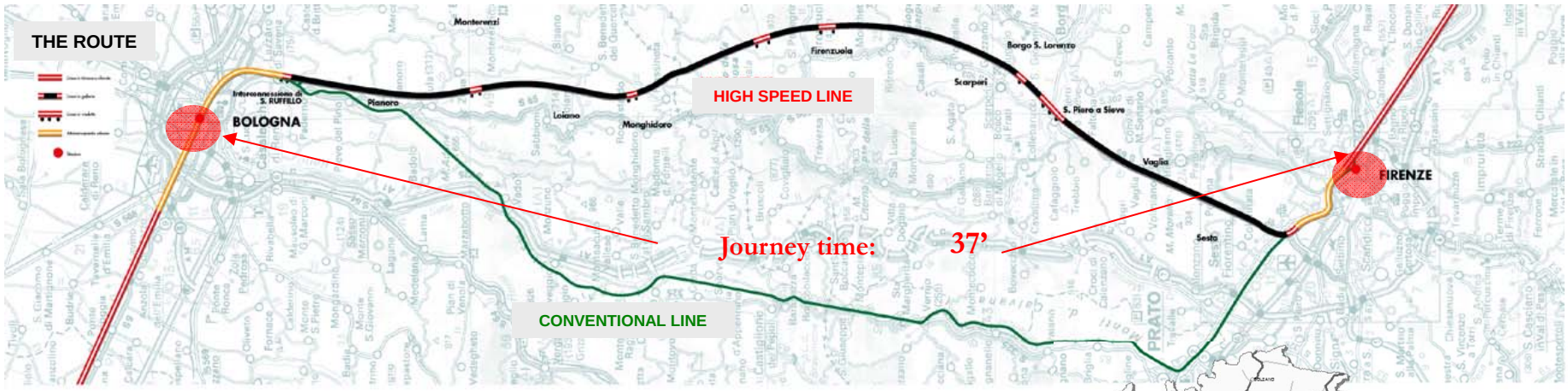
HS Line Bologna-Firenze: technical features



- ✓ Lenght = 78,5 km
  - ✓ 73,8 km tunnel
- ✓ Power supply = 25 kV a.c. 50Hz
- ✓ Signalling system = ERTMS/ETCS with no lineside signals
- ✓ Maximum speed = 300 km/h
- ✓ Peripheral Posts = 8
- ✓ Railway circulation is managed from a Traffic Control Room located in Bologna

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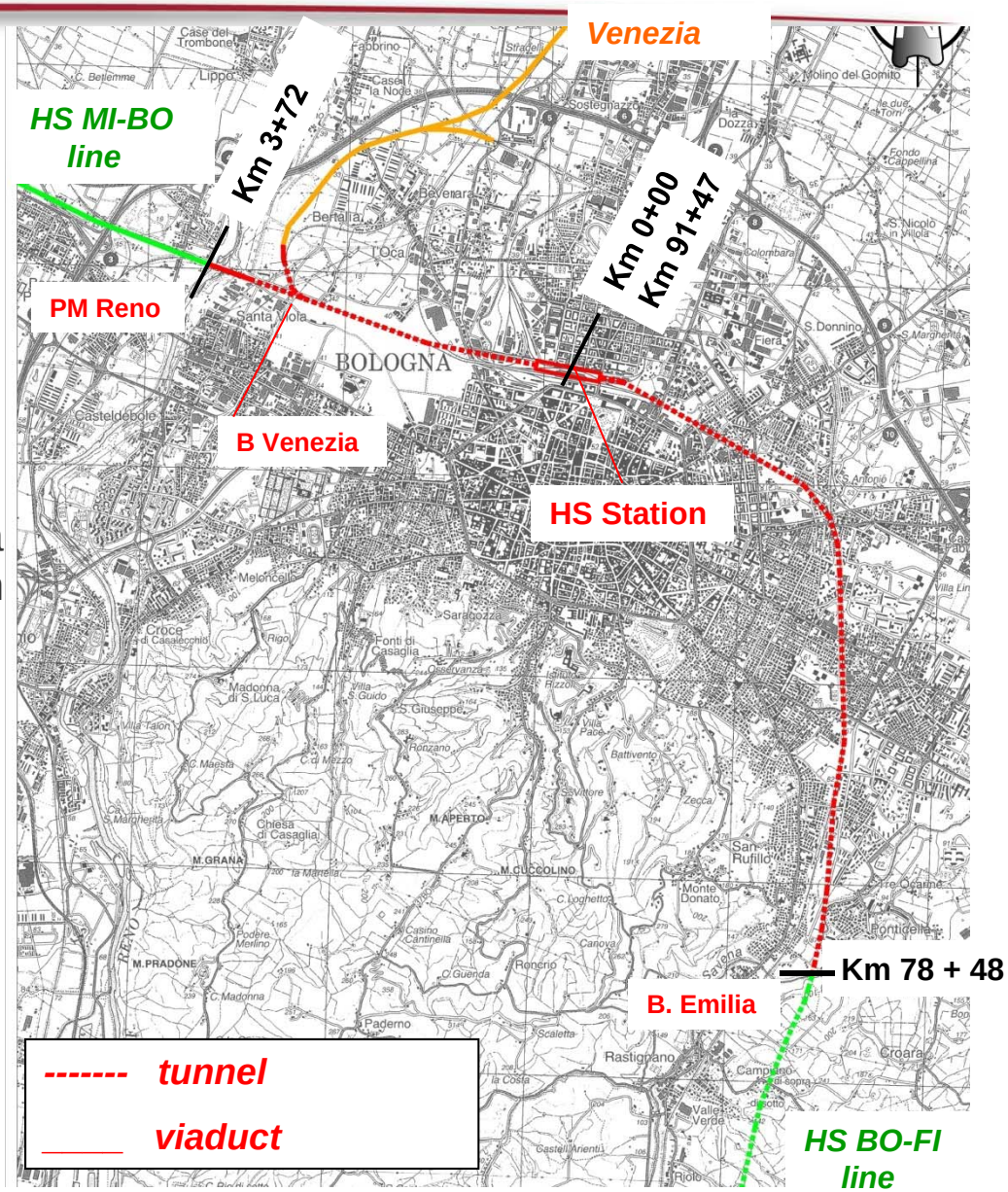
Bologna junction: the new HS Connection

- ✓ Lenght = 17,8 km
  - ✓ 13 km tunnel
- ✓ Signalling system = ERTMS/ETCS L2
- ✓ Maximum speed = 260 km/h
- ✓ Railway circulation is managed from a Traffic Control Room located in Bologna

Starting date:

- 22 June 2012 (no stop trains)



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High Speed Commercial offer

	Trains / day	Trains/hour
	Apr 2013	Traffic peak
MILANO – BOLOGNA HS	110 (28)	10
BOLOGNA – FIRENZE HS	162 (34)	14

ETR 500

AGV

	Punctuality Data [0-15’]		
Route: Milano - Roma	Target 2012	Result 2012	Apr 2013
	94,7 %	95,2 %	95,6 %

ETR 600

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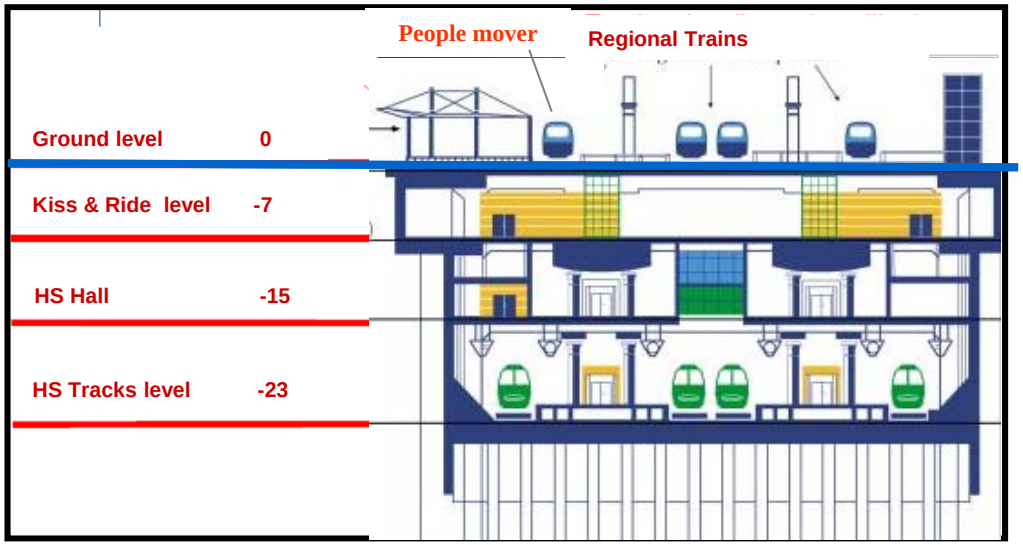
Bologna HS and ground level station



UNDERGROUND STATION

Open: June 2013

GROUND LEVEL STATION

Winning project of an international competition in the 2007

Architect: Arata Isozaki

Cost: ~ 340 million euro

Area: 42.000 mq

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Bologna Control Room

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The new Frecciarossa 1000

INNOVATION
TECNOLOGY

COMFORT E QUALITY

DESIGN A SUSTENIBILITY

INTEROPERABILITY

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