Promotion du Grand Axe Ferroviaire de marchandises Scandinavie-Rhin-Rhône-Méditerranée Occidentale A.S.B.L.

Consortium

Technical, Socio-economic and Supply/Demand study regarding the transport of the FERRMED Great Rail Network (Scandinavia-Rhine-Rhône-Western Mediterranean)

Technical Analysis

Presented by Patrice Bouron - INEXIA

Contents

- FERRMED Rail Network Definition
- FERRMED Standards
- Bottleneck analysis
- Terminals
- Costs
- Recommendations
- Conclusion

FERRMED Rail Network Definition

Consortium

- Started with FERRMED Association Map
- Line by line analysis
  - FERRMED Standards
  - Expert judgement
- Optimal freight train routes selected
- Lines not meeting criteria not retained

The FERRMED Rail Network (2005)

FERRMED Standards 1/2

- **Electrification : preferably 25 kV AC**
- **Double track x 2 on the Core Network**
- **UIC track width (1,435 mm)**
- **UIC C loading gauge**
- **Trains length reaching 1,500 meters with loading capacity from 3,600 to 5,000 tonnes**

FERRMED Standards 2/2

- **Maximum slope of 12‰ and limited ramps length**
- **Max axle load : 22.5t ÷ 25t/axle**
- **Interoperability with ERTMS L 2**

  (ETCS + GSM-R + Traffic Management System (e.g. Europtirails) = ERTMS L2)
- **Availability of capacity for Freight train 24h/day and 7 days/week**
- **Locomotive and wagon concepts adapted to FERRMED standard**

The FERRMED Rail Network (2025)

Compliance with FERRMED Standards

- **Electrification :** the majority of the lines used by FERRMED Network are electrified
- **Slopes :** the FERRMED Network routes comprises lines with slopes ≤ 12 ‰ and new base tunnels decrease gradients
- **Signalling :** ETCS L1 and L2 + GSM-R are being implemented
- **Axle load :** With new wagons, net load may be increased in keeping the current axle load of 22.5t. New lines built for 25t/axle

Non-compliance with FERRMED Standards

- **Track gauge :** Finland (1,524 mm)

  Spain (1,668 mm for conventional lines and 1,435 mm UIC Standard for new HSL)

- **Loading gauge :** Several loading gauges : the aim is to have at least GB1 or PC 410, new lines built in UIC C gauge.

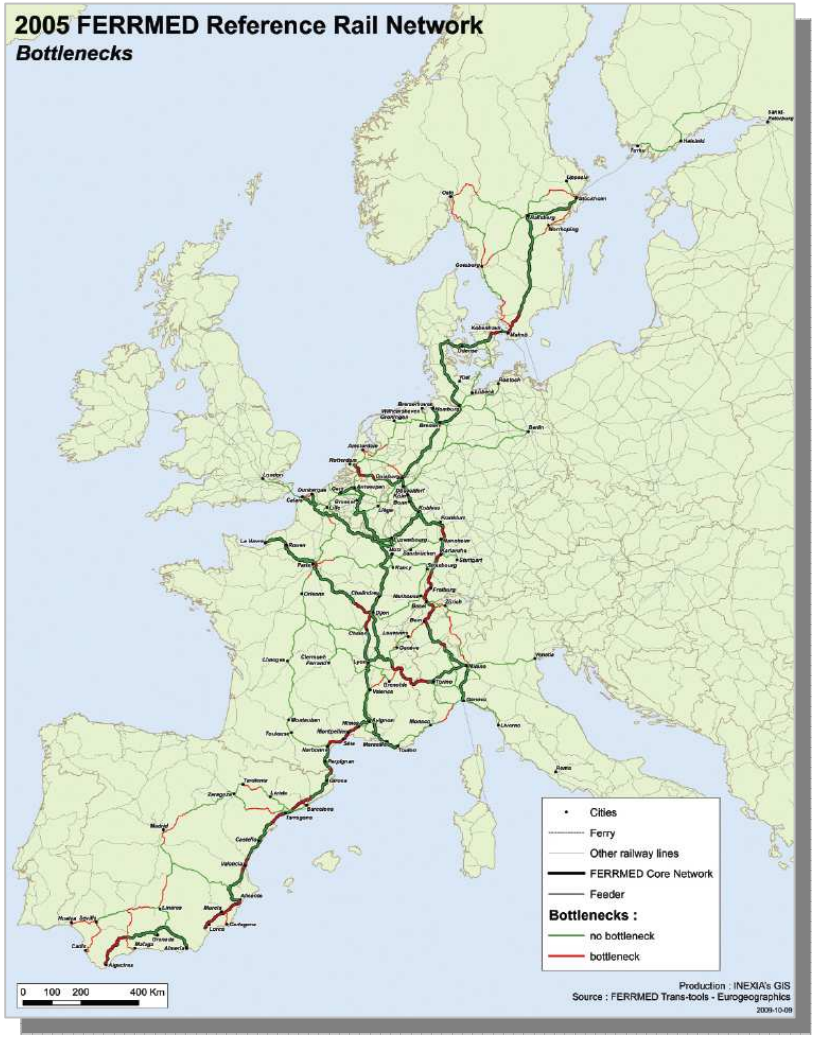
- **Freight train length :** Current European average : 400 m, the aim is to reach an average of 750 m with 1,500 m train length. Solve : coupling issue and synchronous braking system

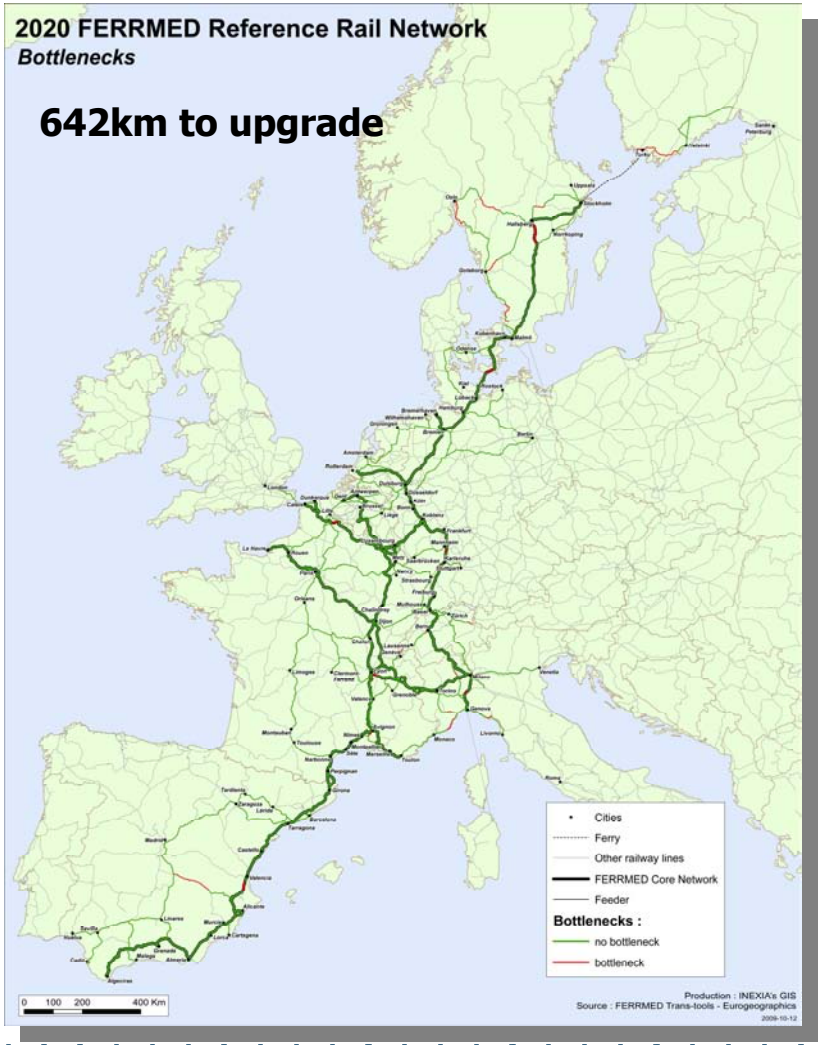
- **Ports and terminals :** Siding tracks increase up to 1,500 m

Bottleneck Analysis

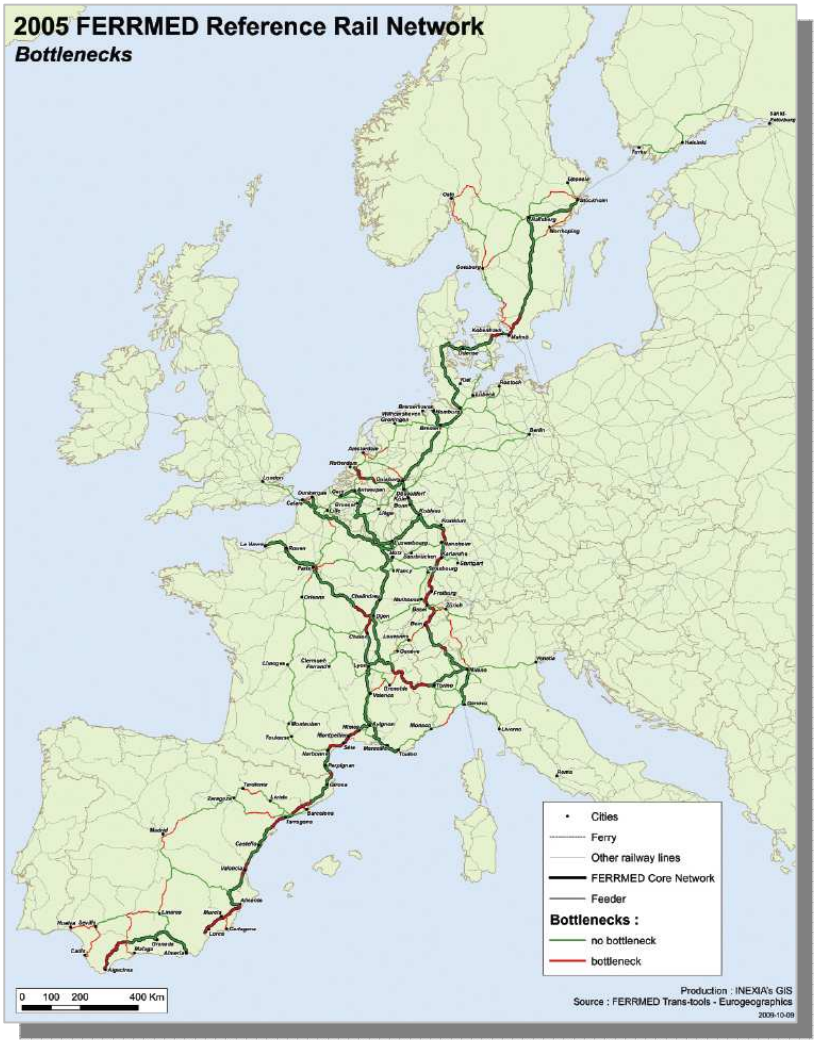
- Theoretical capacity of each line calculated
- Capacity compared with train traffic
- Residual capacity determined
- Bottlenecks identified based on :
  - residual capacity
  - relative capacity (track occupation)
  - variation of traffic intensity

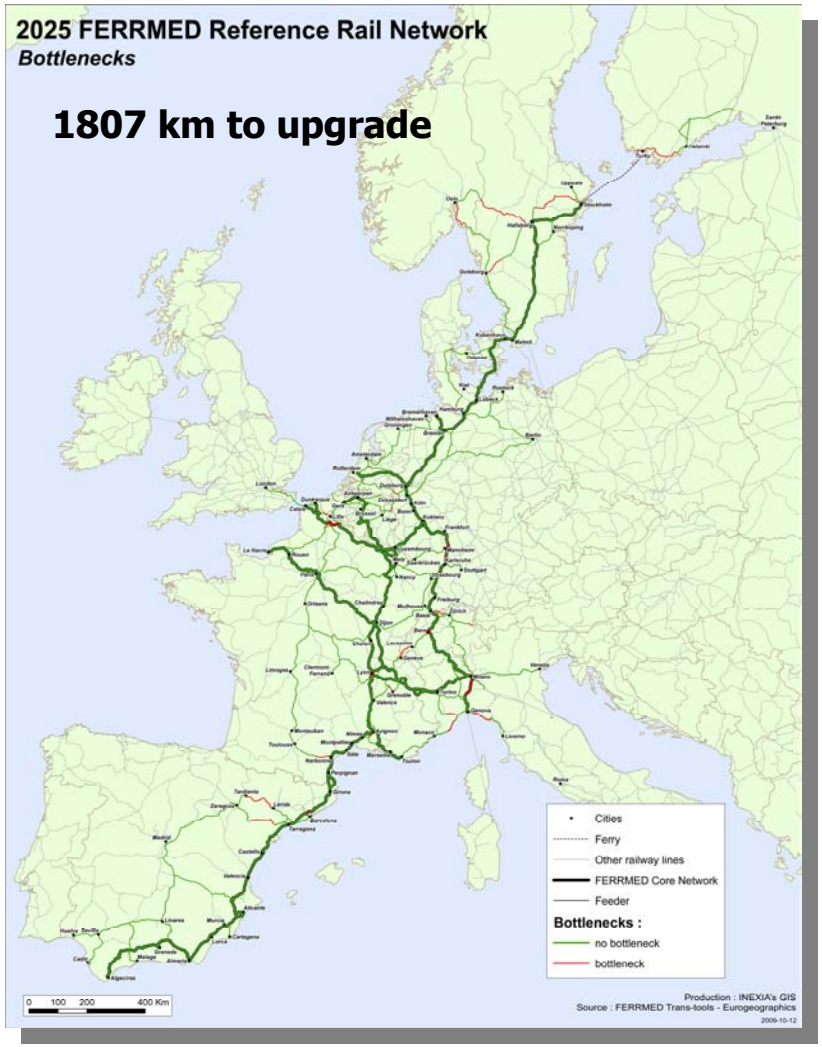
Bottleneck Locations





Bottleneck Locations

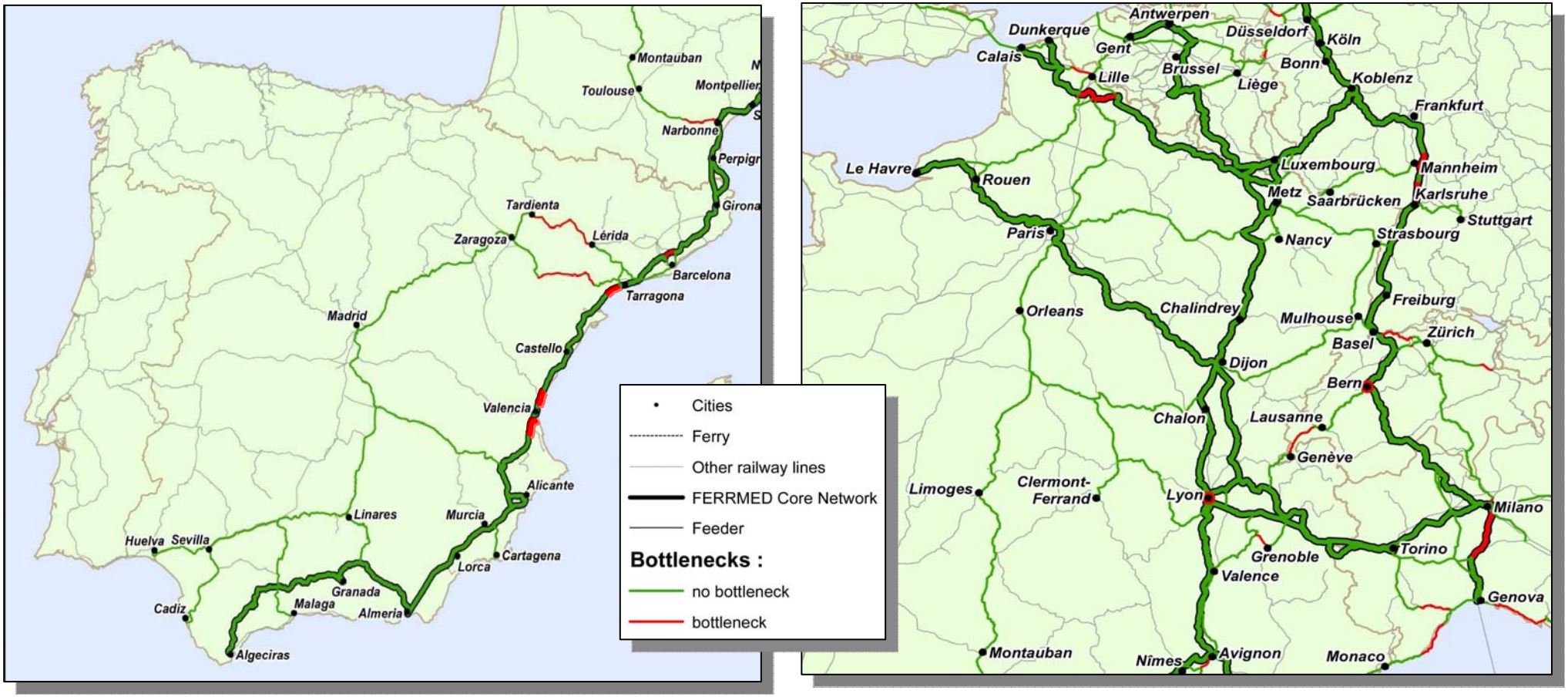




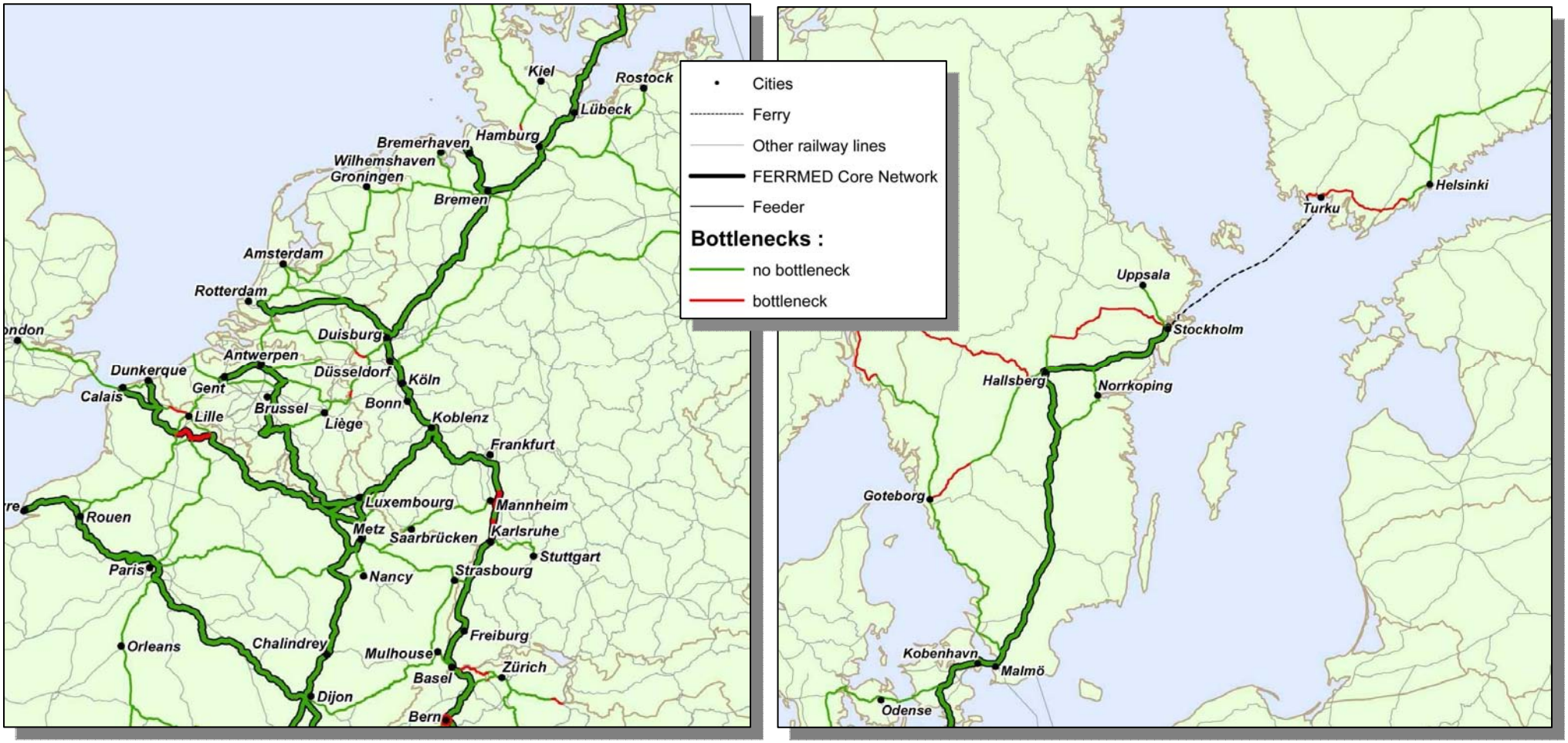
Bottleneck Comments

- Some 2020 bottlenecks will not be solved as they disappear in the 2025 case because of planned projects
  - the number of 2020 bottlenecks to solve < 2025
  - we do not propose as much linear upgrade in 2020 as in 2025.

Bottleneck Locations



Bottleneck Locations



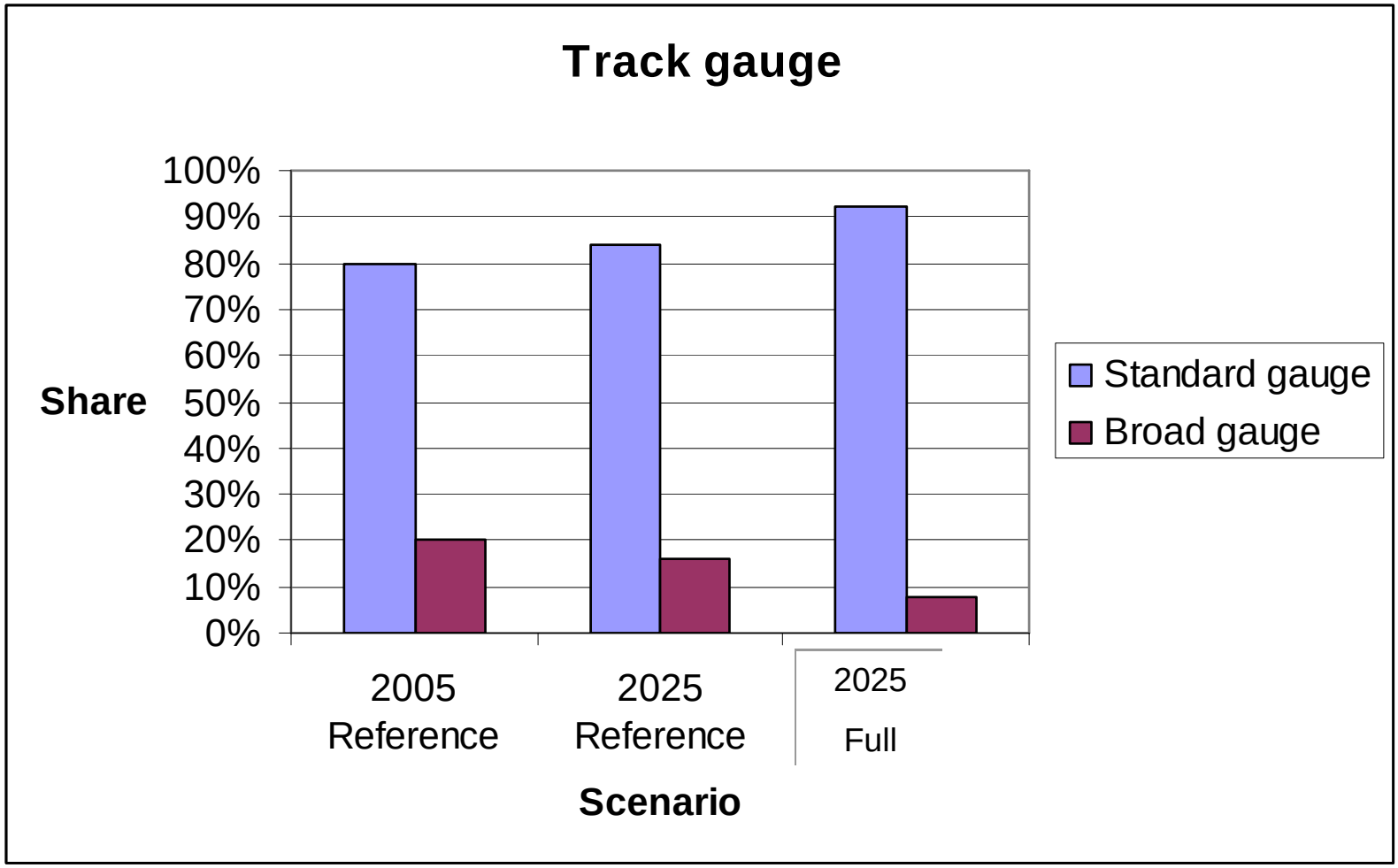
Bottleneck Analysis Results

Country	Scenario				
	2020 Reference	2020 Medium	2025 Reference	2025 Medium	2025 Full
Finland	1	1	1	1	1
Sweden	1	3	3	3	3
Norway	1	1	1	1	0
Denmark	1	0	0	0	0
Germany	2	2	5	6	2
Netherlands	0	0	0	0	0
Belgium	0	0	0	0	0
Luxembourg	0	0	0	0	0
United Kingdom	0	0	0	0	0
France	3	3	6	8	2
Switzerland	4	4	5	5	2
Italy	4	4	5	4	3
Spain	0	0	3	3	1
Total number of bottlenecks	17	18	29	31	14

Bottleneck decrease	No change	Bottleneck increase

The 2025 Full FERRMED Rail Network

Evolution of the network



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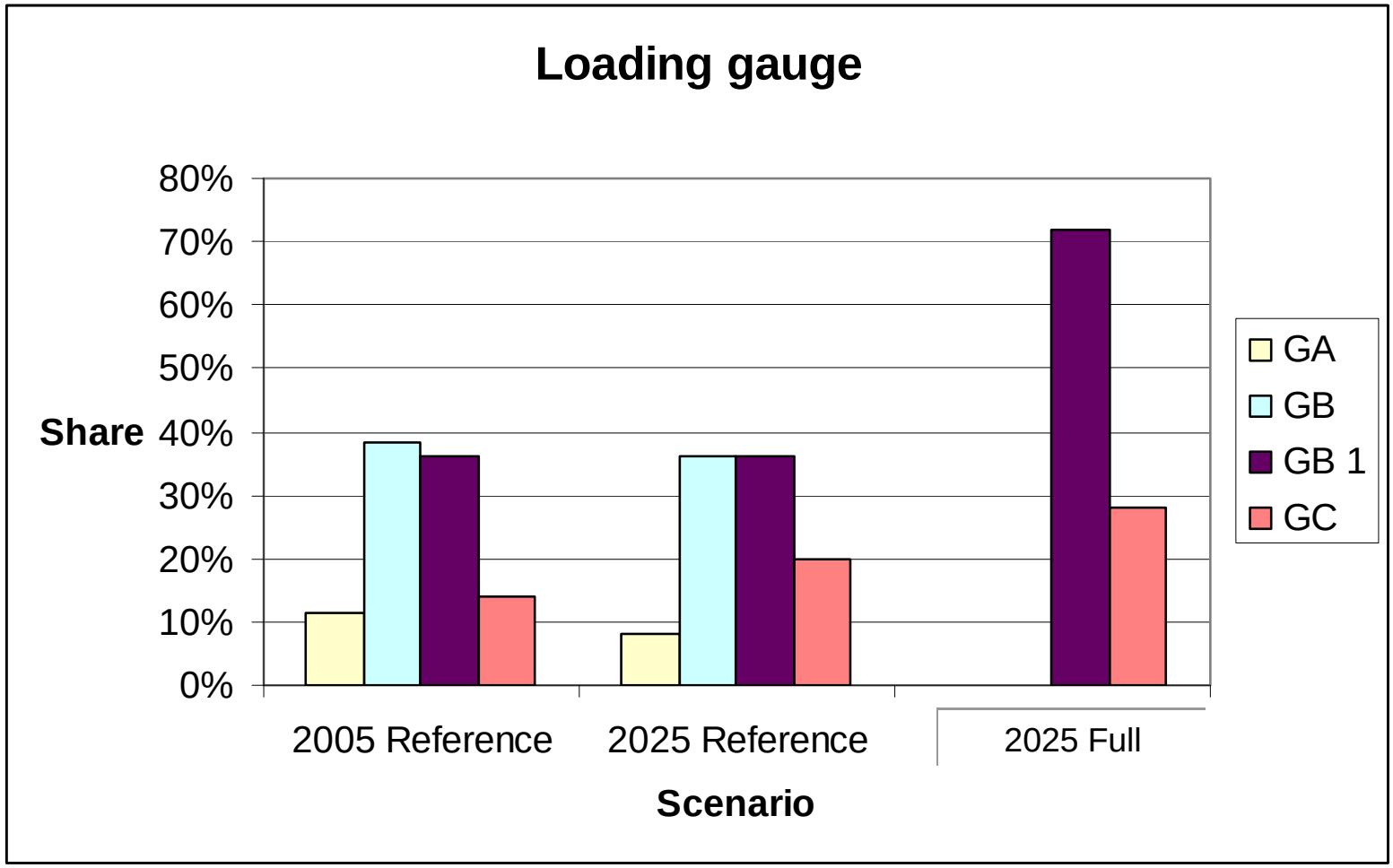

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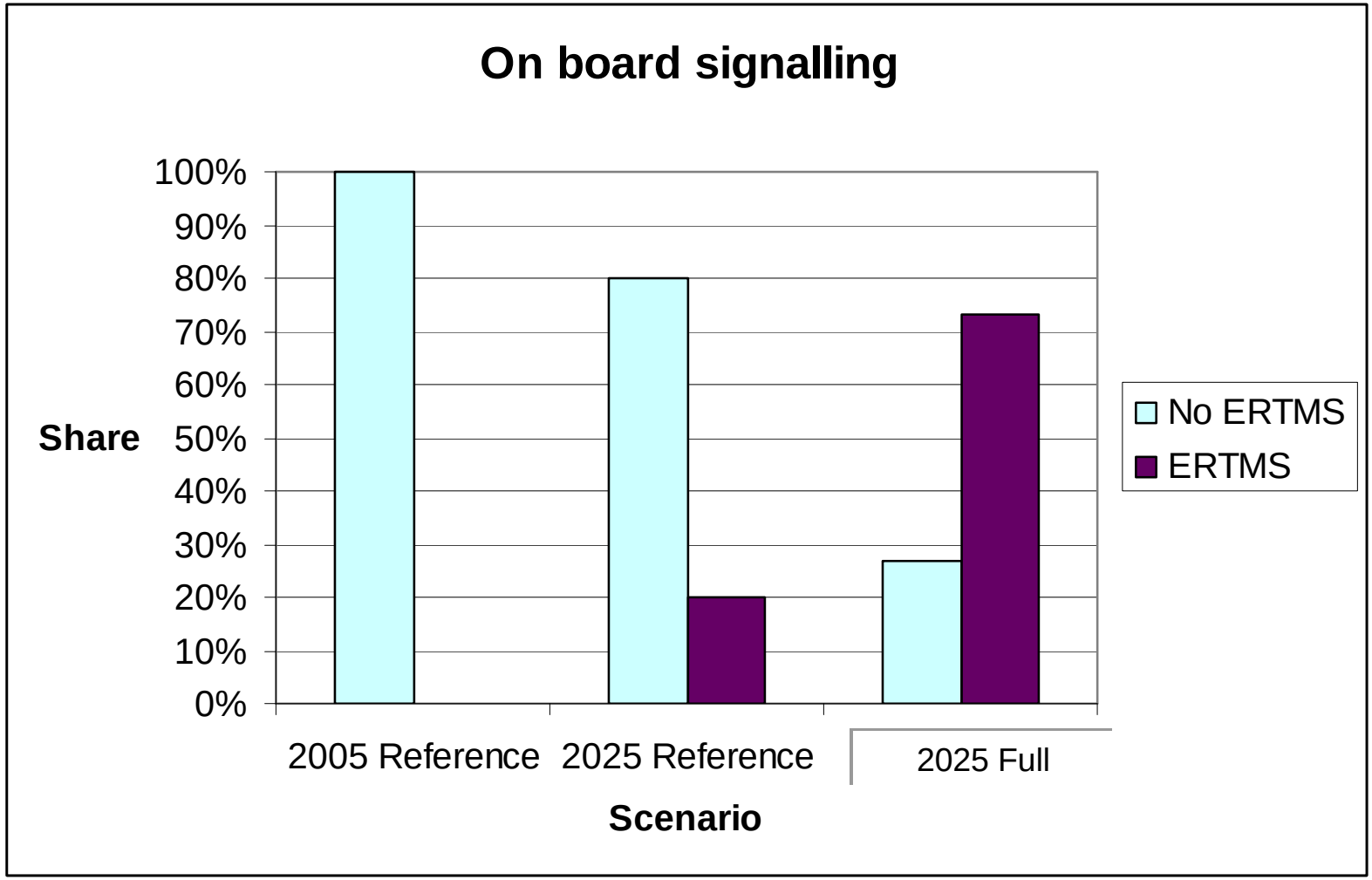

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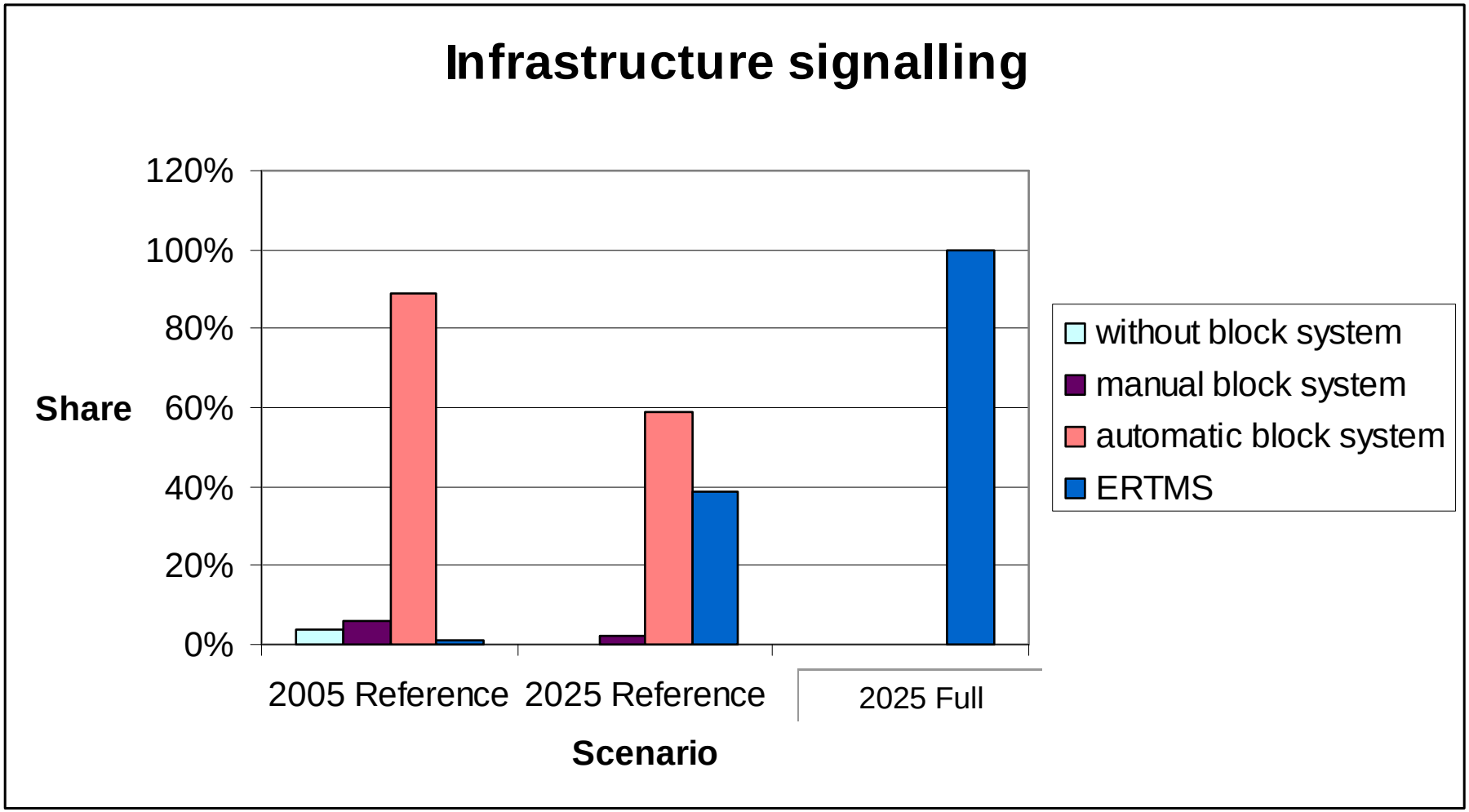

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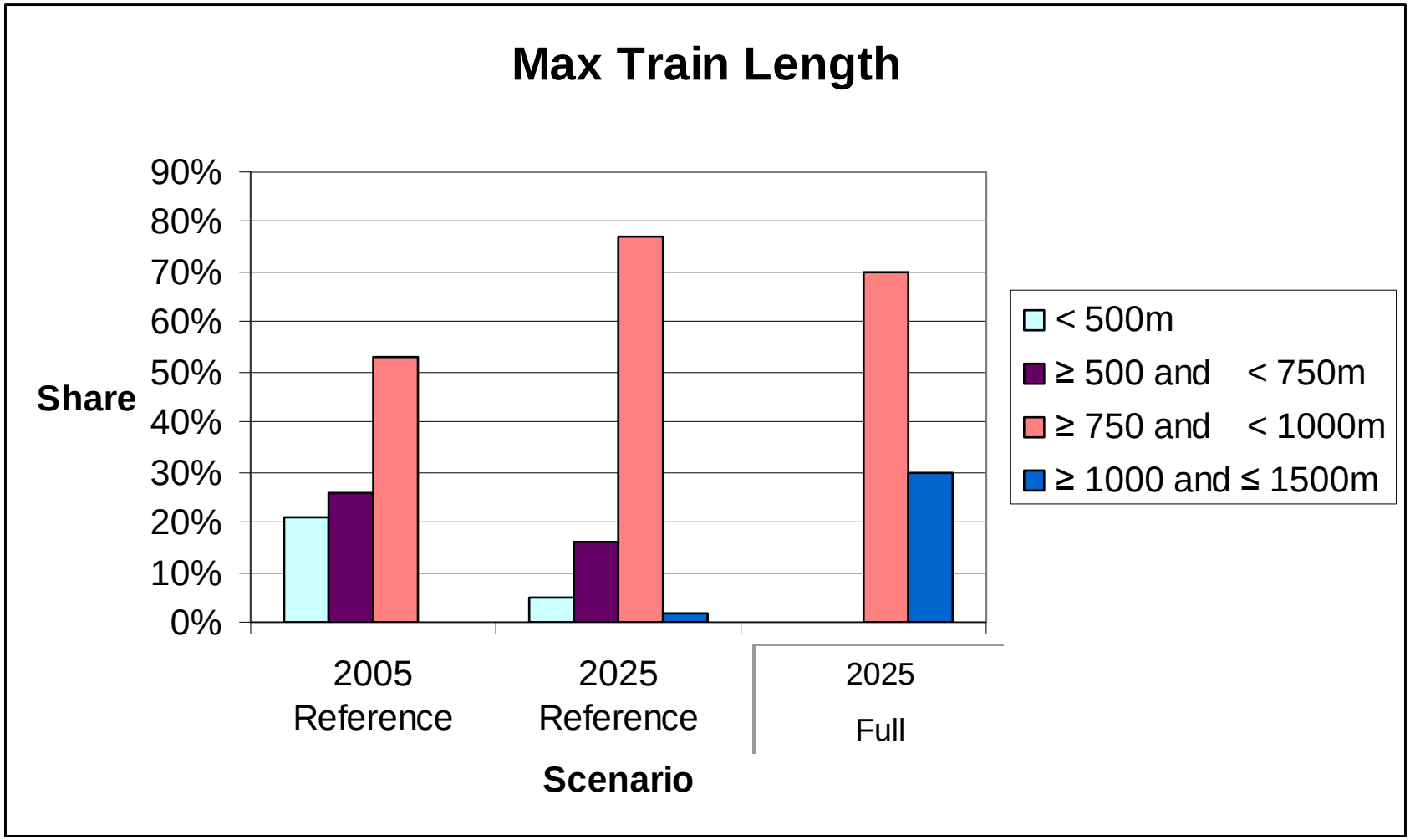
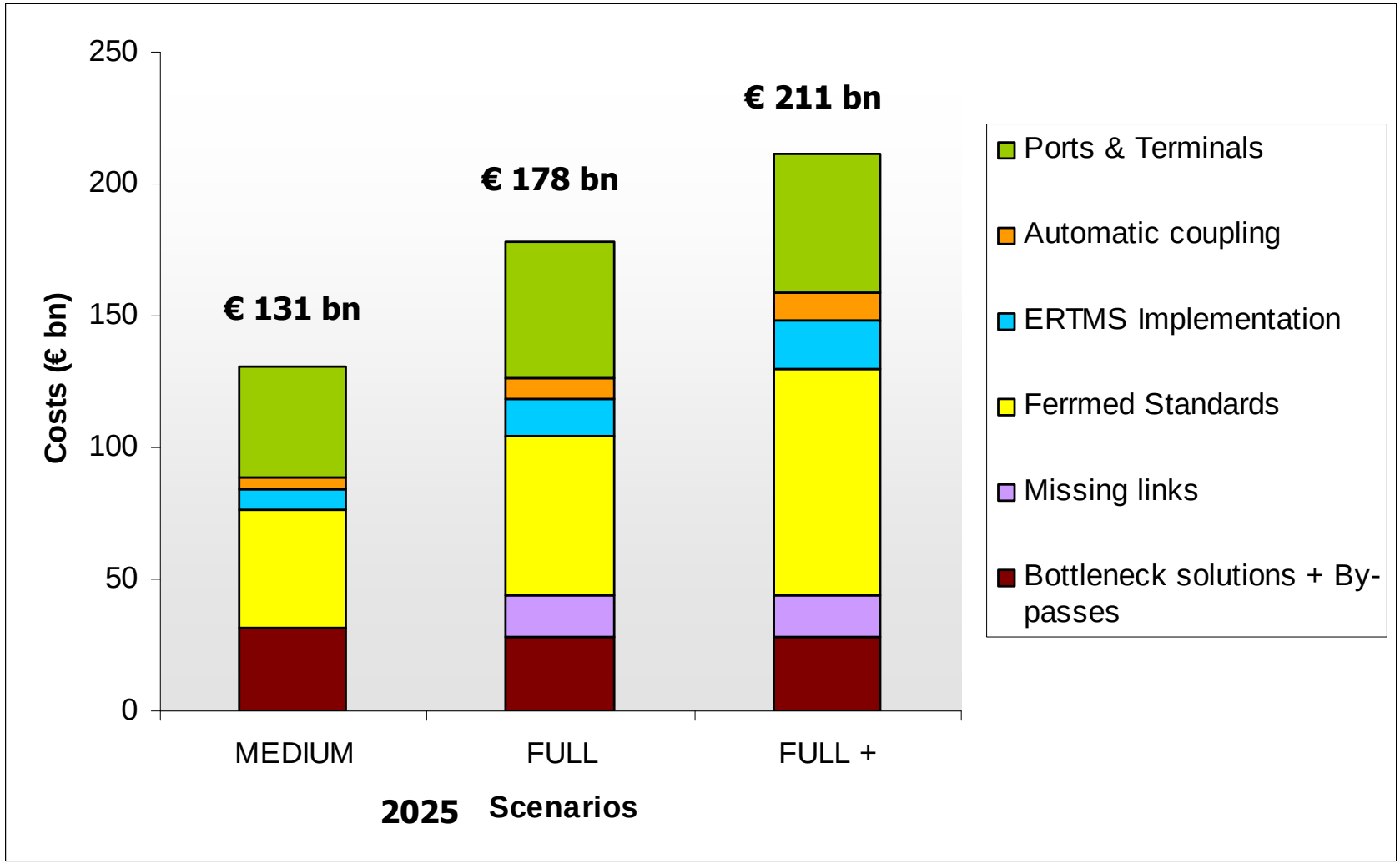
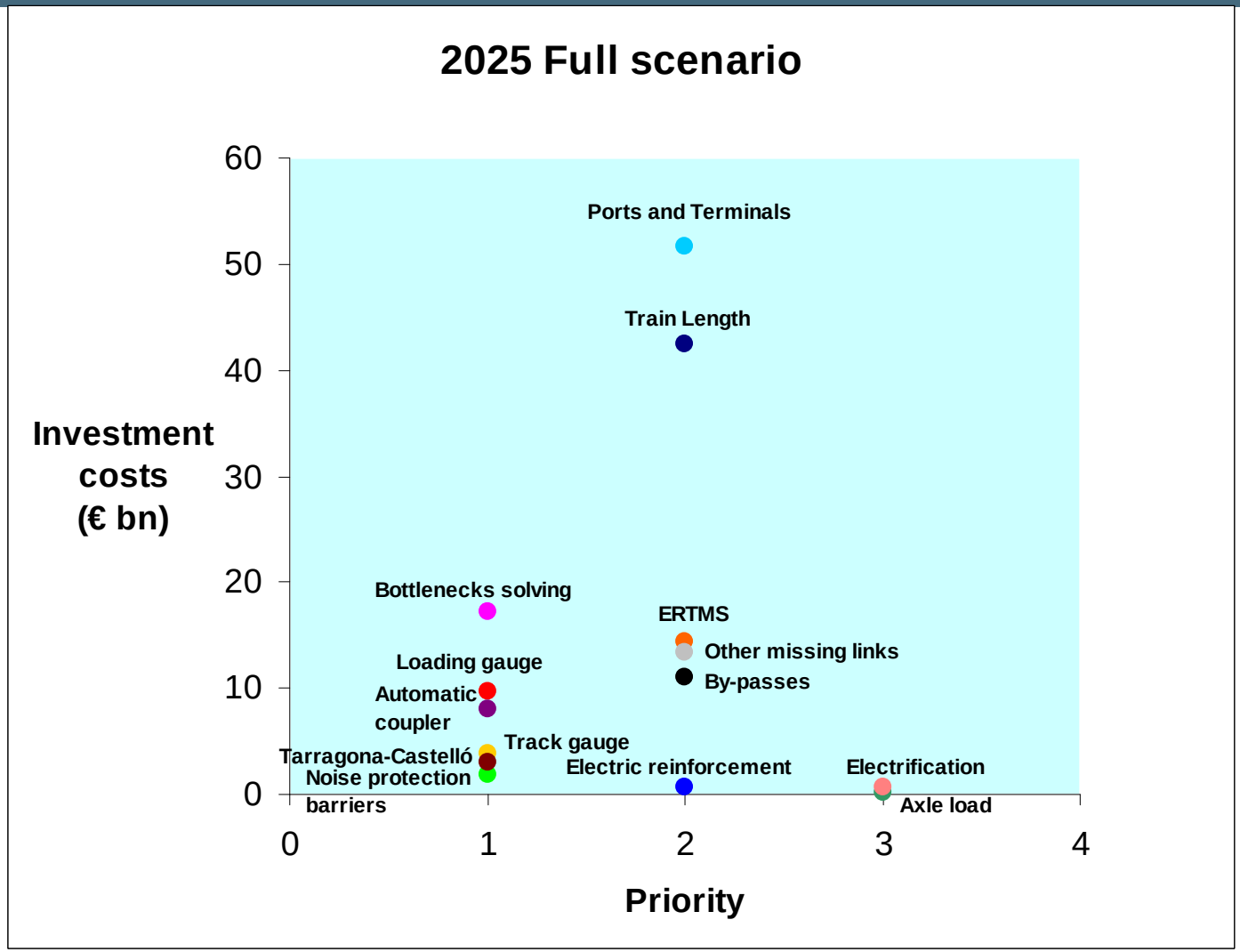


Costs up to 2025 by scenario



Recommendations



Recommendations

- To change the width of the tracks in Spain from the French border.
- To develop the automatic coupler (tractive and compression efforts with wire data transmission)
- To increase the freight train length : ❶ 1000 m
  ❷ 1500 m
- To solve the detected bottlenecks and to build the Tarragona – Castelló new line.
- To construct by-passes of major conurbations

Outcomes

- High performance parallel lines and almost dedicated lines according to passenger or freight traffic
- Autocoupler & long trains with radio or wire data transmission
- A rail network available for freight transportation 24 h / 24 and 7 days / 7
- Unified management and monitoring systems (ERTMS)

THANK YOU FOR YOUR ATTENTION

FERRMED
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