High speed rail in Europe
Lessons learned and experiences

UNECE

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Agenda

UIC & High speed
High speed rail principles
Some facts & figures
HS in Europe and around the world
The future of high speed
Concluding remarks
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What’s the UIC?

The UIC is a professional organisation serving the needs of rail transport through international cooperation at the global level.

Since 1922
230 members on all continents
Members are:

- Railways
- Rail operators
- Infrastructure managers
- Railway service providers
- Public transport companies
UIC Mission

Promoting the development of rail transport at world level, in order to meet challenges of mobility and sustainable development.
UIC Passengers activities
UIC – Intercity & High Speed

Working group in activity since 1995
Studies on strategic issues
www.uic.org/highspeed

High Speed:
- Systems in operation
- Future developments
Some examples of recent reports:

- High speed and the City
- High speed and territory management
- High speed contribution to sustainable mobility
  (including a specific report on Carbon balance)
- **High speed handbook**
- Handbook for Optimisation of Time Travel on Conventional Lines
- High speed under extreme natural conditions
- Optimal speed on high speed systems
- Infrastructure cost for Intercity & High speed services
- Night trains
- …

Full Library of studies & reports available in our website:

[www.uic.org/highspeed](http://www.uic.org/highspeed)
Tourist OPPortunities on Rail Transport (TOPRAIL)

New activity to explore and promote the potential of traffic on rail for leisure: High Speed, seasonal, charter, safety on vintage trains, cruise trains,…

New chairmanship (Catalonian Railways)
UIC – Intercity & High Speed

- Benchmarking and system analyses
- Organisation of technical workshops and training programmes
- World Congress on High Speed
Training on High Speed Systems

One week (5 days) Training Seminar, in which all the elements involved in a high speed system are analysed

10th THSS: June 2014, in Paris
www.uic.org/highspeed
World Congress on HS Rail WCHS

July 2015 in Tokyo, Japan
Organized by the UIC & East Japan Rail
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Definition of high speed

Is a “new transport mode”, fully compatible with classic rail (SNCF, 1981)

High speed means at least 250 km/h
But the definition is not unique
(EU Categories I, II and III)

High speed & high performances
Operating at more than (+/-) 200 km/h requires:

- special trains (train sets)
- special dedicated lines
- in-cab signalling

...and much more
Understanding high speed rail

A very complex system, comprised by the state of the art of:
- Infrastructure
- Station emplacement
- Rolling stock
- Operations rules
- Signalling systems
- Marketing
- Maintenance systems
- Financing
- Management
- Legal issues
- ...

Considering all of them is fundamental
High Speed is a system
High speed is not unique

• Many different commercial concepts of high speed
  (including services to customers, marketing, etc.)
• Many different types of operations
  (maximum speed, stops, etc.)
• Different ways to operate classic trains
  (in particular, the impact on freight traffic)
• Capacity and cost vary in each case
High speed advantages for society

• Offers a high capacity of transport
  Up to 380,000 passengers per day, Tokyo – Osaka
  Permits reducing traffic congestion
  Helps economic development
  Shapes land-use
• Offers sustainability
High speed contribution to sustainable mobility

- **Environment**
  - Land take
  - Energy consumption
  - CO2 emissions

- **Social aspects**
  - Reliability
  - Comfort
  - Impacts on health
  - Safety

- **Economic aspects**
  - Green jobs
  - External costs
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High speed world network

World network (V > 250 km):

- 21 365 km of lines in operation
- 13 967 km of lines under construction
- 16 348 km of lines planned

June 2013
Evolution of the world HS network

km

0 5000 10000 15000 20000 25000 30000 35000 40000 45000

Evolution of the world HS network

km


Total

Asia

Europe

Others
World rolling stock high speed fleet

High speed train sets* in operation in the world:
  Maximum speed 200 km/h or more: 2,897
  Maximum speed 250 km/h or more: 2,088
High speed train sets manufacturing: 945

* and trains operating on dedicated high speed lines

December 2012
Evolution of maximum speed on rails

Maximum speed in tests

Maximum speed in operation
World speed record: 574,6 km/h – France, April 2007
High Speed traffic volume

• 1.15 Billion passengers per year in HS trains
  → 485 Million in China
  → 300 Million in Japan
  → 125 Million in France
  → 240 Million in the rest of the world

• 15 Billion passengers have already travelled in HS trains

  Twice the population of the Earth
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<tr>
<th>In operation:</th>
<th>Belgium</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
<th>Spain</th>
<th>The Netherlands</th>
<th>United Kingdom</th>
<th>Japan</th>
<th>Korea</th>
<th>China</th>
<th>THSRC</th>
<th>Turkey</th>
<th>USA</th>
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<tbody>
<tr>
<td>Planned:</td>
<td>Poland</td>
<td>Portugal</td>
<td>Russia</td>
<td>Morocco</td>
<td>India</td>
<td>Iran</td>
<td>Saudi Arabia</td>
<td>Argentina</td>
<td>Brazil</td>
<td>Indonesia</td>
<td>Canada</td>
<td>Mexico</td>
<td>…</td>
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</table>
France: at the heart of an European Network
Germany: a particular concept on HS network
Spain: Expanding a multi technology system
Italy: Competition now
Italy: Competition now
The Netherlands: Lights and shadows
Main challenge in Europe: Interoperability
Main challenge in Europe: Interoperability
Main challenge in Europe: Interoperability
Celebrating the 50th Anniversary
Most recent technologies Shinkansen (South)
Most recent technologies Shinkansen (North)
China: from 0 to 10 000 km of HRS in just 4 years
THSRC: The only example of BOT in HSR
South Korea: Technological evolution
South Korea: Technological evolution
Turkey: HSR contributes to develop and integrate
USA: several possible models for HSR
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Liberalisation in Europe

New operators

NTV new Italian private operator
Will start operations with 25 new generation AGV trains
SNCF purchased 20 % of the capital
Globalisation
The future of high speed rail

• High speed technology is fully competitive today but new developments are necessary if we want keep this competitiveness for the next 20-30 year

• Developments in new technologies immediately follow the implementation of the first high speed system in any country
## Requirements by Regions

<table>
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<tr>
<th>Region</th>
<th>Europe</th>
<th>Asia</th>
<th>USA</th>
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<tr>
<td><strong>Common requirements</strong></td>
<td></td>
<td></td>
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<tr>
<td>• Reliability</td>
<td></td>
<td>• Life cycle cost</td>
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<tr>
<td>• Flexibility</td>
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<td>• Performance</td>
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<tr>
<td><strong>Individual requirements</strong></td>
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<tr>
<td>• Interoperability</td>
<td></td>
<td>• Localisation</td>
<td>• Creative</td>
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<tr>
<td>• Standarisation</td>
<td>(reduction of the</td>
<td>• Transfer of</td>
<td>financing</td>
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<td>variety of trains</td>
<td>technology</td>
<td>• FRA</td>
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<td>/components</td>
<td>• Consulting</td>
<td>compliance</td>
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<td>• &quot;Buy America&quot;</td>
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In the coming years, high speed will advance on

• Higher commercial speeds
  - maximum speeds in the range of 320 - 350 km/h
  - more availability time for the infrastructure
• New conception of the infrastructure elements:
  - ballasted or unballasted track, new fastenings systems
  - new materials (i.e. catenary wires)
• Standardisation and modularity of rolling stock
• New braking systems
• More respect to the environment (noise, energy efficiency)
• Improvements on safety, security and comfort
  - crossing winds, earthquake’s detection, etc.
• New technologies (telecommunications, WiFi, etc.)
In the coming years, HS rail operators will ask for

**Business**

- More capacity (double deck &/or 2 + 3 instead of 2 + 2)
- More availability and maintainability of trains (RAMS)
- More reduced costs of (purchase and) maintenance (LCC)
- More reduced fees for infrastructure use
- More energy efficiency and less energy consumption
- Optimisation of the operation costs (i.e. when low occupancy)
- Globalisation
- …
Capacity
Capacity

Shinkansen loading gauge

- 3,360 mm
- (3,400 mm)
- 1,435 mm

European loading gauge

- 2,904 mm (TGV-POS)
- (3,150 mm)
- 1,435 mm
New prototypes becoming series trains
New prototypes to compete
New prototypes developed by the industry
New prototypes developed by the industry
New prototypes developed by the industry
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Conclusions - Lessons learned

• Network: from a new HS line to a Continental HS network
• Operating on “classic”, “upgraded” and HS networks
• Capacity concept
• Stations: strategy. Situation, number, intermodality, accessibility, functionality
• Integral protection: safety, security, civil protection
• Environment and sustainability. Carbon balance
• Interoperability
• Skills & knowledge: how to follow
• THE AIM IS THE SERVICE. The line is the consequence
Conclusion

• High speed is **expanding dramatically** around the world
• **A highly beneficial transport system for society**
• High speed **always needs public help**
• High speed is a **complex system**
• High speed conception is **not unique** and it must be adapted to each case
• High speed (railways) must continue to make **innovations**, in order to continue serving Society
Complement more than compete
Thank you very much for your kind attention

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