

## FERRMED GLOBAL STUDY

### FERRMED Great Axis Rail Freight Network and its area of influence

#### OVERVIEW OF THE GLOBAL STUDY

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The Global Study is an initiative of the FERRMED Association, supported by the EC and several European national and regional Governments with a view to contributing to improve EU railway freight transportation system. It was undertaken by a consortium of European consulting companies over a period of more than 2 years.

The Study is a business-oriented analysis of the social, economic, financial and technical viability of the FERRMED Great Axis Rail Freight Network. This Network, connecting all EU primary economic regions with the main sea and inland ports, comprises 20.562 km (in 2005) of railways, including a core network and main feeders, from Helsinki/Stockholm to Algeciras through 13 Member States. In its present condition, this Network transports an estimated 266 billion of tons km per year.

The Study identifies the infrastructure, technical, institutional, legislative and regulatory actions required, and the financial alternatives initially available, to upgrade the FERRMED Great Axis Rail Freight Network into a harmonized, interoperable, profitable, competitive, efficient, safe and sustainable rail freight network, which would be consistent with EU transportation interoperability policies, legislation and regulations. The resulting increase in the total amount in goods transported would be to 524 billion of tons km per year by 2025.

The Study takes into account four main supply scenarios:

- Reference: includes the infrastructure master plan scheduled for the appraisal period by Member States government.
- Medium FERRMED: FERRMED standards implemented at medium level.
- Full FERRMED: FERRMED standards implemented at high level.
- Full + FERRMED: FERRMED standards implemented at their maximum.

The Global Study includes the following analyses:

- The transport supply and demand for the FERRMED Network from 2005 to 2025, including a section by section analysis of traffic and line capacity, and an origin-destination matrix. To carry out this assessment, the Study relied on Trans Tool, a modelling tool funded by the EC, and additional models, including a specific model for European ports, all fed with

information provided by EC publications, including socio-economic variables and transport forecasts, as well as Member States investment plans in the transport sector.

- The rail infrastructure of the FERRMED Great Axis Rail Network in order to determine the feasibility of implementation of the FERRMED standards; to identify the core network, main line and feeders; to identify the infrastructure bottlenecks, to estimate the investments needed for a different speed of implementation of the FERRMED Standards and the resolution of bottlenecks.
- The socio-economic, financial and environmental costs and benefits, in the form of “savings” produced by a shift in modal transport from road to rail and by a lower environmental impact, in the FERRMED Network area from 2016 to 2045;
- EU and Member States rail transport policies, legislation, regulations and technical standards, that have an impact on the harmonization and interoperability of freight transport by railway, including proposals for their improvement.

The Global Study considers the development of the FERRMED Great Rail Axis Network under four main scenarios <sup>1</sup> :	Minimum level of investments	Planned investments until 2025	Investments for bottlenecks solution	FERRMED Standards Implementation	Investments for large cities by-passes
<b>Reference Scenario (RS)</b>	X	X	X		
<b>Medium FERRMED Scenario (MFS)</b>	X	X	X	X	
<b>Full FERRMED Scenario (FFS)</b>	X	X	X	X	X
<b>Full+ FERRMED Scenario (F+FS)</b>	X	X	X	X	X

<sup>1</sup> Two additional scenarios have been analysed by the Global Study to take into consideration “forced” North South port distribution growth and the achievement of inland long distance freight rail share of 35%.

<b>FERRMED Standards</b>	<b>Medium FERRMED Scenario</b>	<b>Full &amp; Full + FERRMED Scenarios</b>
<b>1. Signalling</b>	ERTMS 1	ERTMS 2
<b>2. Train length</b>	750 m	1500 m in core lines and main feeders
<b>3. Creation of new terminals and expansion of existing ones</b>	Medium capacity	High capacity
<b>4. Upgrade of the maximum axle load</b>	22.5 tons/axle and new lines 25 tons/axle <sup>2</sup>	
<b>5. Homogenization of the tracks width to UIC standard of 1435 mm</b>	UIC width from France to Almeria	UIC width from France to Algeciras
<b>6. Liberalization of the rail freight market</b>	Included	
<b>7. Reliability and Quality</b>	Consequence of the other standards	
<b>8. UIC C standard loading gauge for new lines and line renovation</b>	Included <sup>2</sup>	
<b>9. Two parallel lines in the core FERRMED Network</b>	Included (when needed)	
<b>10. Increase of freight train priority</b>	Included	
<b>11. Slope limitation to 12 ‰ for new lines</b>	Included	
<b>12. Electrification</b>	Included	
<b>13. Gradual renewal of rolling stock</b>	Included	

<sup>2</sup> The Full+FS considers the gradual upgrade of the main lines to 25 tonnes/axle load, UIC C loading gauge and implementation of automatic couplings in wagons and most of locomotives.

## MAIN CONCLUSIONS

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1. All the EC policies, legislation and regulations since 2001, including the TEN-T 30 Priority projects, and all investments in transport scheduled by national and regional authorities of the Member States of the FERRMED Great Axis Rail Network combined would only freeze the trend at which the rail sector has been losing its transport market share to road transport during the last 50 years (14% of inland freight transport in the FERRMED Great Axis Rail Network countries<sup>3</sup> in 2025 and 20% in the long distance inland transport<sup>4</sup>). More is needed to implement the EU policy of shifting transport from road to railways to improve European socio-economic and environmental conditions.
2. Upgrading the FERRMED Great Axis Rail Network, implementing the FERRMED Standards and eliminating the institutional, legislative, infrastructural and technical bottlenecks should increase the transport share of railways to 17% of all inland freight and 24% (more than 500 km) - 28% (more than 1,000km) of all long distance transport by 2025, reversing the trend of road transport share growth and capturing a broad range of socio-economic and environmental benefits for Europe.
3. Most of the investments required to upgrade the FERRMED Great Axis Rail Network will be allocated to achieve rail freight harmonization and interoperability. As a comparison, TEN-T Priority Projects require total investments of about EUR 600 billion until 2020.
4. The socio-economic benefits of upgrading the FERRMED Great Axis Rail Network and implementing the FERRMED Standards contribute to European industrial competitiveness through lower costs and a better environment. The Study shows that, after the proposed investments and actions, the FERRMED Network is feasible and sustainable from an economic, social and environmental perspective:
  - ⇒ Under the MFS, EUR 130 billion in investments until 2025 should generate EUR 150 billion in savings in vehicle operational costs (VOC), EUR 41 billion in savings in travel and transport time and EUR 12 billion in savings in accident and environmental benefits from 2016 to 2045. The Economic Internal Rate of Return (EIRR) under the MFS, based on socio-economic and environmental costs and benefits, is estimated at **4.97%**, in line with profitability benchmarks for these types of projects in Western Europe (3 to 5%).
  - ⇒ Under the FFS, **EUR 177 billion in investments until 2025 should generate EUR 228 billion in savings in VOC, EUR 285 billion in savings in travel and transport time and EUR 15 billion in savings in accidents and pollutant emissions from 2016 to 2045.** The EIRR under the FFS, based on socio-economic and environmental costs and benefits, is **11.09%**.
  - ⇒ The F+FS requires EUR 210 billion in investments until 2025 with an expected EIRR of **8.85%**<sup>5</sup>.

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<sup>3</sup> In tonnes.km.

<sup>4</sup> Traffic of trips of more than 500 km.

<sup>5</sup> The difference of EIRR values between FFS and F+FS is partially due to the fact that some savings associated to additional investments are not considered (like increased loading capacity).

INVESTMENTS IN FERRMED SCENARIOS <sup>6</sup>	2025 Medium (Total in M €)	2025 Full (Total in M €)	2025 Full+ (Total in M €)
<b>1. Bottlenecks solving<sup>7</sup></b>	21 105	17 131	17 131
<b>2. FERRMED Standards Implementation</b>			
<i>Track gauge</i>	1 871	3 841	5 246
<i>Loading gauge</i>	8 769	8 769	8 521
<i>Rolling motorway</i>	915	915	915
<i>Axle load</i>	164	164	19 565
<i>Train length</i>	30 606	42 425	46 457
<i>Electrification</i>	596	596	596
<b>Subtotal</b>	<b>42 920</b>	<b>56 709</b>	<b>81 299</b>
<b>3. By-passes in large cities</b>	11 000	11 000	11 000
<b>4. New lines (Spain)</b>	0	16 360	16 360
<b>5. Electric reinforcement (substations)</b>	561	724	1 051
<b>6. ERTMS Implementation</b>	7 518	14 296	18 296
<b>7. Rolling stock automatic coupling</b>	4 210	7 365	10 275
<b>8. Spanish rolling stock to UIC track width</b>	355	630	840
<b>9. Ports and Terminals</b>	42 000	51 700	51 700
<b>10. Noise barriers</b>	1 009	1 848	2 783
<b>TOTAL investments in M €</b>	<b>130 677</b>	<b>177 764</b>	<b>210 735</b>

5. The positive EIRR of the Full FERRMED Scenario indicates that increasing competitiveness of rail freight would cause a sharp shift in modal transport. This implies that economic results will increase significantly provided that investments undertaken goes beyond the threshold marked by investment for the implementation of the FERRMED Standard and resolution of bottlenecks.
6. The Study has identified institutional, legislative and technical bottlenecks at the EU and Member State levels, assessing appropriate alternatives to address and eliminate them. A total of 30 infrastructure bottlenecks were found under the Reference Scenario in 2025.
7. The investments in infrastructure in the FERRMED Great Axis Rail Network, without consideration of all social, economic and environmental benefits of the project will require EC and Member States financing support over the period of the financial analysis (2013-2045). The financial structure should be such as to attract also the participation of equity investors, lenders and providers of guarantees from the private sector. PPP financing alternatives should be particularly important to finance infrastructure such as city bypasses and terminals.

<sup>6</sup> All the investments are additional to those already committed in the Reference Scenario.

<sup>7</sup> The difference in bottlenecks solving investments between MFS and FFS is due to the fact that longer trains decrease traffic frequency.

8. Transport in the Study area is expected to grow about 60% in tonnes km until 2025 due to increased economic activity. If no actions to develop and implement alternatives are taken, the increased traffic volume will be translated into increased road traffic, with the additional consequences that the goal of reducing greenhouse emissions by 20% in 2020 would be compromised and road congestions would increase since key highways and large city rings in the FERRMED Great Axis Rail Network area are not ready to absorb this additional road traffic.
9. The rail freight traffic in the FERRMED Great Axis Rail Network would practically double in tonnes km to achieve a market share of about 24-28 % for long distance freight in 2025. With additional public policy support, the FERRMED Network could reach 30% to 35% of inland long distance freight rail transport market in later years. According to the line capacity assessment undertaken in the study, investments proposed under the Full FERRMED Scenario will be able to respond to this additional rail freight traffic.

## MAIN RECOMMENDATIONS

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The FERRMED Great Axis Rail Freight Network project would be a major contribution from the European private sector to implement the EC policy of harmonization and interoperability of the European rail transport system as established in the 2001 White Paper and the 3 Railway Packages of 2001, 2004 and 2007. The **100-project action plan of this Study proposed by FERRMED Association** in Chapter 3 as consequence of this Study, includes 15 essential points:

1. **Upgrading the FERRMED Great Axis Rail Network, implementing the FERRMED Standards and adopting the FERRMED Core Network and main feeders as an EU priority rail network under TEN-T.**
2. **Address and eliminate institutional, legislative and technical bottlenecks to the harmonization and interoperability of the FERRMED Great Axis Rail Network.** A total investment of EUR 28 to 32 billion until 2025<sup>8</sup> is proposed for solving the infrastructure bottlenecks and city bypasses.
3. **Use of mixed conventional lines with parallel high speed lines (HSL).** In the FERRMED core network, double track (2x2) is required in all its extension. One should be dedicated to fast moving trains (passenger and light freight) and the other to conventional speed trains (mixing freight trains with regional passenger trains). The study shows that if this is accomplished, there is still capacity in existing lines for additional freight traffic. A balanced approach should be used to establish priorities for passenger and freight trains. Dedicated lines could be required in large cities by-passes and HSL main lines in sectors with an existing single line (as is the case in Tarragona-Castelló).
4. **Build rail by-passes in large cities.** Capacity and traffic schedules for freight transport 24 hours a day and 7 days a week requires by-passes for free crossings over nodes and large cities, specifically in the cases of Hamburg, Koblenz, Karlsruhe, Brussels, Paris, Lyon, Lille, Dijon, Barcelona, Valencia, Alacant and Murcia.

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<sup>8</sup> already included in the total investment cited above.

5. **Harmonize and reinforce border crossings in the Alps and the Pyrenees.** These crossings are of key importance to upgrade the FERRMED Network. In the Alps new base lines are required between Switzerland and Italy and between France and Italy. The different track width in Mediterranean and Atlantic side crossings of the Pyrenees should be harmonized at international standards as a first priority action.

6. **Upgrade of Spanish main corridors to UIC width.** The track width should be changed to international standards (UIC 1,435 mm) in the FERRMED Network in Spain.

7. **To build new lines in the FERRMED Core Network** in the corridors which are not interconnection axis as it is the case of Fehmann new fix link and the lines Almeria - Motril, Málaga-Algeciras and Lorca – Granada.

8. **Establish better connections between inland intermodal and industrial terminals, ports and hinterlands and the FERRMED core Network.** These are of key importance to facilitate the flow of freight in the FERRMED Great Axis Rail Network. Special attention should be given to improving these connections as well as to create a network of intermodal public / private terminals in industrial areas, large cities surroundings and multimodal communication centres.

One objective of the EC policy is to enhance the capacity of European ports to absorb the intercontinental and shipping traffic growth. The anticipated expansion of EU trade with Asia and North Africa will likely result in increased pressure on Southern ports. The Study recommends a proportional refurbishment of all EU main ports linked to the FERRMED Great Axis Rail Network.

9. **Upgrade of FERRMED Network to UIC GC.** This should be done in 2 steps: before 2025 the network should be upgraded to UIC GB1, less costly in the case of old tunnels. Later, UIC – GC can be introduced gradually during the periodical refurbishment of existing line tracks.

10. **Signalisation.** ERTMS Level 2 should be installed in the rail core network.

11. **Lower gradients:** New lines should be constructed with a maximum gradient of 12‰.

12. **Longer and heavier trains** increase the network capacity and reduce transport costs. Train lengths should be increased to about 750 m in the FERRMED Network and to 1,500 m in the FERRMED core lines and main feeders, allowing the possibility of 3,600 ÷ 5,000 tons of freight capacity by train. New lines should be suitable for 25 tonnes per axle. The 20 tons sections should be upgraded to 22.5 tons/axle in the entire FERRMED Network. The periodical renewal of tracks could be used to gradually convert these lines to 25 tons/axle. New wagon concept with automatic couplings is required.

13. **Electrification.** The railway network should be fully electrified. All new lines must be preferentially at 25 Kv.

14. **EC rail transport policies.** The adoption of EC policies, legislation, regulations and technical standards on rail transport by Member States should be accelerated, particularly those related to liberalization and openness to competition, operational and management standards, regulations and procedures, especially for traffic priority, operational coordination and infrastructure use fees.

15. FERRMED considers that **all railway lines included in FERRMED Great Axis Core Network would have to be considered as EU Priority Projects.**