



HIGH-SPEED RAIL : THE RIGHT SPEED FOR OUR PLANET Under the High Patronage of his Majesty King Mohammed VI

# Session 6.4, Room Fez 2 Stations / Accessibility



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#### Session 6.4 Stations / Accessibility Speaker Lists;







HIGH-SPEED RAIL : THE RIGHT SPEED FOR OUR PLANET Under the High Patronage of his Majesty King Mohammed VI

# 11<sup>TH</sup>WORLD CONGRESS OF HIGH-SPEED RAIL

Marrakech, 7-10 MARCH 2023

# ACCESSIBILITY REQUIREMENTS BEYOND THE USA: A CLOSE LOOK AT THE KINGDOM OF MOROCCO

Svetlana Grechka Professional Engineer (PE), Denver Regional Transportation District, USA Session 4-6.4 Stations/Accessibility







#### ACCESSIBILITY REFERENCES

- The Kingdom of Morocco
  - Provisions of the Law No. 07-92 related to the social protection of disabled persons
  - Framework of the Law No. 97-13 on the rights of persons with disabilities, 2014
  - Law No. 10-03, Article 1 considers buildings, roads, outdoor areas and the various means of transport to be easily accessible, 2003
- United States of America
  - The Americans with Disabilities Act (ADA) was signed into law in 1990
  - 1st version of the ADA Standards was adopted in 1991
  - 2010 revised regulations adopted accessibility standards called the 2010 ADA Standards for Accessible Design





#### ACCESSIBILITY IMPLEMENTATION IN MOROCCO

Pilot Project to Promote Accessibility for People with Limited Mobility

- Sponsored by Japan's Policy and Human Resources Development (PHRD), Year 2012-2017
- An inventory of needed improvements was conducted
- Work was carried on to update urban infrastructure

#### ✤ Outcome

- At least 5 km of boulevards were upgraded in Marrakesh
- Public infrastructure elements were upgraded in three cities to include accessibility access
- Several transportation infrastructures were upgraded
- The draft Construction Code has been prepared by the Ministry of Housing and Urban Planning





#### ACCESSIBILITY GUIDELINES AND STANDARDS

Technical Specifications for Interoperability (TSI) related to accessibility of the Union's rail system for persons with disability and persons with reduced mobility (PRM), EU

- ✤ Applied to the following network and new infrastructure by 2008 Directive:
  - Conventional rail system network
  - High-speed rail system network
- Applicability for Rail Stations



Image: Tangier Ville Rail Station





# EXAMPLES OF ESENTIAL ACCESSIBILITY REQUIRMENTS FOR TRANSIT INFRUSTRUCTURE

- Parking Facilities
- Obstacle-Free Route
  - Horizontal circulation
  - Vertical circulation
- Lighting
- Visual Information



Accessible Route, Image Source: www.ada.gov





#### ESENTIAL ACCESSIBILITY REQUIRMENTS FOR TRANSIT INFRUSTRUCTURE – PARKING FACILITITES

- Technical Specifications for Interoperability (TSI):
  - Sufficient and adapted parking space
  - Nearest practicable position within parking area
- ADA Standards, USA
  - Required number of accessible parking 2% of total parking spaces
  - Shortest accessible route to accessible entrances



Parking space, Image Source: www.ada.gov





# ESENTIAL ACCESSIBILITY REQUIRMENTS FOR TRANSIT INFRUSTRUCTURE – OBSTACLE FREE ROUTE (HORIZONTAL CIRCULATION)

- Technical Specifications for Interoperability (TSI)
  - Minimum width of platform is the width of danger area (area where passengers are not allowed to stand when train is passing or arriving) plus two opposing freeways 160 cm (63") total
  - Rail platform with tactile walking surface indicators
    - Attention pattern to indicate hazards
    - Guiding pattern to indicate path of travel

- ✤ Accessibility Standards, USA
  - Minimum width calculated based on egress
  - Detectable warning along full length of platform







#### ESENTIAL ACCESSIBILITY REQUIRMENTS FOR TRANSIT INFRUSTRUCTURE – OBSTACLE FREE ROUTE (VERTICAL CIRCULATION)

- Technical Specifications for Interoperability (TSI)
  - Staircase minimum width 160 cm (63")
  - Stairs and ramps shall be provided with handrails of both sides



Rabat Agdal Rail Station, Image Source: Wikimedia Commons

- ADA standards, USA
  - Minimum width based on egress capacity
  - Handrails shall be provided on both sides of stairs and ramps



Image: Denver Union Station





# ESENTIAL ACCESSIBILITY REQUIRMENTS FOR TRANSIT INFRUSTRUCTURE - LIGHTING

- Technical Specifications for Interoperability (TSI), Lighting on Platforms
  - Normative document EN 12464-2, 2014
    - Covered urban stations 100 lux
    - Walkways and footbridges 10 lux



Gare de Marrakech Rail Station, Image Source: Wikimedia Commons

- ✤ ADA standards, USA
  - Illumination at elevator landing 5 foot candle (54 lux) minimum



Elevator Landing





#### ESENTIAL ACCESSIBILITY REQUIRMENTS FOR TRANSIT INFRUSTRUCTURE – VISUAL INFORMATION (BRAILLE SIGNS)

- Technical Specifications for Interoperability (TSI)
  - On handrails
  - On walls at height between 145 cm and 165 cm



- A mark of destination in Braille
- It is desirable that a mark in Braille should be accompanied by its decoded version

- ADA standards, USA
  - At least one station name Braille sign shall be placed in uniform location
  - Braille sign shall be located 48 inches (122 cm) minimum above surface



#### ACCESSIBILITY REQUIREMENTS BEYOND THE USA: A CLOSE LOOK AT THE KINGDOM





#### COMMONALITIES BETWEEN MOROCCO AND USA



- Accessible transit facilities help individuals with disabilities to live independently within their communities by providing an access to public transportation
- Transportation allows individuals with disabilities to be valuable members of our society as individuals, workers, consumers, and taxpayers





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# THANK YOU







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# 11<sup>TH</sup>WORLD CONGRESS OF HIGH-SPEED RAIL

Marrakech, 7-10 MARCH 2023

# Innovative technologies for people with reduced mobility in the station environment

Nerea Canales Sebastian R&D Engineer, RFI, Italy Session4-6.4 Stations / Accessibility







#### **Project Context**

Rete Ferroviaria Italiana (RFI) has launched a research project aimed at providing an indoor navigation tool in high-speed stations, useful for all travellers, based on user profiling. The research project investigates the use of 5G+UWB in the context of assisting people with disabilities, in order to allow the traveller to move around the station independently, without the need for external support.







#### Indoor Navigation with 5G+UWB

The Indoor Navigation 5G+UWB technology proposes an integrative smartphone-based solution, without the need for additional devices, that will allow people to navigate along predefined station routes.

The system will load a virtual route onto the smartphone, providing autonomous guidance along the route that allow :

- Moving along barrier-free routes and explore the station independently with one's smartphone.
- Having support along the route to reach specific points (e.g. the platform and the assigned carriage), as a supplement to the tactile routes currently present in the station.
- Dynamic and multisensory station information







#### Study of Innovative Technologies

Guidance by Indoor Positioning in high-speed stations must be able to guarantee:

- Accuracy, estimation below 1m (approx. 20cm)
- Low technological complexity (User Friendly)
- Low device power consumption

- Ability to process large volumes of data in real time
- High connection speed and low latency
- Flexibility in updating SW information



For this reason, the proposed solution uses techniques based on 'Data Fusion' of the 5G signal and the Ultra Wideband signal present in the latest generation of smartphones.





#### 5G+UWB Positioning: Scenario

Together, the two technologies make possible to create a guided station navigation scenario with an accuracy of the order of tens of centimetres



#### UWB transceiver module (anchor)





#### Indoor Navigation 5G+UWB technology demonstrator

The experimental part of the project (technology demonstrator) is aimed at studying innovative technologies and is developed in several stages.



# It is planned to realise and **install a technological demonstrator at the Rimini station**

The degree of accuracy in position estimation that the service requires (below 1m) suggests the use of **solutions for position estimation based on "Data Fusion"**.

For the realisation of such a service, the use of a public 5G network provided by a telecommunication operator and the additional installation of a 'low-cost' infrastructure ,based on unlicensed frequencies, of anchor sensors (Ultra Wide Band sensor) is envisaged.





#### Rimini station testing MNO (Mobile Network Operator) network coverage

The project's first step was to carry out a measurement campaign to obtain the electromagnetic characteristics of the HS station through the analysis of Frequency bands present belonging to telecommunication operators: 2G (GSM, EDGE),3G, 4G (LTE) 5G.

Focusing on 5G band, two signals were found in the 3.6 - 3.8 GHz :

Signal E1 - 5G NR signal with 80 MHz bandwidth - range 3640-3720 MHz

Signal E2 - 5G NR signal with 80 MHz bandwidth - range 3720-3800 MHz









#### Rimini station testing UWB sensors coverage

To create an infrastructure which enables localization through 5G+UWB technology, it was necessary to conduct a state-of-the-art study of UWB technology in modern smartphones. This entailed the need to carry out a field study in order to analyse the coverage area of each UWB devices, in order to define the number of sensors to deploy in the station.





#### Rimini station testing UWB sensors coverage

For each measurement area, four UWB sensors were considered, the anchors, positioned so as to surround the area in which the receiving terminal (Smartphone) moves. Therefore, the measurements were carried out in both static and dynamic modes, i.e. with a user walking in the path of interest.

> UWB Sensor





Platform area

Innovative technologies for people with reduced mobility in the station environment









#### Rimini station testing UWB sensors coverage

The different pictures show how the measurement campaign at the Rimini station was developed. Tripods with UWB sensors installed were moved around the station to analyse the coverage of the sensors used. These sensors were placed at different heights 2.5m 3m and 4m.





#### Key take away and conclusions

The measurement campaigns conducted have defined the positioning and number of anchors to be installed in the station. Moreover, has permitted the electromagnetic characterization of a railway station, a groundbreaking study in the station domain.

The following steps of the research project will be:

- Installation and testing of the designed system at the Rimini station
- Validation and testing of the technology demonstrator with application in pre-Alpha version
- Verification of the fulfilment of service performance requirements
- Development of a customised mobile application

The development of the application as well as the validation of the system would involve the principal associations





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Marrakech, 7-10 MARCH 2023

# FRECCIAROSSA – FSI GROUP

Antonio Tresca Resp. Customer Service/Direct Sales High Speed Trains, Trenitalia Spa Sesson4-6.4 Stations / Accessibility







#### Frecciarossa - Main Features



#### ENVIROMENTAL SUSTAINABILITY

- · High aerodynamic efficiency and energy saving
- First HS train in the world having obtained the **certification** of environmental impact (EPD)
- Almost entirely made of recycled materials (93%)



#### **ACOUSTIC COMFORT**

- High soundproofing
- Reduced vibration



#### TECHNOLOGY

- On board WIFI network and Internet connection
- · Equipped with the most advanced technological system for traffic management

(ERTMS / ETCS)

- Predictive diagnostic system
- CCTV system







#### Frecciarossa – Executive Class



- Ergonomic swivel leather armchairs in same direction of travel
- 1+1 seat layout
- 1.5 meters distance between armchairs
- Relax lighting before than 7 a.m. and after 20 p.m.
- Freccia Lounge & Club free access at the main stations
- Dedicated catering service at your seat
- Exclusive Fast Track check-in at stations of Rome and Milan
- Welcome on board by Trenitalia staff
- All other services offered in Standard, Premium, Business classes









#### Four Levels of Service







- Eco-leather reclining seat
- "Vis-à-Vis" accommodation
- Special luggage zone
- Table and power sockets at seat
- Frecce Entertainment Portal
- Travel info monitors
- Internet Wi-Fi
- Easy Bistrò catering service
- On site cleaning service
- Air-conditioned car

- Leather reclining seat
- Free welcome drink & snack

- Wide ergonomic leather armchairs
- Crystal seat dividers for more privacy
- Business Salottino option
- Meeting room service option
- PRM dedicated seats and toilet
- Silent coach option available





#### Our Customer Assistance Process



- Sala Blu (14 offices in Italy);
- Redesigned Ticket Offices and FrecciaLounge;
- Contact center (free toll number 800 90 60 60 – or 02.32.32.32 from mobile phones);
- Posto Blu: reserve a seat for PRM and partner and then pay within 24 hours before departure.

- Lift truck assisted ascent/descent service;
- Infobordo App allows the audio / video delivery of the announcements;
- High Quality Refreshments;
- **Disruption Assistance** in real time through Trenitalia Control Room and re-routing through an Al Bot via whatsapp.

- Smart Refund: obtain the refund for train delay directly into a digital wallet in few minutes;
- Carta Blu: a special card dedicated for PRM.





#### Before the Journey



















FRECCIAROSSA - FSI GROUP





#### On Board Services for PRM



Lift truck assisted ascent/descent service guaranteed by station manager through Sala Blu reservation;





# Pescrivi il tuo problema × Questo ci siuterà a trovare la miglior soluzione per te Buongiorno, ho perso la concludenza e devo essere riprotetto Mi potresti fornire il PNR del tuo biglietto? PHLPNE PHLPNE Scrivere anche la tua









#### Digital Issuing of Carta Blu

- Carta Blu is the card that allows PRM Customers to book a trip with Trenitalia, receive discounted fares and other advantages to both the PRM and the companion;
- more than 100k Cards issued and in dec 2022 the issuing process has been completely digitized within three simple steps:

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#### Smart Refund







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Marrakech, 7-10 MARCH 2023

# The success of High Speed rail in Spain

#### Marie Jeanne Lopez

Accessibility Manager (Customer Experience and Accessibility) **Renfe** Session4-6.4 Stations / Accessibility HS23I-141247BOH







#### THE BUSINESS CHALLENGE

PEOPLE

- People
- Training
- A Service designed for internal and external customers
- A Service for All



The success of Spanish High speed rail





#### THE BUSINESS CHALLENGE

- PEOPLE
  - People
    - The on-board staff
    - Intervention staff
    - The driving staff
    - Station staff







#### THE BUSINESS CHALLENGE

- PEOPLE
  - Training
    - Mandatory training
    - Welcome training
    - Recycling training
    - Voluntary training



#### "To Know is to Understand"





#### THE BUSINESS CHALLENGE

PEOPLE

- A service for internal and external Customers
  - Designed for Renfe Professionals
  - Designed for Travellers
  - To satisfy all internal and external Customers of Renfe







#### THE BUSINESS CHALLENGE

PEOPLE

A service made for Everyone



#### Each Client is different and that is the reason we serve you differently





#### THE BUSINESS CHALLENGE

PEOPLE

- A service designed for Everyone
  - Competence
  - Differential values
    - Our Staff
    - An inclusive vision of High speed rail transport







#### THE BUSINESS CHALLENGE

PEOPLE

- A service designed for Everyone
  - Differential values
    - Our People
      - Since 1992
      - A general offer that has been customized







#### THE BUSINESS CHALLENGE

PEOPLE

A service designed for Everyone

Differential values



- An inclusive vision of High speed rail transport
  - An Accessibility Plan 2020-2028
  - Days of "To Know is to Understand"
  - The Day of People with Disabilities
  - Accessibility Week at Renfe
  - Partnership with Disability Associations





#### THE BUSINESS CHALLENGE

- PEOPLE
  - A service designed for Everyone
    - Support service
    - An inclusive web
    - Inclusive communication
    - Adapted trade regulation







#### THE BUSINESS CHALLENGE

PEOPLE



#### Working with People with Special Needs makes us grow and

be unique role models





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# Thank you renfe

#### Marie-Jeanne Lopez

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Marrakech, 7-10 MARCH 2023

# The Role of High-Speed Rail Accessibility for the Location Choice of Knowledge-Intensive Firms. An Interview Survey in Germany

Manuel Weiß Research Associate, ILS Research Dortmund, Germany Session 6.4 Stations / Accessibility







#### INTRODUCTION AND BACKGROUND

High-Speed Rail (HSR) improves accessibilities and can potentially initiate developments

Accessibility as a locational factor for households and firms Knowledge-intensive firms (KIF) depend on different dimensions of proximity and exchange Potential benefits from agglomeration and network externalities

HSR accessibility remains one among many locational factors Most studies combining HSR + knowledge-intensive activities are on the regional scale

Investigating the location choices of knowledge-intensive firms (KIF) can provide important insights and policy recommendations

Sources: Banister & Givoni 2013; Beckerich et al. 2019; Bentlage et al. 2013; Blanguart & Koning 2017; Chen et al. 2019; Chen & Hall 2011; Strambach 2014; van Meeteren et al. 2016; Willigers & van Wee 2011 THE ROLE OF HIGH-SPEED RATE ACCESSIBILITY FOR THE LOCATION CHOICE OF KNOWLEDGE-INTENSIVE FIRMS 52





#### RESEARCH QUESTIONS

What role does the HSR access have for the location choices of KIF?

Which firm characteristics cause differences in the relevance of the HSR access?

What are other factors that influence the location choices of KIF?



#### HIGH-SPEED RAIL IN GERMANY

First two HSR lines in 1991 Today: ~ 1,600 km, 32 currently served stations

*Hybrid-National*: passenger HS + conventional rail Polycentric spatial structure is reflected

Most stations are upgraded and located in inner-city locations



Sources: Perl & Goetz 2015; UIC 2022



#### CASE STUDIES

Station	Year of Opening	Inhabitants (2019)	Existence	Station location
Fulda	1991	69,000	upgraded	central
Vaihingen (Enz)1	1991	45,000	newly built	edge
Cologne (Köln) Messe/Deutz	2002	1,088,000	upgraded	central/ edge
Montabaur	2002	40,000	newly built	edge
Siegburg/Bonn	2002	42,000	upgraded	central
Ingolstadt	2006	137,000	upgraded	central/ edge
Erfurt	2015	214,000	upgraded	central
Bamberg	2017	77,000	upgraded	central

<sup>1</sup> currently mainly served by InterCity/EuroCity-trains Sources: BBSR; own resource







#### METHODICAL APPROACH

Identification of KIF based on industry branch (Eurostat)
 Location in close spatial proximity to HSR stations

49 semi-structured interviews with firm representatives

Inductive approach and qualitative content analysis



Figure: Location of interviewed KIF within isochrones and buffers around the HSR stations

Sources: Eurostat 2016; Flyvbjerg 2006; Yin 2018

THE ROLE OF HIGH-SPEED RAIL ACCESSIBILITY FOR THE LOCATION CHOICE OF KNOW LEDGE-INTENSIVE FIRMS





#### KNOWLEDGE BASES TO CATEGORISE KNOWLEDGE-INTENSIVE FIRMS (KIF)

- To distinguish types of required knowledge
- Distinction between analytical, synthetic, and symbolic knowledge Two main sectoral clasifications:
  - ✤ High-Tech (HT)
  - Advanced Producer Services (APS)

	High-Tech	APS
Analytic	Biotechnology, Pharmaceuticals	Not applicable
Synthetic	Automotive, Food	Consulting, Software

Table: Combination of knowledge base and employment sectors



Figure: Knowledge bases and industries: an illustration (Asheim 2007: 227; edited)

Sources: Asheim 2007; Legler & Frietsch 2006; Zhao et al. 2017

THE ROLE OF HIGH-SPEED RATE ACCESSIBILITY FOR THE LOCATION CHOICE OF KNOWLEDGE-INTENSIVE FIRMS





#### MAIN FINDINGS ON FIRMS' LOCATIONAL FACTORS

Establishment after HSR implementation: HSR more often strategic important

\* Mainly synthetic-APS and located in the immediate station area

#### Differences concerning sectoral distinctions

- \* HSR most important for consulting and project management
- \* HT-firms attach particularly high importance to the motorway accessibility
- \* Software firms express ambiguity due to spatially independent activities

Path dependencies: regional and private ties are crucial

Sometimes relocation to the HSR station area





#### RELEVANCE OF HSR AND OTHER LOCATIONAL FACTORS: KNOWLEDGE BASES

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	High-Tech	APS		
Analytic	3	Not applicable		
Synthetic	8	28		
Symbolic	Not applicable	7		

Sources: Own interviews; adapted from Zhao et al. 2017





#### IMMEDIATE STATION AREA AS DISTINCTIVE LOCATIONAL FACTOR

Characteristics appreciated and expressed:

- "lively/pleasant/urban environment"
- "urban/supply infrastructure"
- "visibility", "image", "not like a greenfield site"

Station as 'place'

\* Significance of urban amenities and temporary proximity

Soft factors more significant than local business cooperation

Resident (APS) firms relationally and network-like connected, spatial proximity to local actors lesser important  $\rightarrow$  Station as 'node'



Sources: Own interviews; Bertolini 1999





#### PRELIMINARY CONCLUSION

HSR accessibility seldom decisive but completes portfolio of location factors Significance of accessibility depends on type of firm HSR explicitly relevant for APS firms; otherwise, "nice benefit" and "helpful"

HSR accessibility shapes local and interregional business activities Partial dominance of immediate station area compared to relevance of HSR

Role of HSR in territorial development:

- ✤ HSR station areas should be developed in a more targeted way
- Efficient land management: Integrated mixed-use development and plea for Transit-Oriented Development





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# THANK YOU

Part of the research project 'Brain Train? High-speed rail stations as focal points of the knowledge economy'

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HIGH-SPEED RAIL: IS THE SPEED OF PLANET ACCESSIBLE TO ALL? An Accessibility Review For A High-Speed Station at the Capital of Türkiye: Ankara High-Speed Train Station

Baki Burak, Acıl Architect, Turkish State Railways, Türkiye Session4-6.4 Stations / Accessibility

**HIGH**SPEED

Morocco 2023

