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

SENER

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Consortium

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

Supply and Demand Analysis

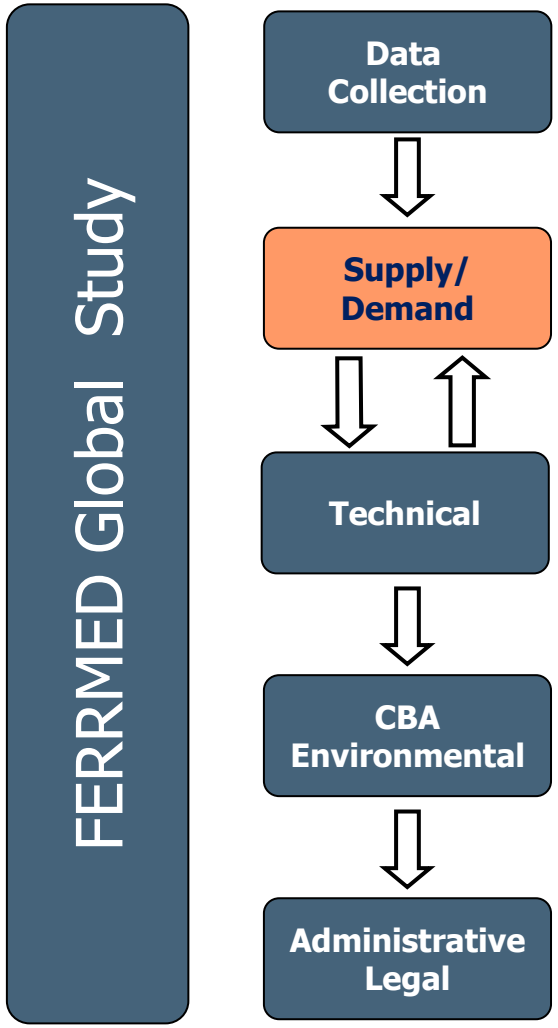
Presented by Daniele Maroni - SENER

Content

1. Scope of the S&D analysis
2. Simulation model (2005)
3. Future Scenarios
4. Forecasting (2020 and 2025)
5. Conclusions of the S&D analysis

Framework

Consortium



SUPPLY/DEMAND ANALYSIS

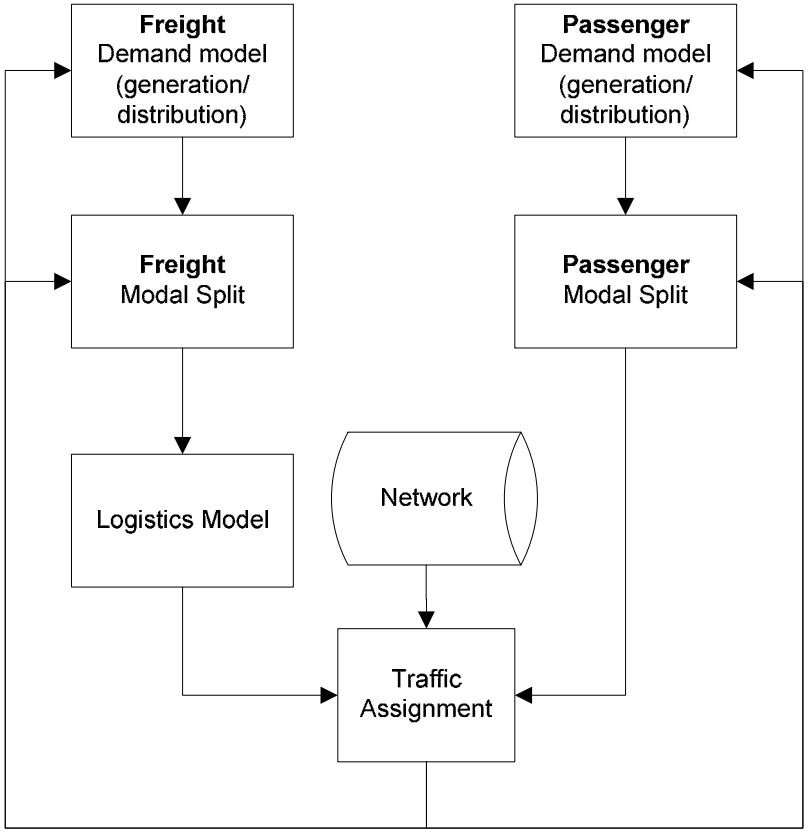
- FERRMED transport planning model building (base year 2005)
- Definition of 14 future scenarios (2020-2025)
- Simulation and traffic forecasting

Trans-Tools Modelling Platform

- Developed under EU funding
- Originally for evaluation of TEN-T projects
- Models passenger and freight transport across Europe
- Database (2000)
  - transport variables
  - socioeconomic variables
  - networks
  - services
- Largest European transport model

Trans-Tools provides a simulation tool for strategic analysis

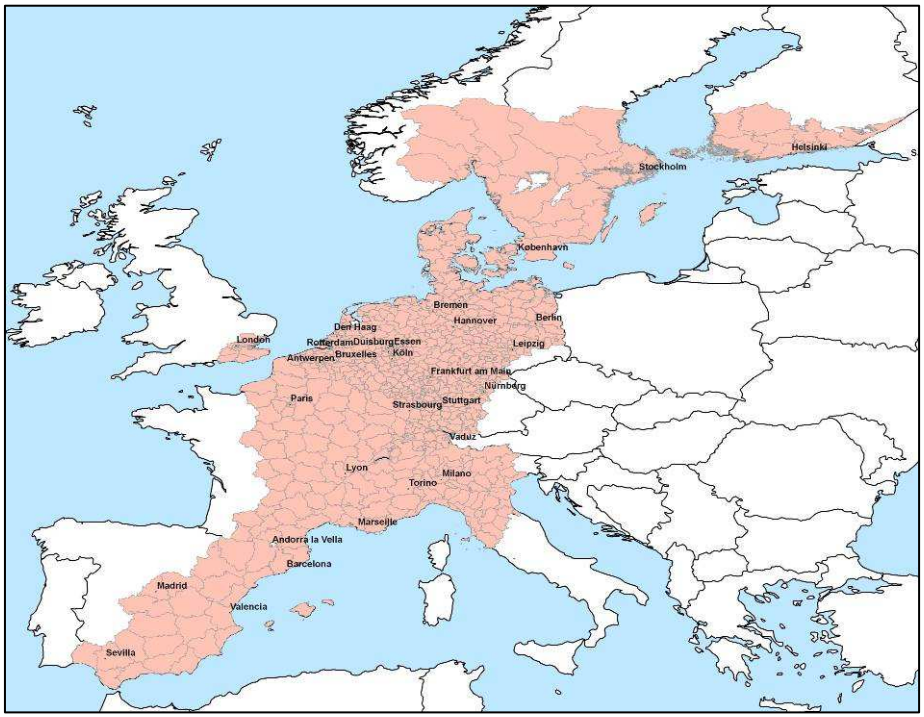
4 step transport planning model (macroscopic)



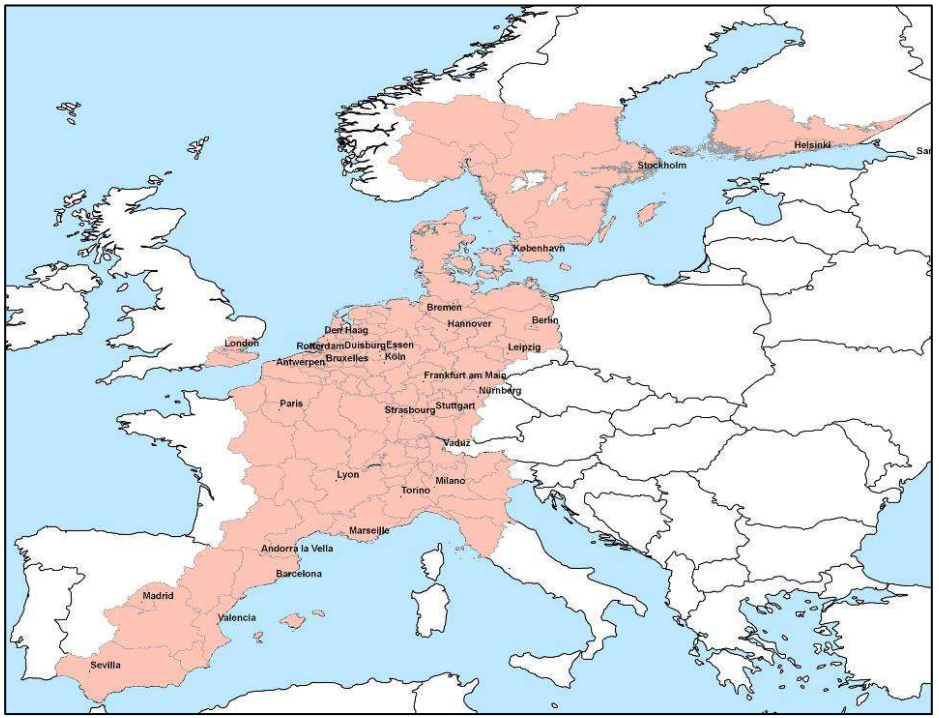
Zoning System

- Passenger zoning system: NUTS III ~ 1,290 zones
- Freight zoning system: NUTS II ~ 295 zones

Passengers

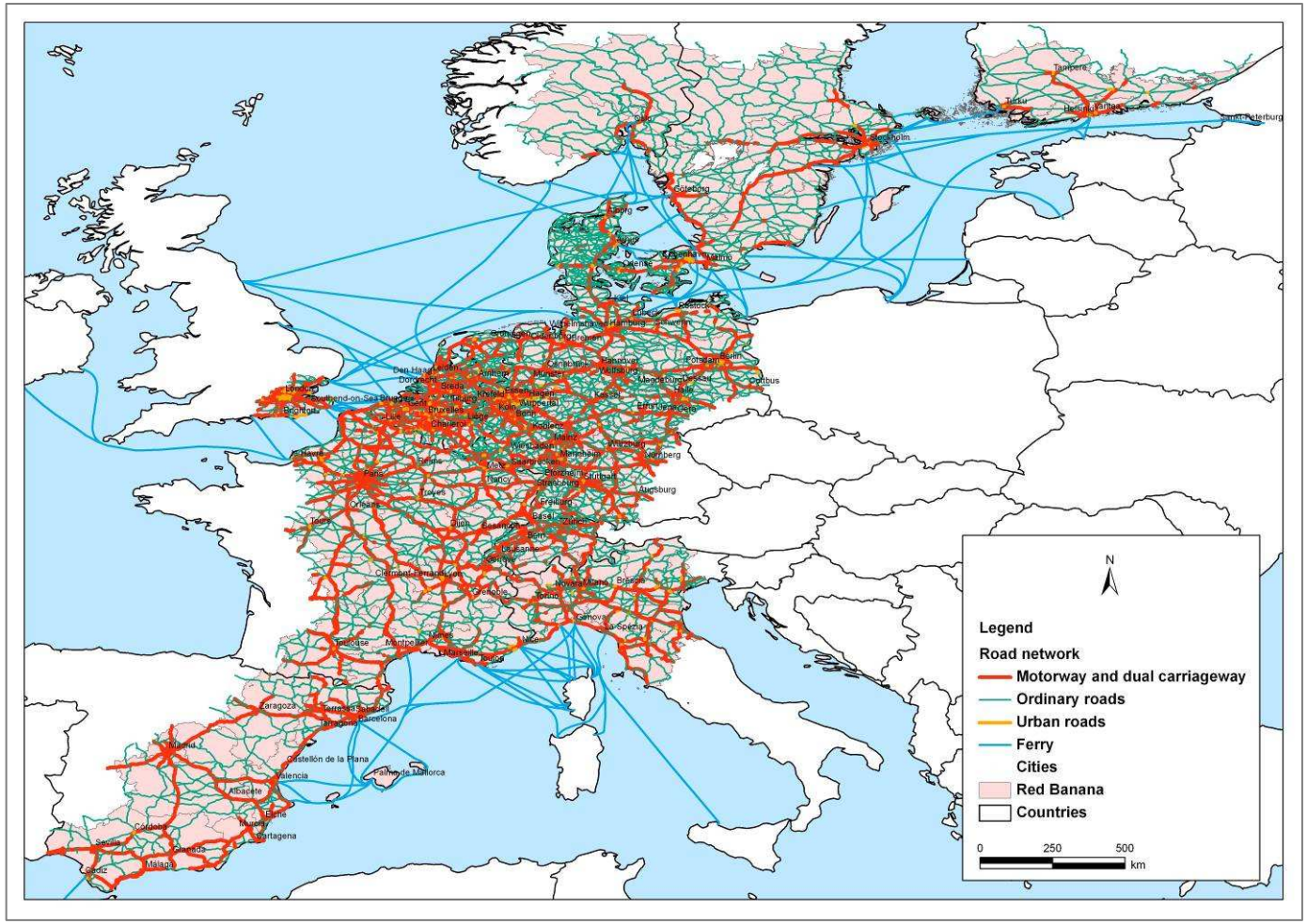


Freight



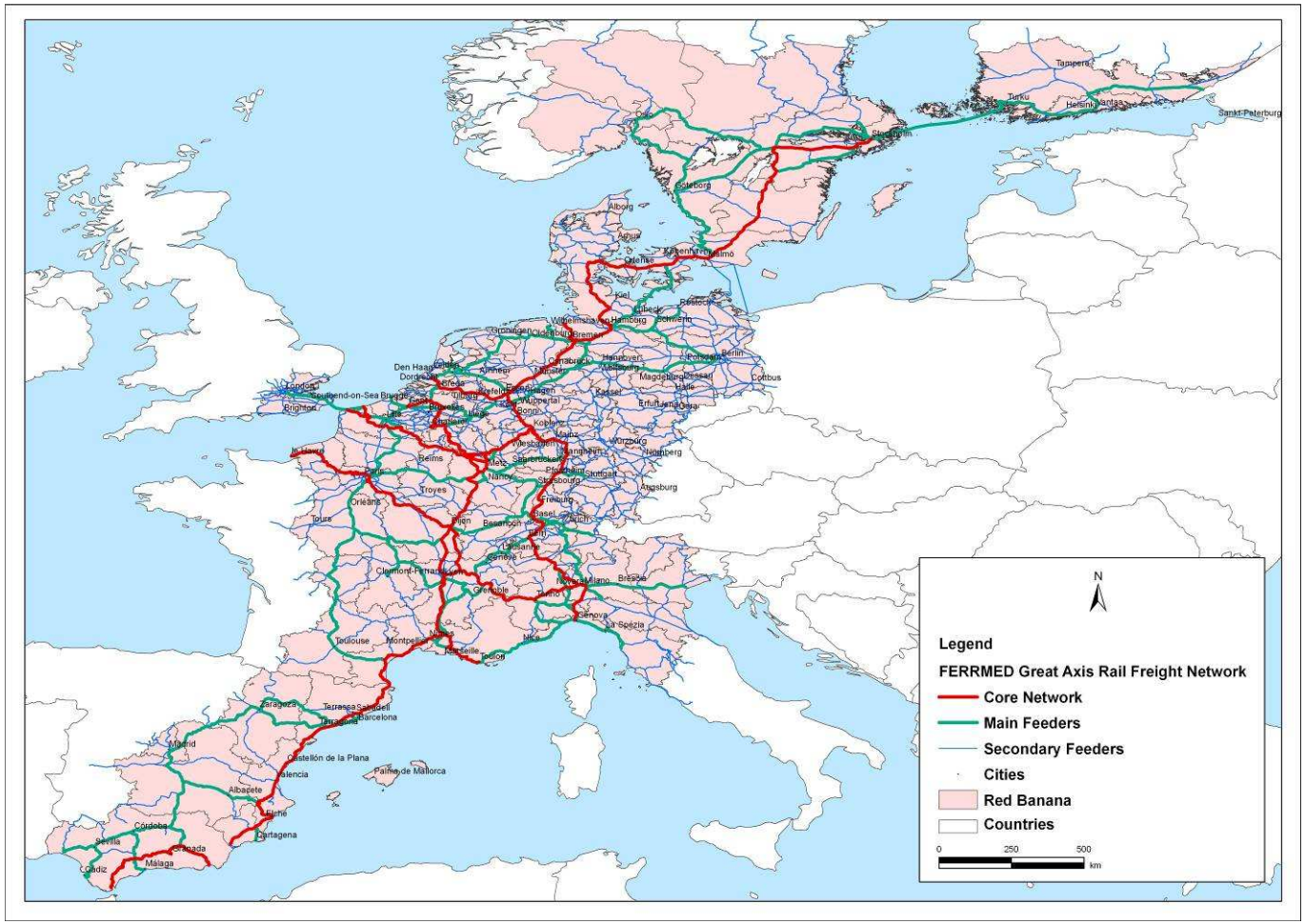
Transport Networks (I)

- **Roads**
  - Motorways
  - Dual carriageways
  - Regular roads
  - Urban arterials
  - Ferries



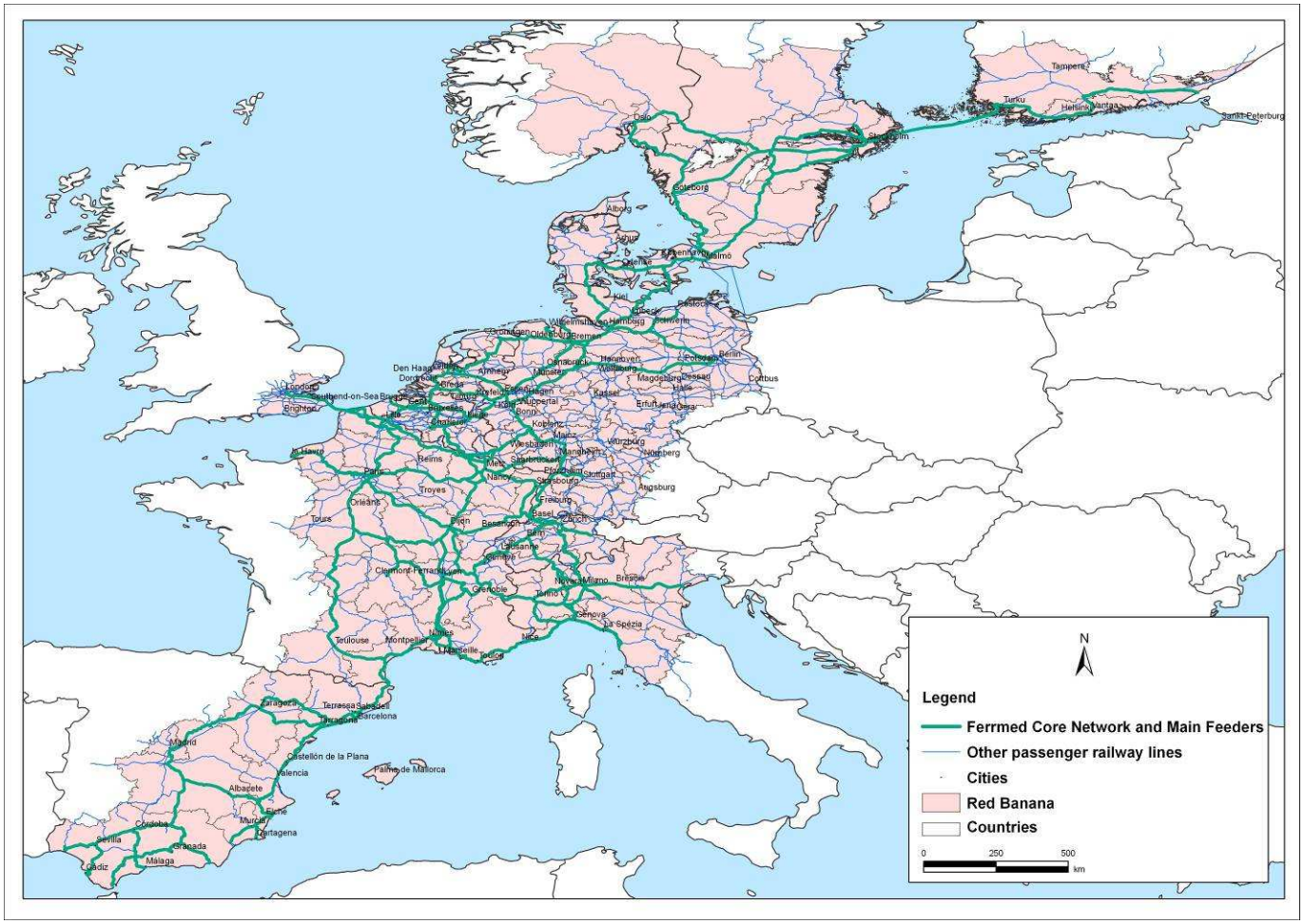
Transport Networks (II)

- **Railways (freight)**
  - Mixed lines
  - Dedicated lines



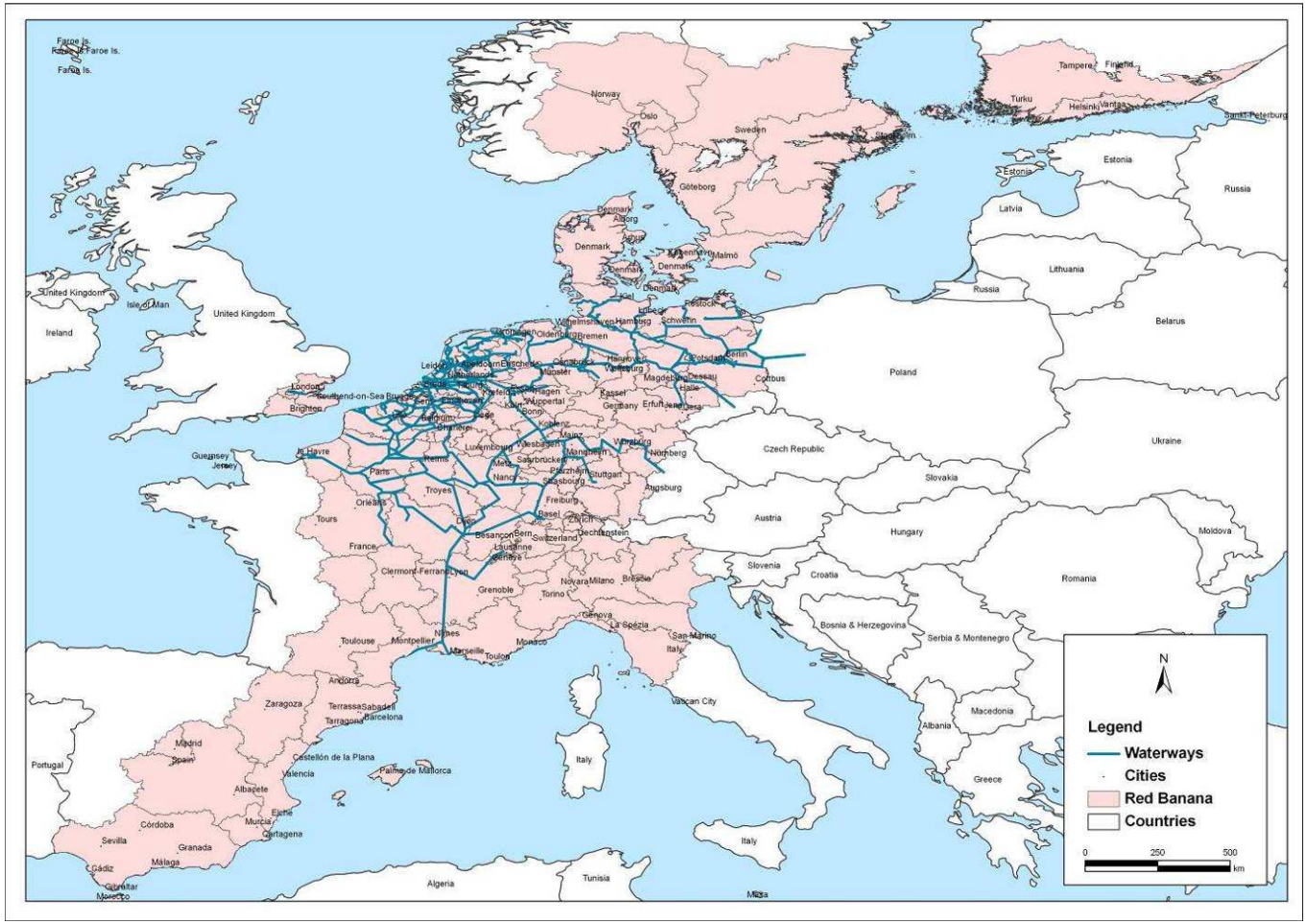
Transport Networks (III)

- **Railways (passenger)**
  - High speed lines
  - Conventional lines



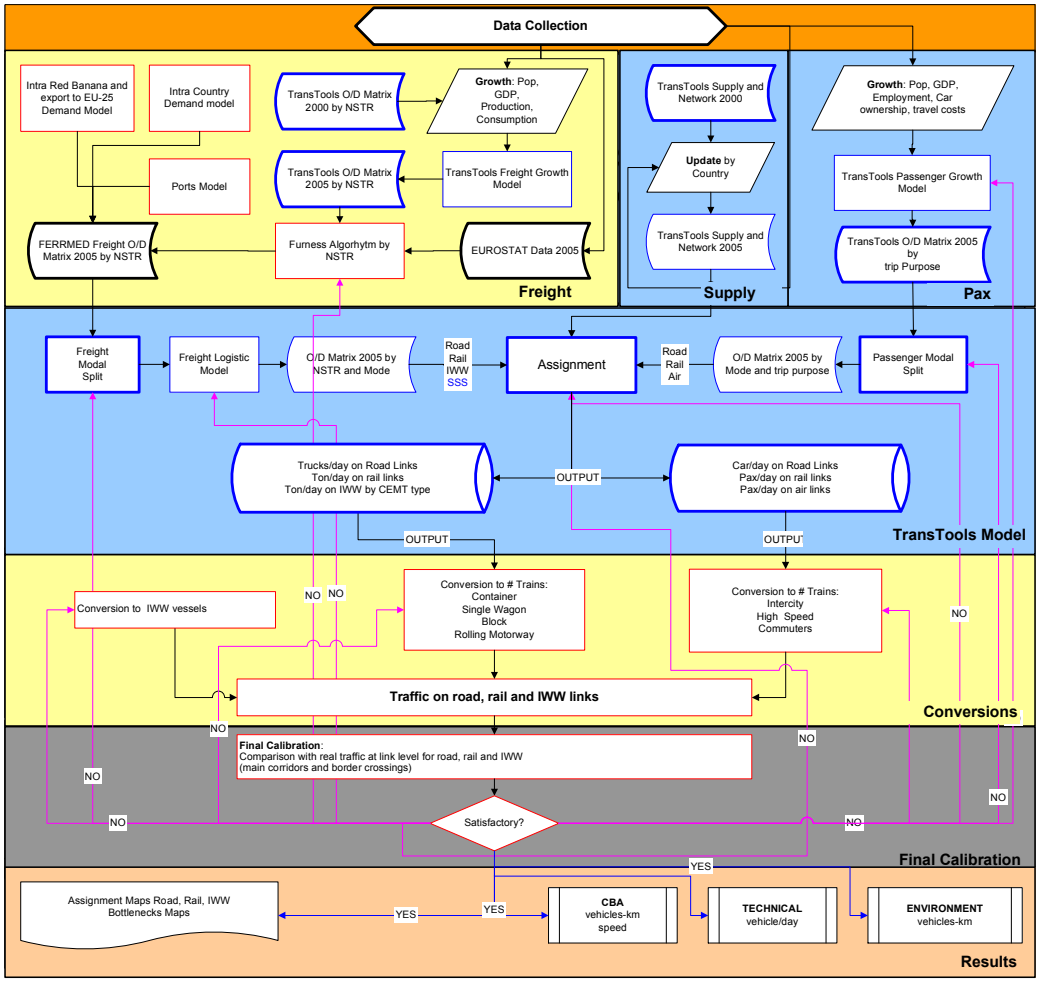
Transport Networks (IV)

- **Inland Waterways (IWW)**
- **Air**
- **Freight maritime transport**



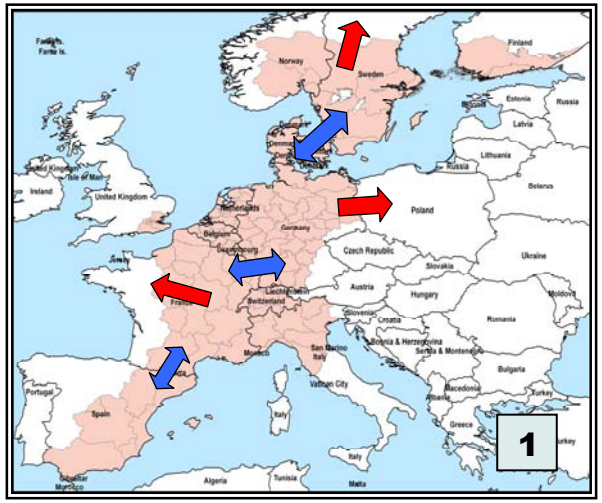
Methodology

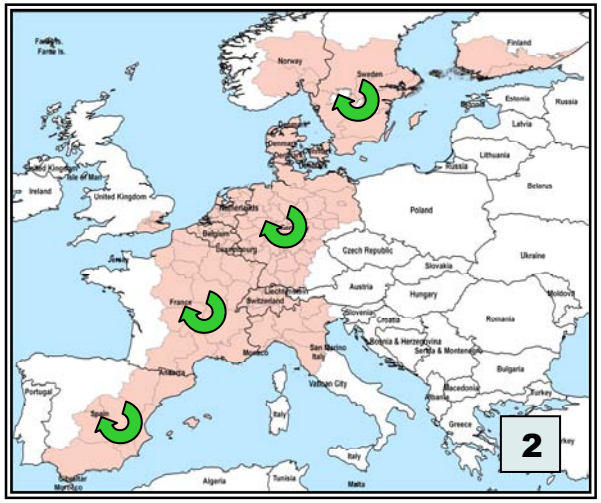
- Trans-Tools base year is 2000
- Transport costs updated to 2005 values
- FERRMED Study calibrated model against 2005 data
- External models built
  - Trans-Tools limitations
  - Study requirements



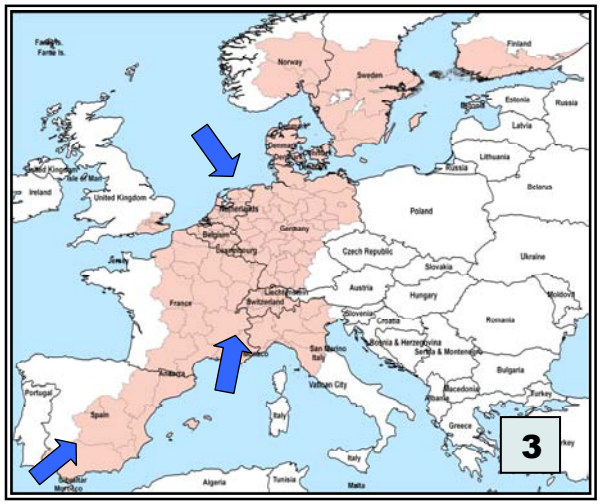
External models for freight demand

1. Intra Red Banana and export to EU 25
2. Internal Demand for Red Banana Countries





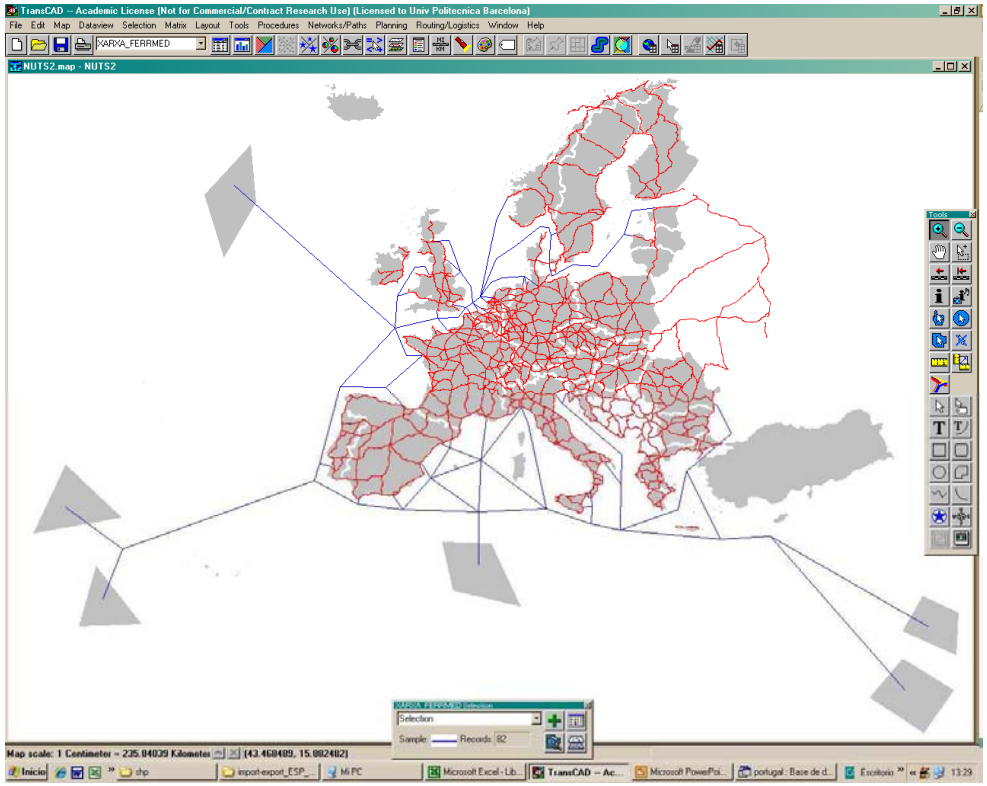
- At country level
- 4 production sectors
  - Industry
  - Agriculture
  - Construction
  - Energy
- Eurostat data



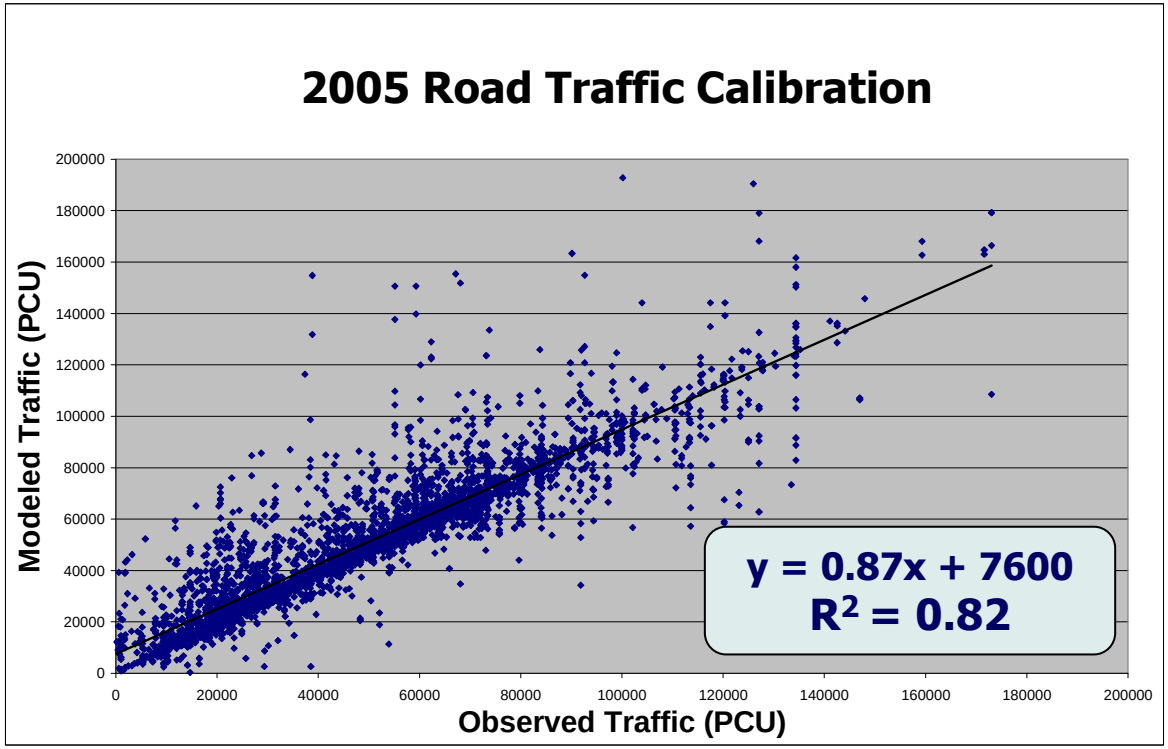
3. Port Flow Distribution Model

Port Flow Distribution Model

- 45 major European ports included
  - 55% total European ports freight traffic
  - 75% of intercontinental freight traffic in Europe
- Maritime and inland networks
- 4 models built in TransCAD
  - containers
  - Ro-Ro
  - general cargo
  - dry bulk



Traffic Assignment: Road

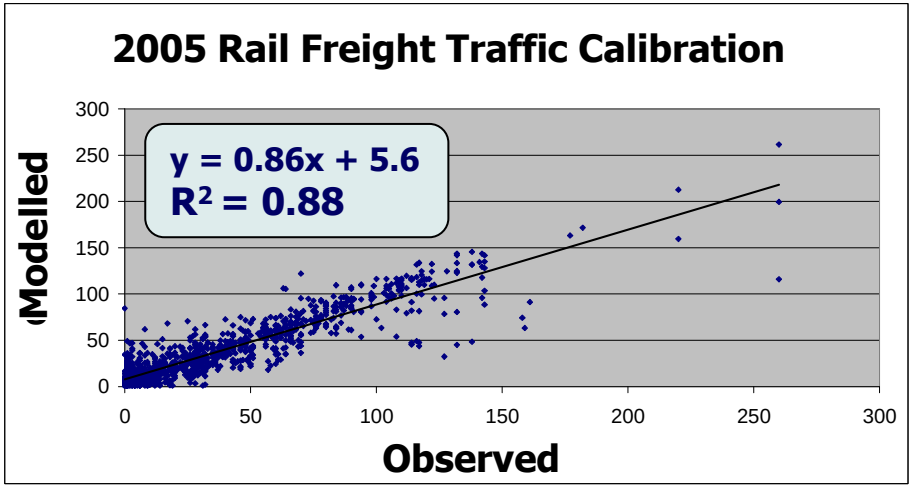


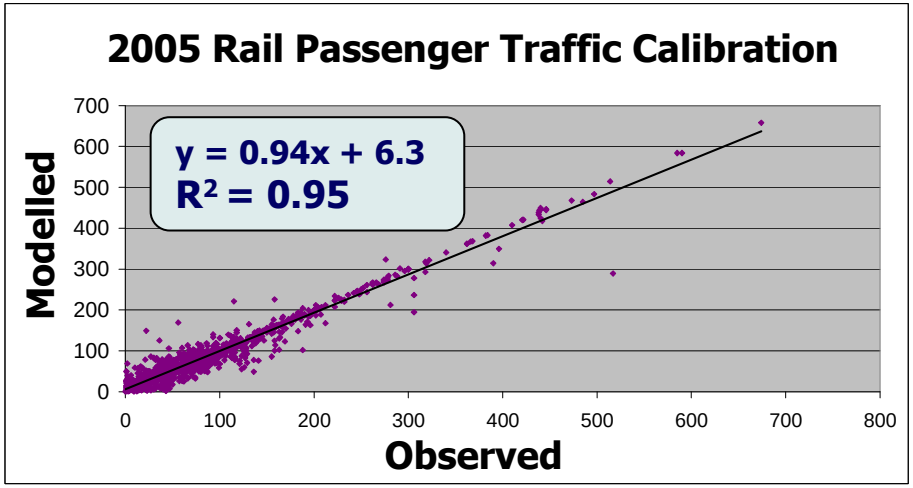
Note

- Local traffic has been taken into account on the basis of Eurostat data
- Satisfactory calibration achieved for each country

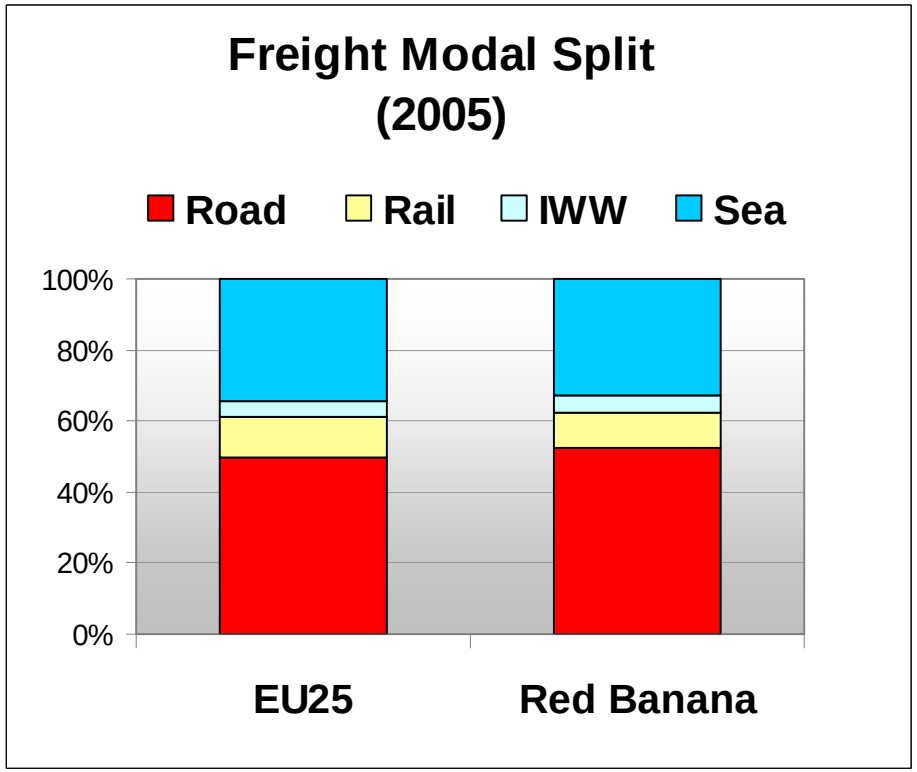
Traffic Assignment: Rail

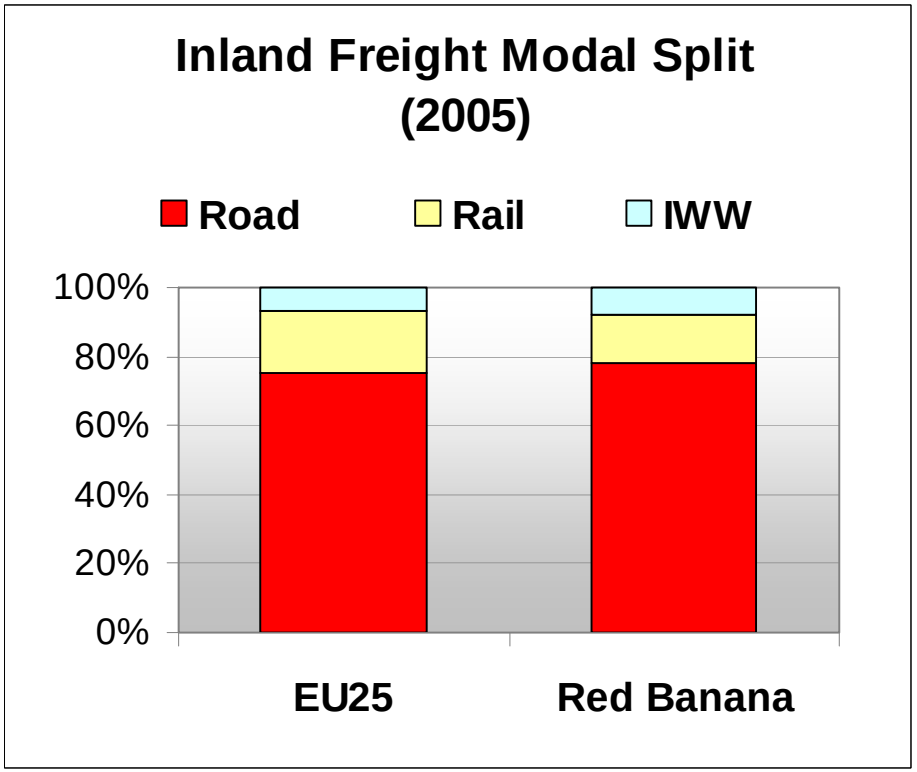
- Output in tonnes/day (freight) and pax/day (passengers) converted to traffic (trains/day)
- Model calibrated against observed rail traffic data for main lines
- Local traffic considered separately using different occupancy and loading factors
- Traffic split by train type
  - Passenger: high speed, intercity, commuter
  - Freight: block, wagon and container





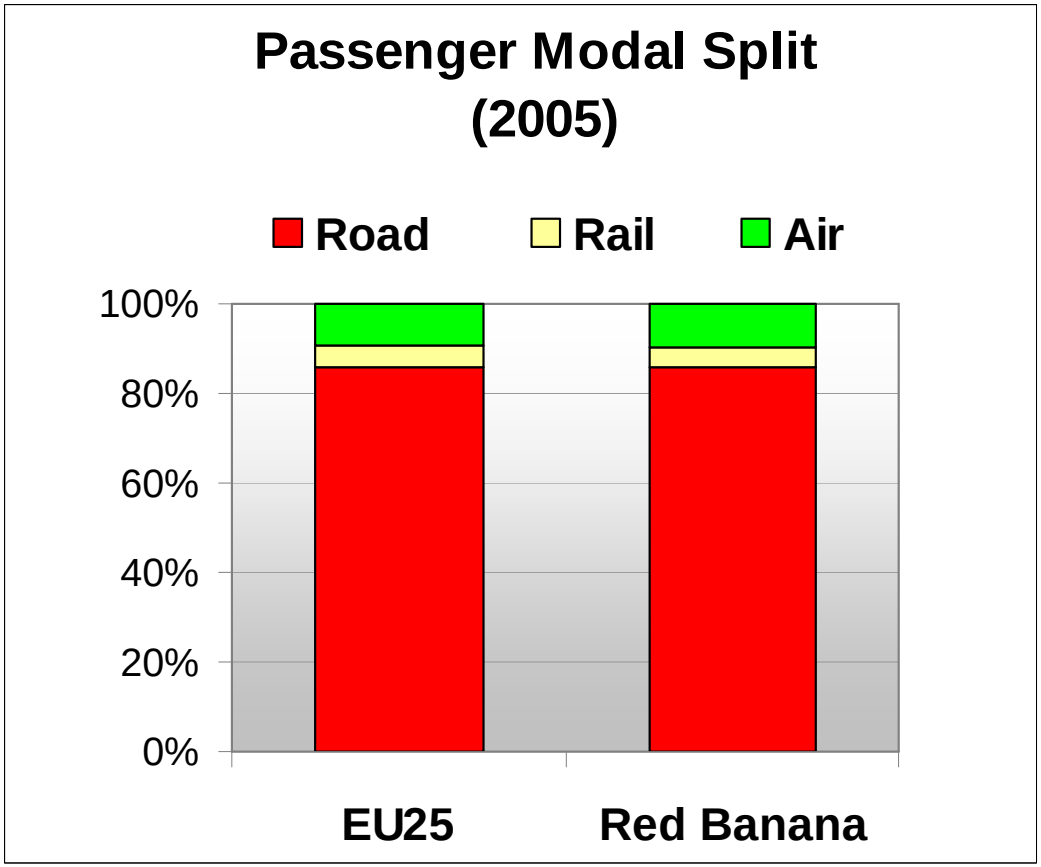
Freight Modal Split





(Measured in tonnes-km)

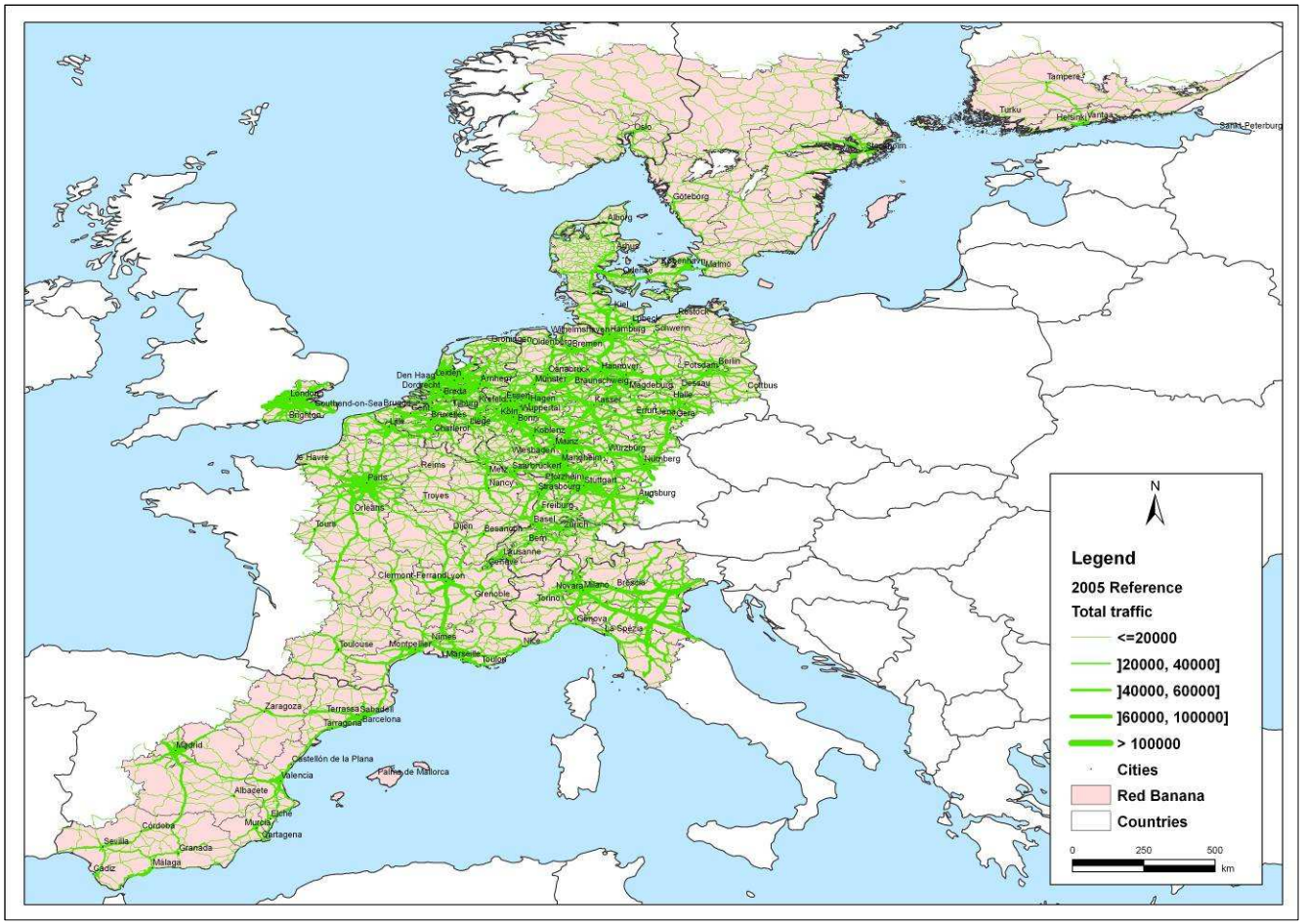
Passenger Modal Split



(Measured in passenger - km)

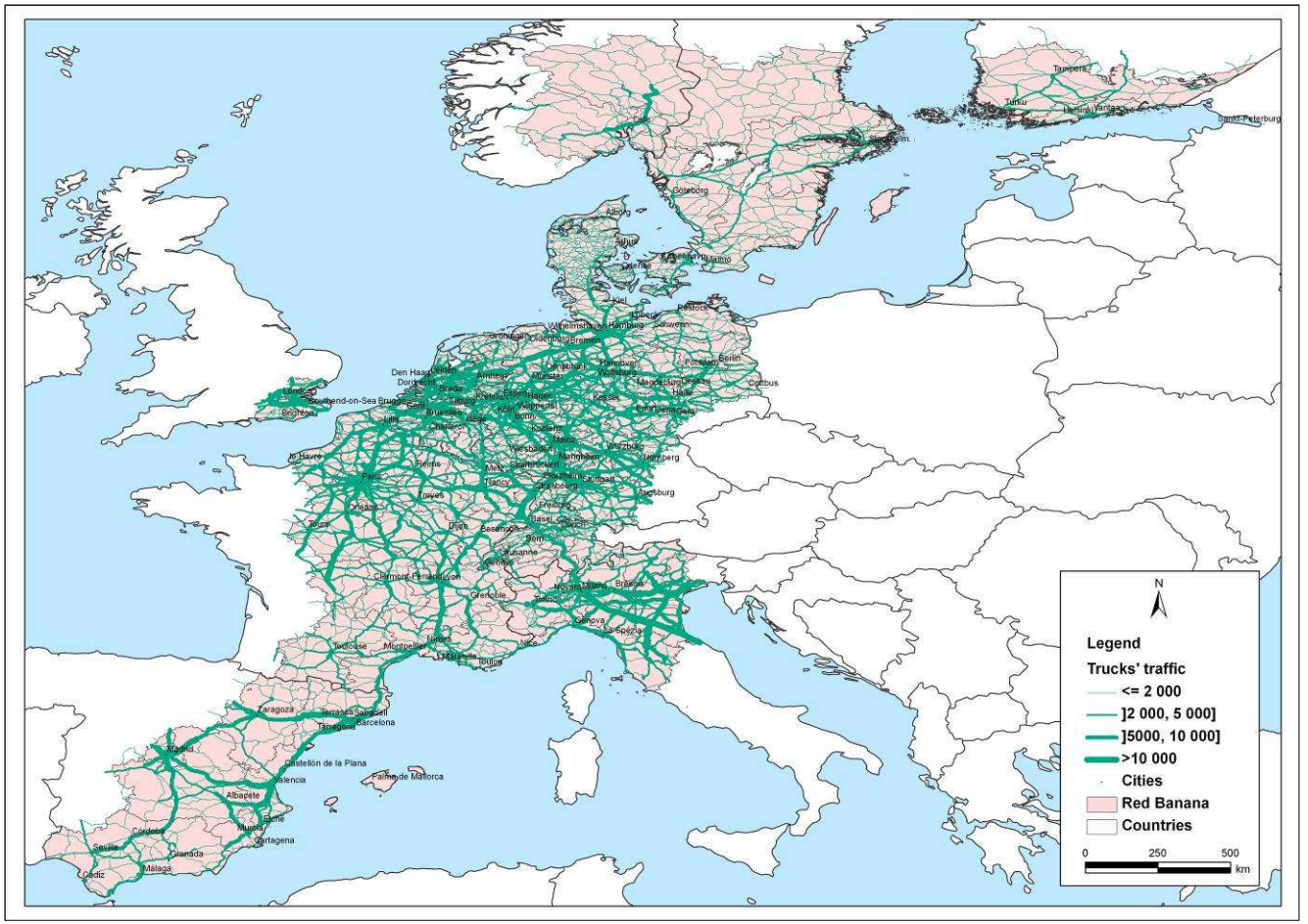
Year 2005 Traffic (I)

- **Road Total (veh/day)**



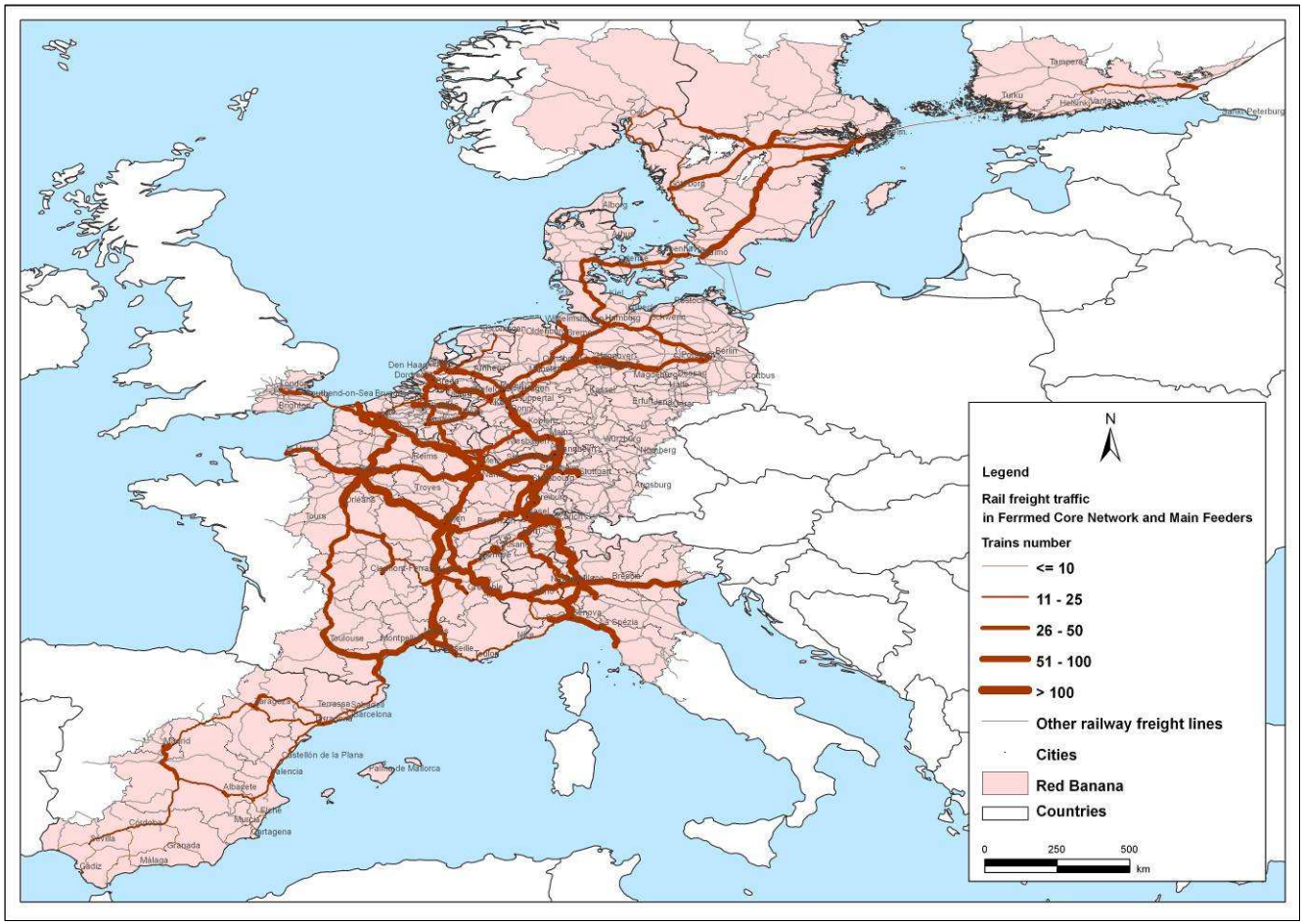
Year 2005 Traffic (II)

- **Road Freight (HGV/day)**



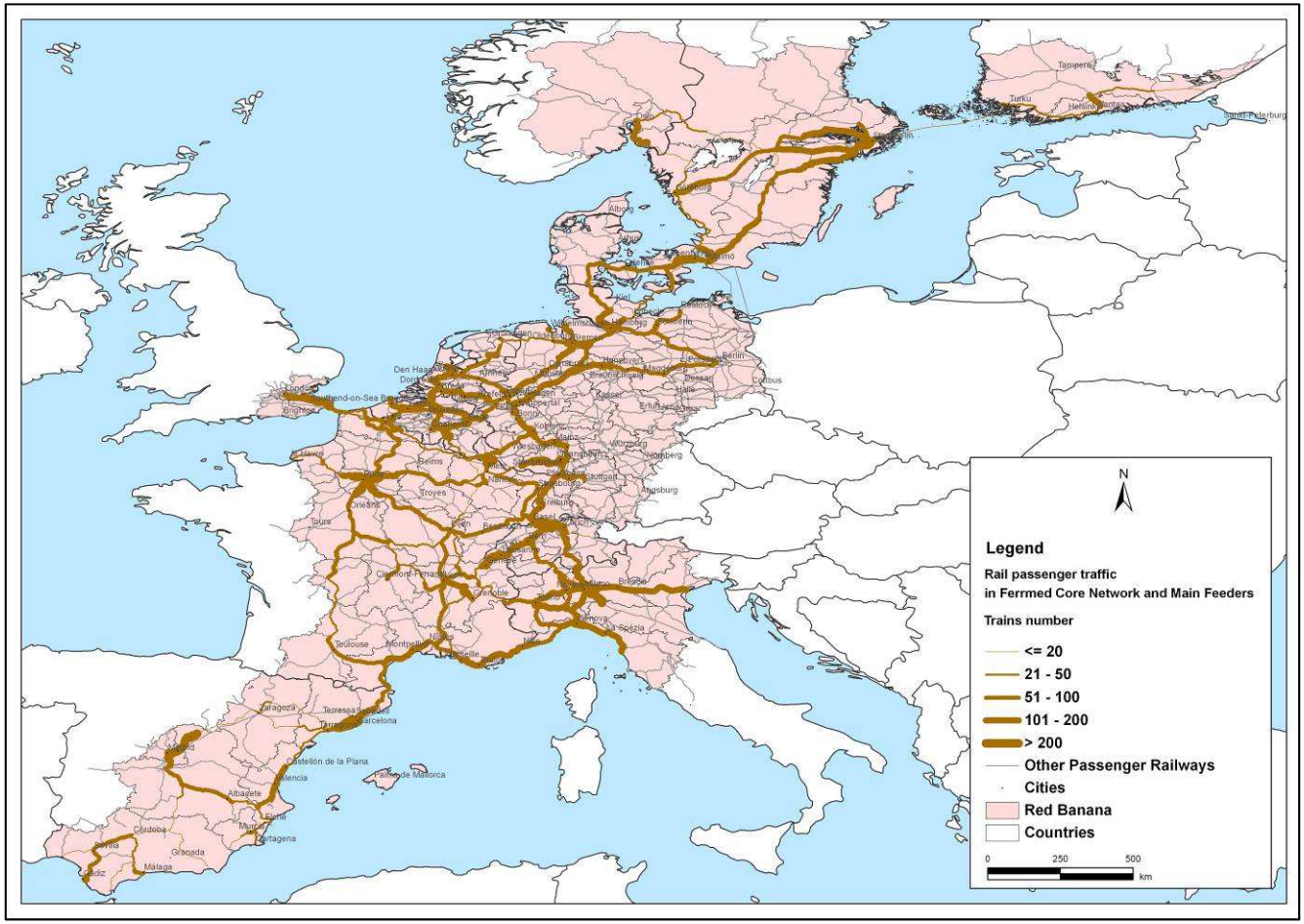
Year 2005 Traffic (III)

- **Rail Freight (trains/day)**



Year 2005 Traffic (IV)

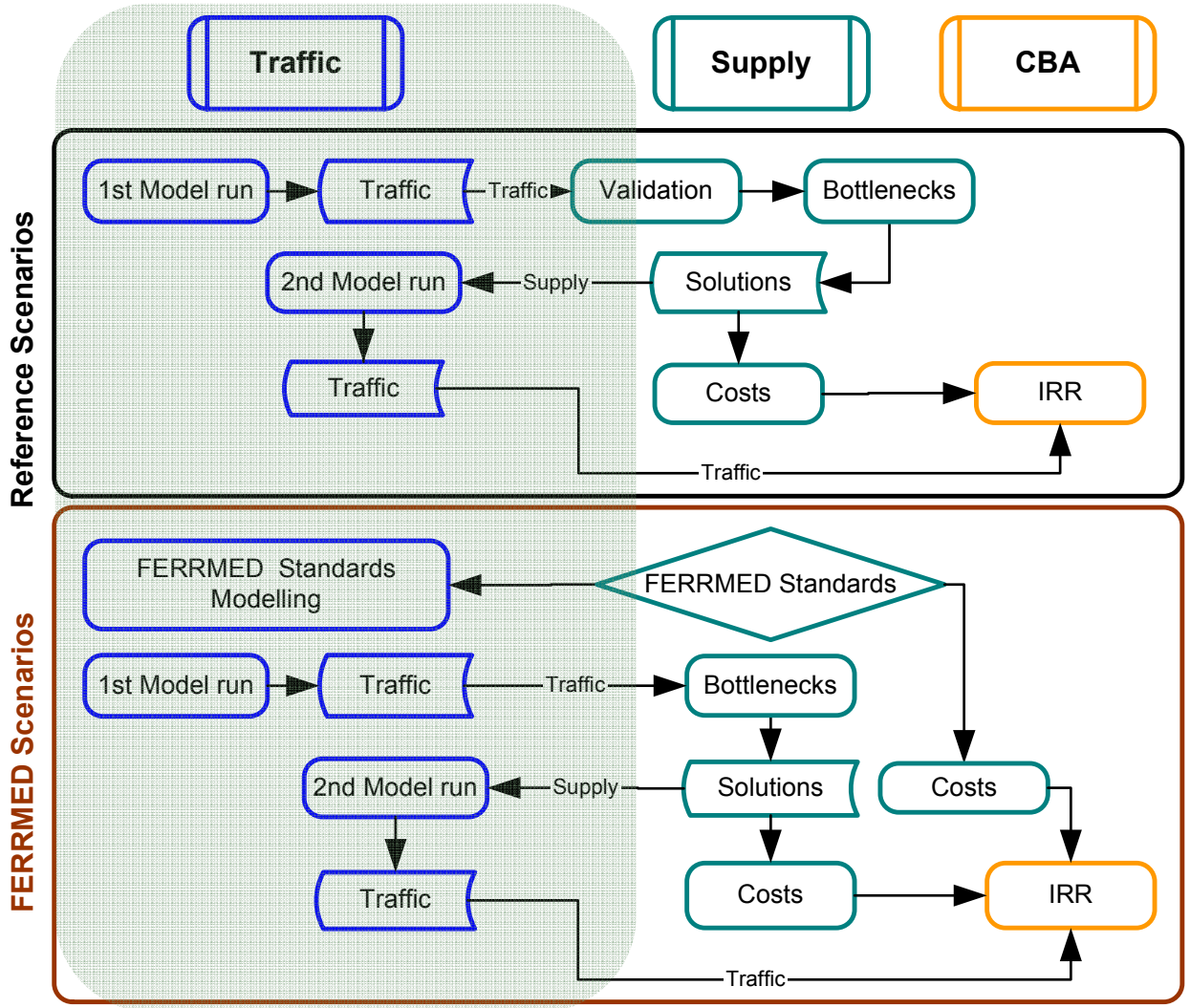
- **Rail Passenger (trains/day)**



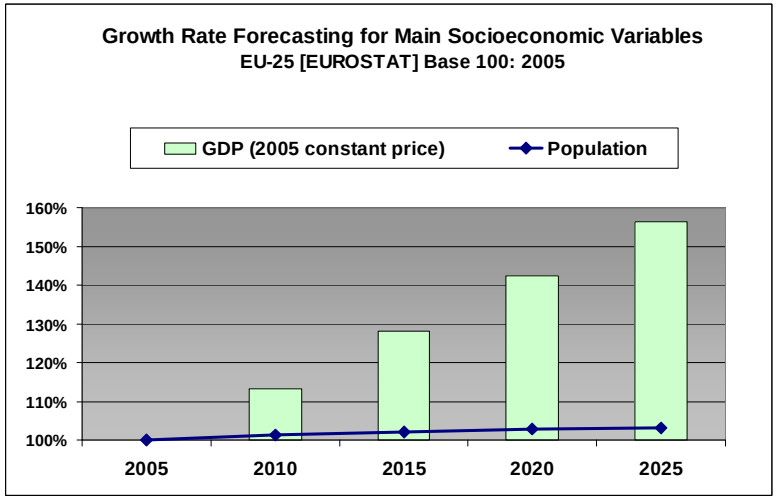
Scenarios

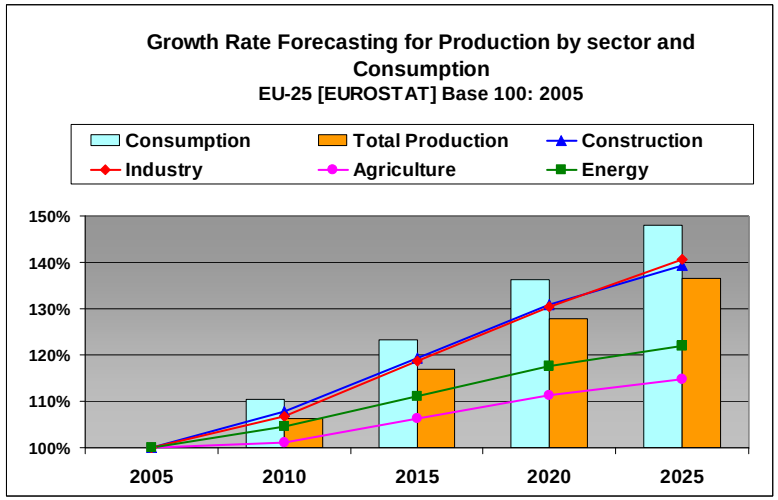
	Reference	Medium FERRMED	Full FERRMED	Southern ports enhancement 27% to 35%	FERRMED Objective achieved
2005	√	-	-	-	-
2020	√	√	-	-	-
2025	√	√	√	√	√

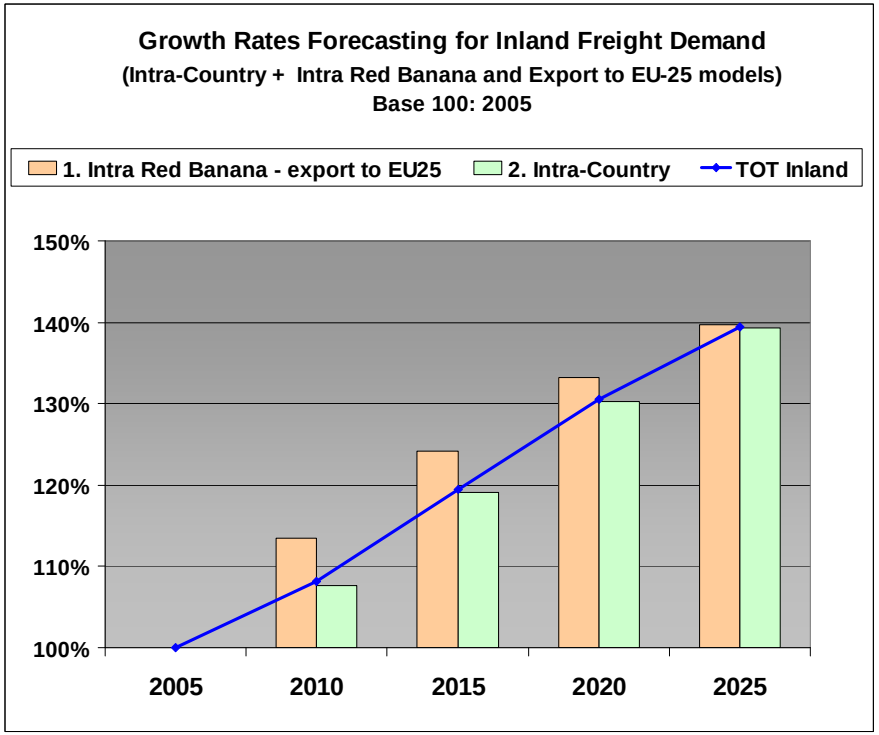
Supply / Demand Scenario Building



Inland Demand Forecasting

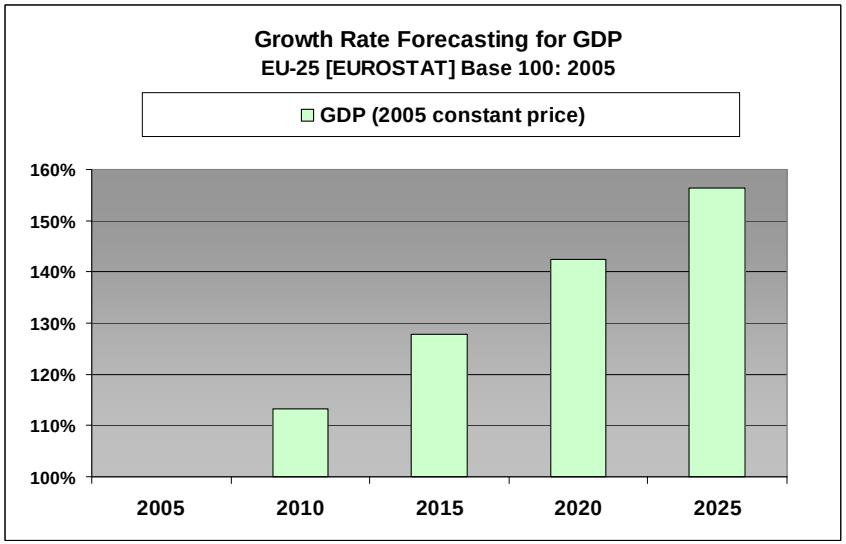






Maritime Demand Forecasting

- **Inputs**
  - GDP
  - Port expansion plans
  - Exports / imports
  - OECD industrial performance



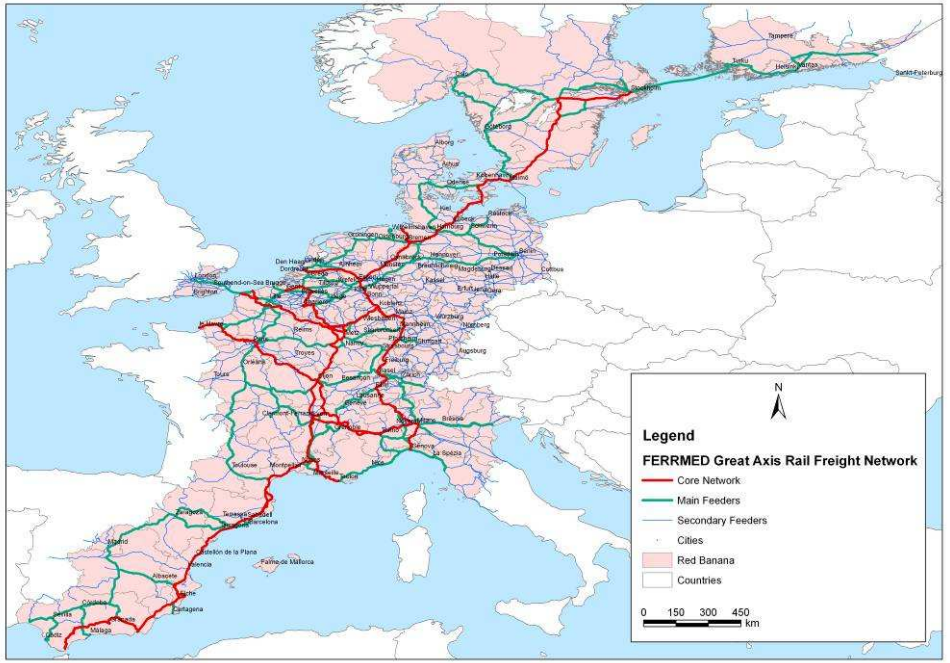
	2005 - 2025 Ref Growth Factor
Containers	262%
Ro-Ro	106%
Dry Bulk	41%
General Cargo	24%
Total	**118%**

Share between Mediterranean Ports and Others

Scenario	Med. Ports	Other European ports
2005 Base year	24%	76%
2025 Reference	27%	73%

Reference Scenario Network

- Planned and committed projects at 3 levels
  - European
  - National
  - Regional
- New and upgraded infrastructure
  - Rail Freight (127 projects)
  - Rail Passenger (140 projects)
  - Road (209 projects)
  - Inland waterways (11 projects)
- Terminals



Rail Freight Network (2025 Reference Scenario)

Reference Scenario Policies (I)

Policy	Action	Scenario year	Modelling
Freight intermodality and logistics	Motorways of the sea	2020	Reduce sea shipping waiting time at ports by 10%.
	Intermodal loading units (ILU) and freight integrators (Marco Polo Programme)	2020	Reduce cost at freight terminals by 30% viz: - fixed inventory (Euros/ton) - handling (Euro/m3) - storage (Euro/m3)
			Reduce waiting time at terminals by 10% Reduce travel time by 10%
Road pricing (Eurovignette) for freight and passenger transportation		2020	Vehicle charges per country (€/veh-km)

Reference Scenario Policies (II)

Policy	Action	Scenario year	Modelling
Liberalisation of transport markets and interoperability	Adoption of common rules in rail sector to improve interoperability and enhance quality of services	2020	Reduce rail freight travel time by 10%
	Rail sector liberalisation --full separation between infrastructure and operations-	2020	Reduce rail freight travel cost by 10% (€/ton-km)
			Reduce rail freight travel time by 10%
	International passengers services deregulation	2020	Reduce rail passenger travel cost by 5% (€/pax-km)
	Ports service liberalisation	2020	Reduce sea shipping costs (€/load) by 10 %
	Airport slots liberalisation	2020	Reduce tariffs for airport connections by 20%
Simplify Sea/IWW custom formalities		2020	Reduce sea and IWW port waiting times by 10%

Transport Costs

- Transport operating cost heavily dependant on fuel cost
- Operating cost calculation assumptions:
  - Road freight transport fuel prices grow at 50% of crude oil rate
  - IWW and Maritime Transport fuel prices grow at 80% of crude oil rate
  - Rail electric power price grows at 30% of average energy rate
- Assumptions for crude oil and energy prices growth:
  - Base year for prices: 2000 (Trans-Tools)
  - Future trends: World Bank (2008) and STEPs project (EC, 2006)

Freight Model Input

Total freight transport cost growth 2000-2025	
Road	18.6%
Rail	1.7%
IWW	21.5%
Sea	16.9%

Modelling Scenarios (I)

Year	Name	Demand	Transport Costs	Supply	FERRMED Standards
2005	1. Base year	2005	2005	2005	-
2020	2. Reference 1st run	2020 Forecasts	Reference 2020	Planned 2020	-
2020	3. Reference 2nd run Bottlenecks solution			Planned 2020 + Infrastructural Solutions	-
2020	4. MEDIUM FERRMED 1st run		Reference 2020 + MEDIUM	Planned 2020 +MEDIUM	MEDIUM
2020	5. MEDIUM FERRMED 2nd run Bottlenecks solution			Planned 2020 +MEDIUM+ Infrastructural Solutions	MEDIUM

Modelling Scenarios (II)

Year	Name	Demand	Transport Costs	Supply	FERRMED Standards
2025	6. Reference 1st run	2025 Forecasts	Reference 2025	Planned 2025	-
2025	7. Reference 2nd run Bottlenecks solution			Planned 2025 & Infrastructural Solutions	-
2025	8. MEDIUM FERRMED 1st run		Reference 2025 + MEDIUM	Planned 2025 & MEDIUM	MEDIUM
2025	9. MEDIUM FERRMED 2nd run Bottlenecks solution			Planned 2025 & MEDIUM & Infrastructural Solutions	MEDIUM
2025	10. FULL FERRMED 1st run		Reference 2025 + FULL	Planned 2025 & FULL	FULL
2025	11. FULL FERRMED 2nd run Bottlenecks solution			Planned 2025 & FULL & Infrastructural Solutions	FULL
2025	12. Southern ports enhancement 27% to 35%	North-South port share, assumed split 65-35%	Reference 2025 + FULL	Planned 2025 & FULL	FULL
2025	13. FERRMED Objective achieved	Long distance rail freight share assumed 35%	Reference 2025 + FULL	Planned 2025 & FULL	FULL
2025	14. FERRMED FULL+	2025 Forecasts	Reference 2025 + FULL	Planned 2025 & FULL+	FULL+

FERRMED Standards Implementation

FERRMED Standard	FERRMED Scenarios 1st Run	FERRMED Scenarios 2nd Run
1. Signalling	Included	Included
2. Train Length	Included	Included
3. New terminals and expansion	Included	Included
4. Maximum Axle Load	Included	New lines
5. Width of the tracks UIC 1435 mm	Included	Included
6. Liberalisation of the rail freight market	Included (Ref. Scenario)	Included (Ref. Scenario)
7. Reliability and Quality	Included	Included
8. Loading gauge UIC C	As in Reference scenario	For Upgraded and New lines
9. Two Parallel lines in core FERRMED rail network	Included when justified	Included when justified
10. Increase of Freight train priority	As in Reference scenario	Selected lines
11. Slope limitation to 12 ‰	As in Reference scenario	Included when needed to solve slope bottlenecks
12. Homogenisation of Power type	As in Reference scenario	Included
13. Renewal of Rolling stock	Indirect Effect	Indirect effect

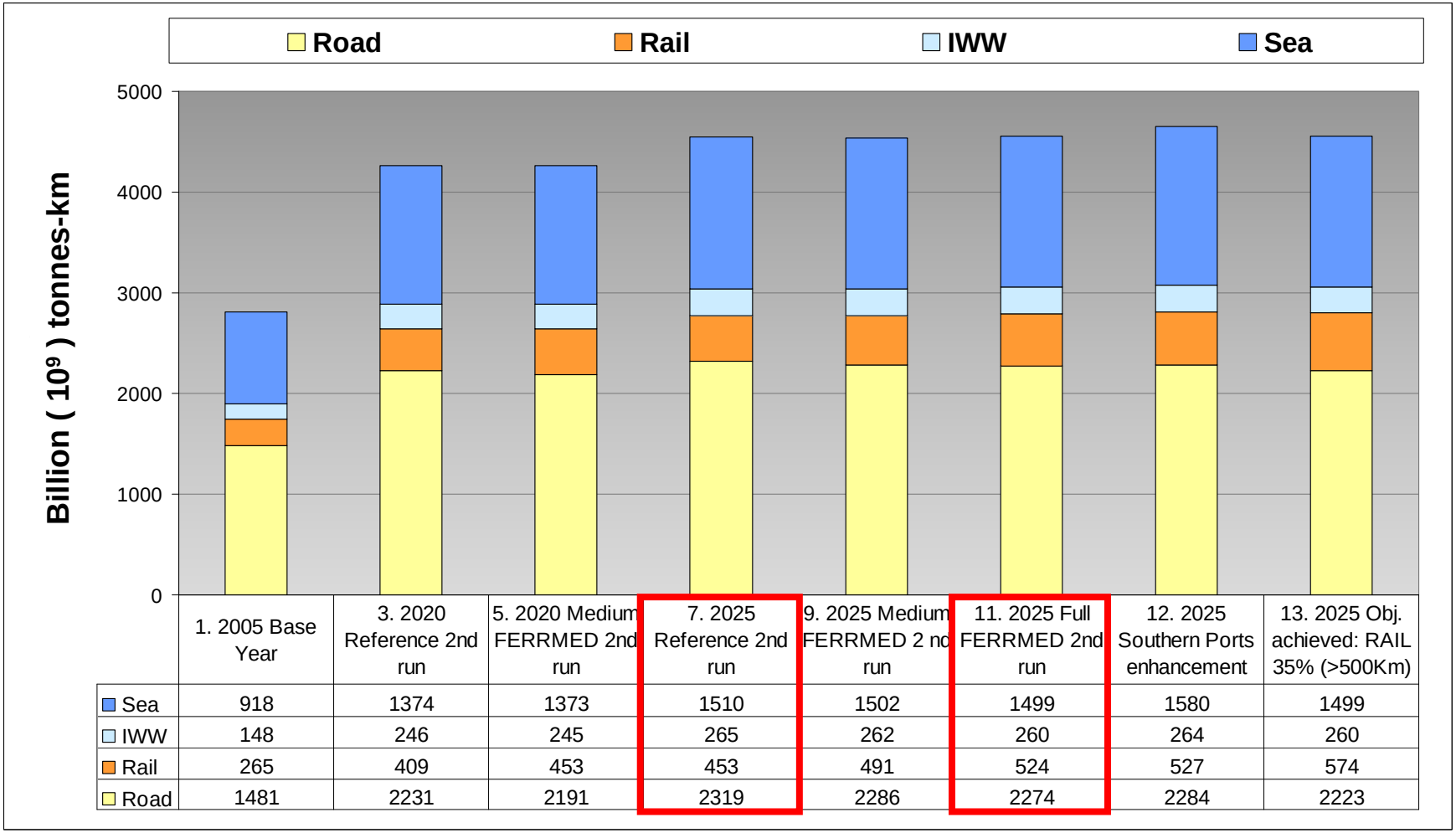
Modelling variables:

- Link Speed
- Line capacity
- Border crossing delays
- Loading capacity
- Operating costs
- Market prices
- Costs at freight terminals (handling, storage…)
- Times at terminals

FERRMED Standards Modelling

Modelling variable	FULL FERRMED Scenario	MEDIUM FERRMED Scenario
Link Speed	+ 15%	+ 0%
Line capacity	+ 15%	+ 0%
Border crossing delays	Eliminated	Eliminated
Loading capacity	+50%	+45%
Operating costs	-25%	-15%
Market prices	-25%	-15%
Costs at freight terminals (handling, storage…)	-20%	-15%
Times at terminals	-35%	-25%

Freight Transport Performance

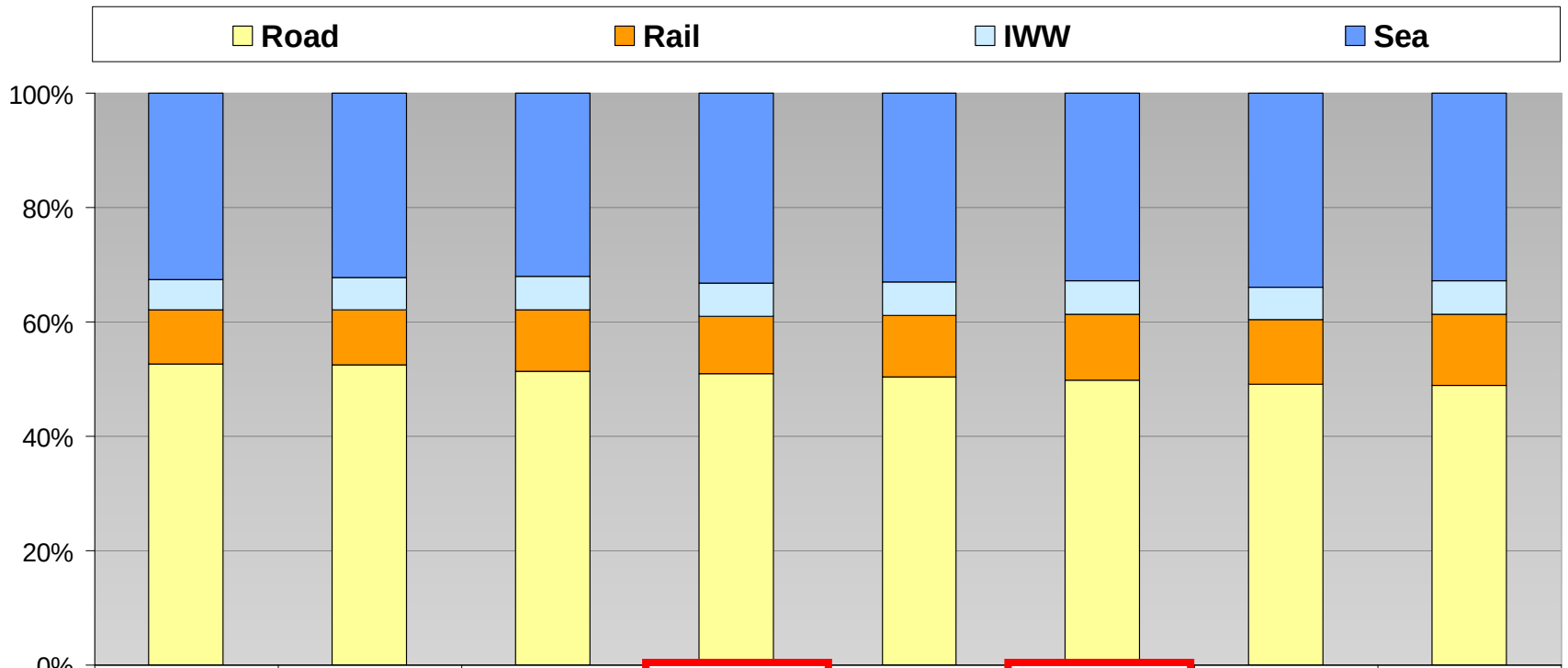


	1. 2005 Base Year	3. 2020 Reference 2nd run	5. 2020 Medium FERRMED 2nd run	7. 2025 Reference 2nd run	9. 2025 Medium FERRMED 2 nd run	11. 2025 Full FERRMED 2nd run	12. 2025 Southern Ports enhancement	13. 2025 Obj. achieved: RAIL 35% (>500Km)
Sea	918	1374	1373	1510	1502	1499	1580	1499
IWW	148	246	245	265	262	260	264	260
Rail	265	409	453	453	491	524	527	574
Road	1481	2231	2191	2319	2286	2274	2284	2223

Freight Transport Growth Rates

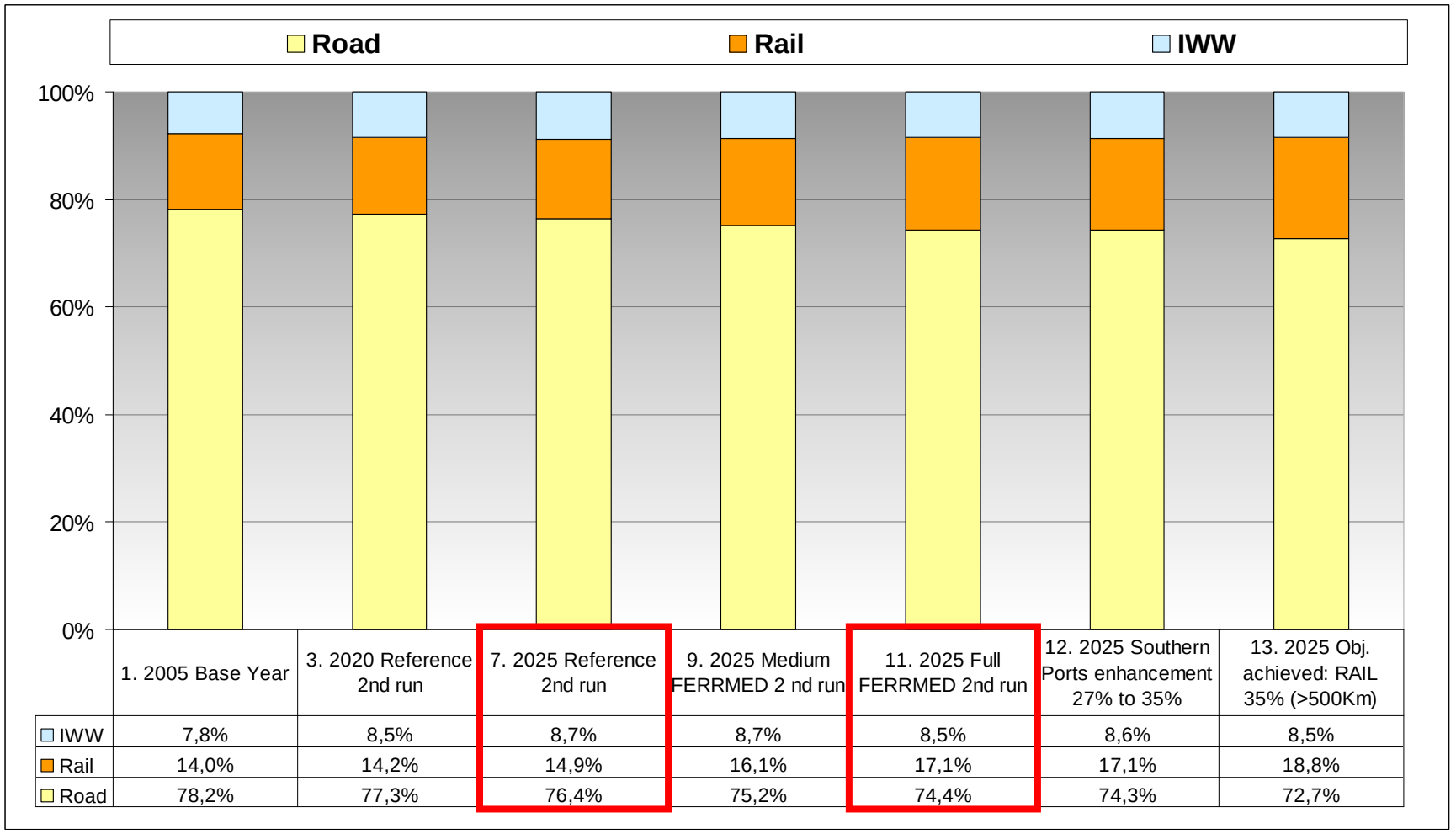
Period	Scenario	Rail	Road	IWW	Total Inland	Sea	Total All
2005-2020	3. 2020 Reference 2nd Run Bottlenecks Solution	54%	51%	66%	52%	50%	52%
2005-2020	5. 2020 Medium FERRMED 2nd run Bottlenecks solution	71%	48%	65%	52%	51%	52%
2005-2025	7. 2025 Reference 2nd run Bottlenecks solution	**71%**	57%	79%	60%	64%	62%
2005-2025	9. 2025 Medium FERRMED 2nd run Botteleneck solutions	**85%**	54%	77%	60%	64%	62%
2005-2025	11. 2025 Full FERRMED 2nd run Bottlenecks solution	**97%**	54%	76%	61%	63%	62%

Freight Modal Split



	1. 2005 Base Year	3. 2020 Reference 2nd run	5. 2020 Medium FERRMED 2nd run	7. 2025 Reference 2nd run	9. 2025 Medium FERRMED 2 nd run	11. 2025 Full FERRMED 2nd run	12. 2025 Southern Ports enhancement	13. 2025 Obj. achieved: RAIL 35% (>500Km)
Sea	32,6%	32,2%	32,2%	33,2%	33,1%	32,9%	34,0%	32,9%
IWW	5,3%	5,8%	5,8%	5,8%	5,8%	5,7%	5,7%	5,7%
Rail	9,4%	9,6%	10,6%	10,0%	10,8%	11,5%	11,3%	12,6%
Road	52,7%	52,4%	51,4%	51,0%	50,3%	49,9%	49,0%	48,8%

Inland Freight Modal Split



	1. 2005 Base Year	3. 2020 Reference 2nd run	7. 2025 Reference 2nd run	9. 2025 Medium FERRMED 2 nd run	11. 2025 Full FERRMED 2nd run	12. 2025 Southern Ports enhancement 27% to 35%	13. 2025 Obj. achieved: RAIL 35% (>500Km)
IWW	7,8%	8,5%	8,7%	8,7%	8,5%	8,6%	8,5%
Rail	14,0%	14,2%	14,9%	16,1%	17,1%	17,1%	18,8%
Road	78,2%	77,3%	76,4%	75,2%	74,4%	74,3%	72,7%

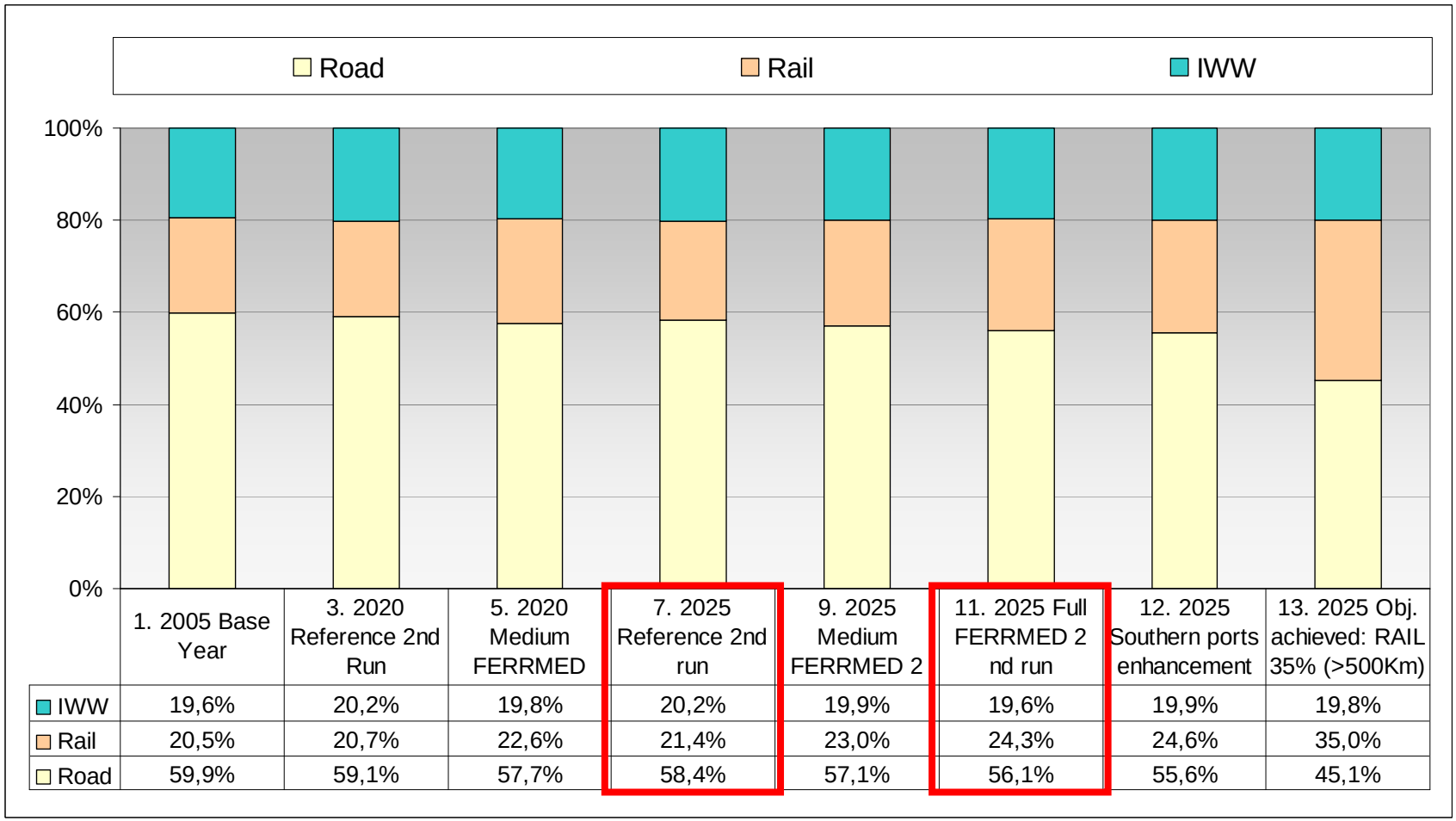
(Measured in tonnes-km)

Average Trip Distance

Trip Distance Distribution	Rail				Road			
	Trips < 500 km	Trips [500, 750] km	Trips [750, 1000] km	Trips >1000 km	Trips < 500 km	Trips [500, 750] km	Trips [750, 1000] km	Trips >1000 km
1. 2005 Base Year	51%	16%	10%	23%	75%	11%	5%	9%
3. 2020 Reference 2nd run Bottlenecks Solution	51%	17%	11%	21%	74%	11%	5%	10%
5. 2020 Medium FERRMED 2nd Bottlenecks Solution	51%	17%	11%	21%	74%	11%	6%	9%
7. 2025 Reference 2nd run Bottlenecks Solution	50%	17%	12%	21%	74%	11%	5%	10%
9. 2025 Medium FERRMED 2nd run Bottlenecks Solution	50%	18%	11%	21%	74%	10%	6%	10%
11. 2025 Full FERRMED 2nd run Bottlenecks Solution	50%	18%	11%	21%	74%	10%	6%	10%
12. 2025 Southern ports enhancement 27% to 35%	50%	18%	11%	21%	74%	10%	6%	10%

Average Rail trip distance around 300 km

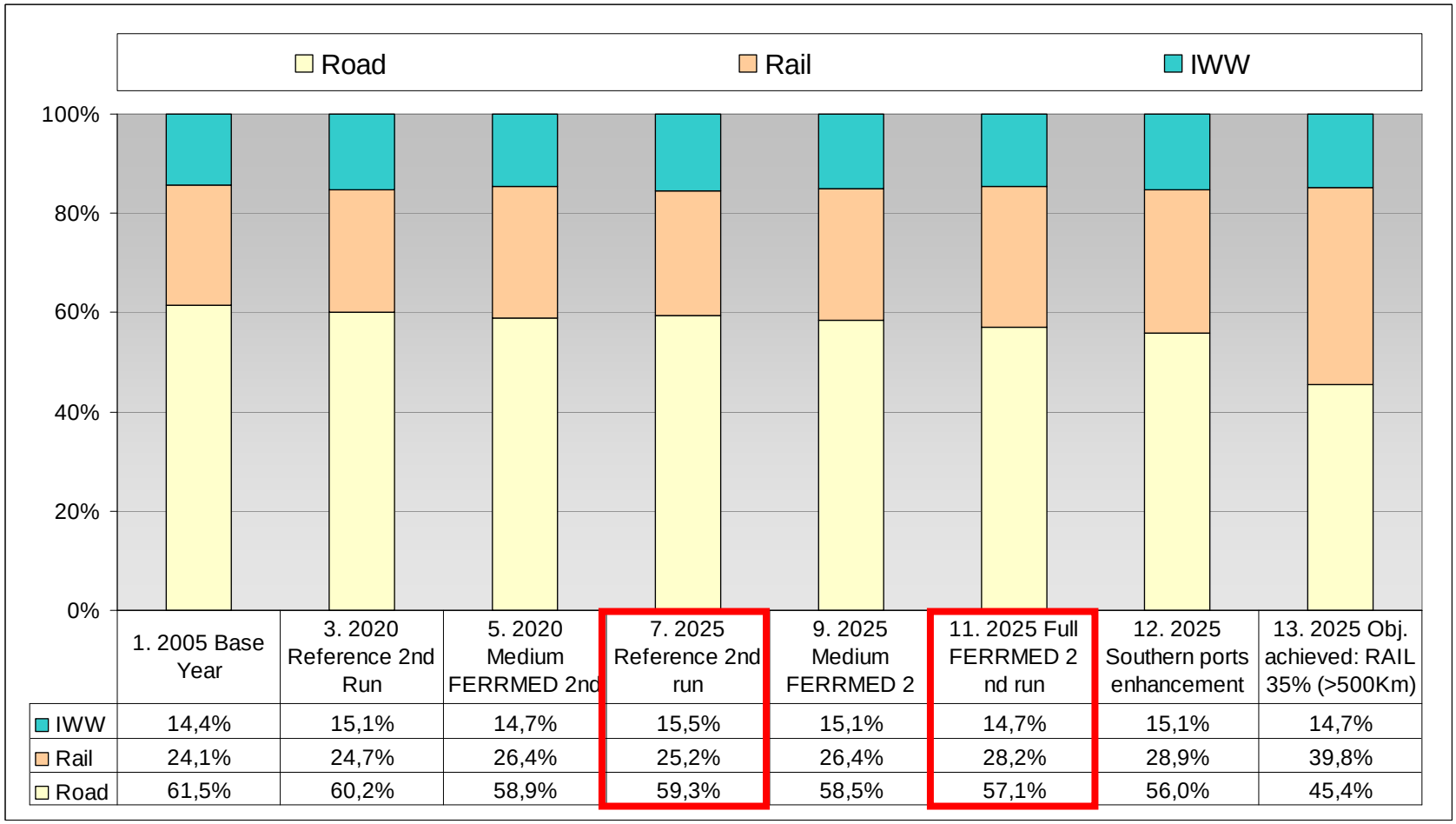
Freight Modal Split Inland Long Distance (>500 km)



	1. 2005 Base Year	3. 2020 Reference 2nd Run	5. 2020 Medium FERRMED	7. 2025 Reference 2nd run	9. 2025 Medium FERRMED 2	11. 2025 Full FERRMED 2 nd run	12. 2025 Southern ports enhancement	13. 2025 Obj. achieved: RAIL 35% (>500Km)
IWW	19,6%	20,2%	19,8%	20,2%	19,9%	19,6%	19,9%	19,8%
Rail	20,5%	20,7%	22,6%	21,4%	23,0%	24,3%	24,6%	35,0%
Road	59,9%	59,1%	57,7%	58,4%	57,1%	56,1%	55,6%	45,1%

(Measured in tonnes-km)

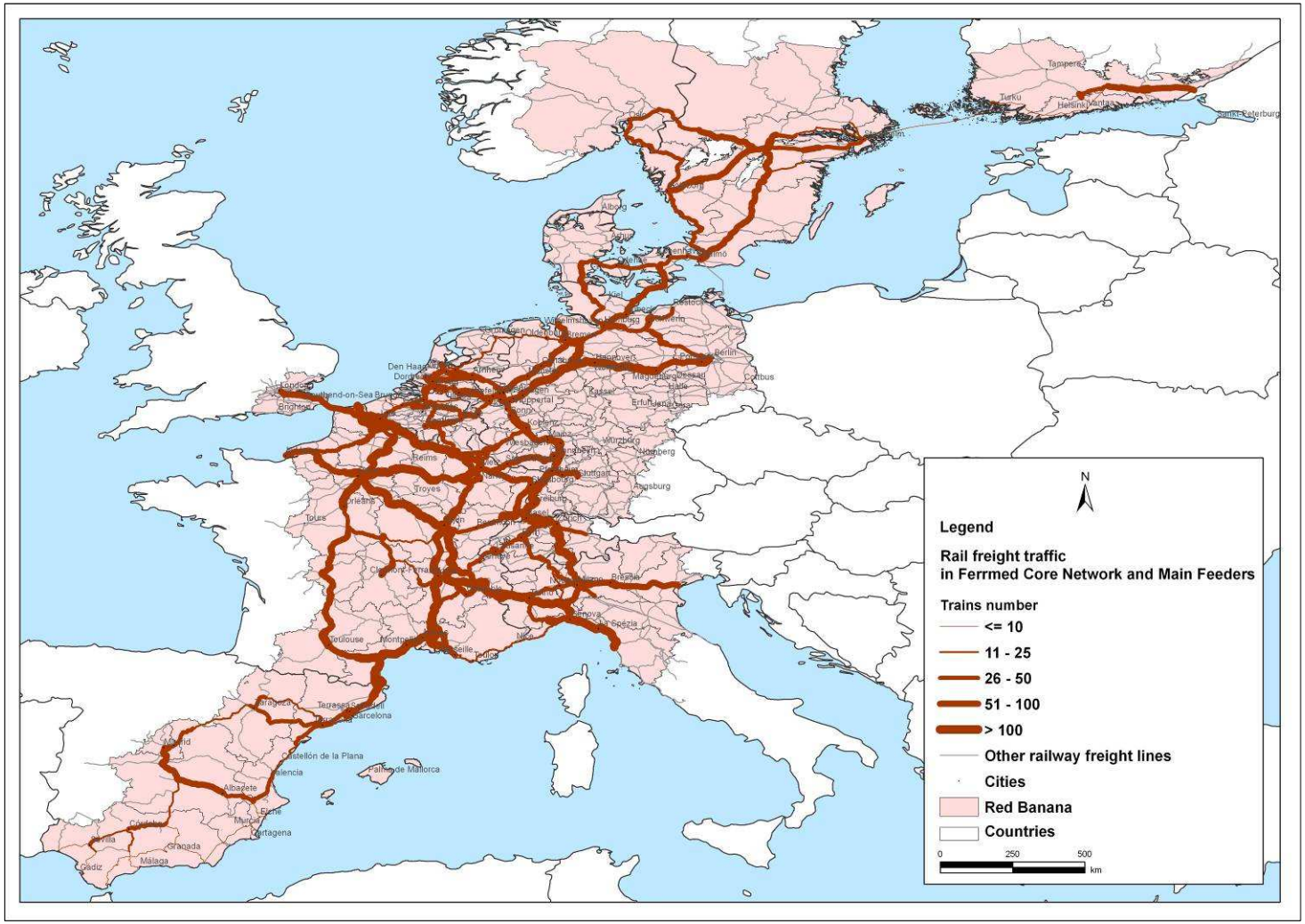
Freight Modal Split Inland Long Distance (>1000 km)



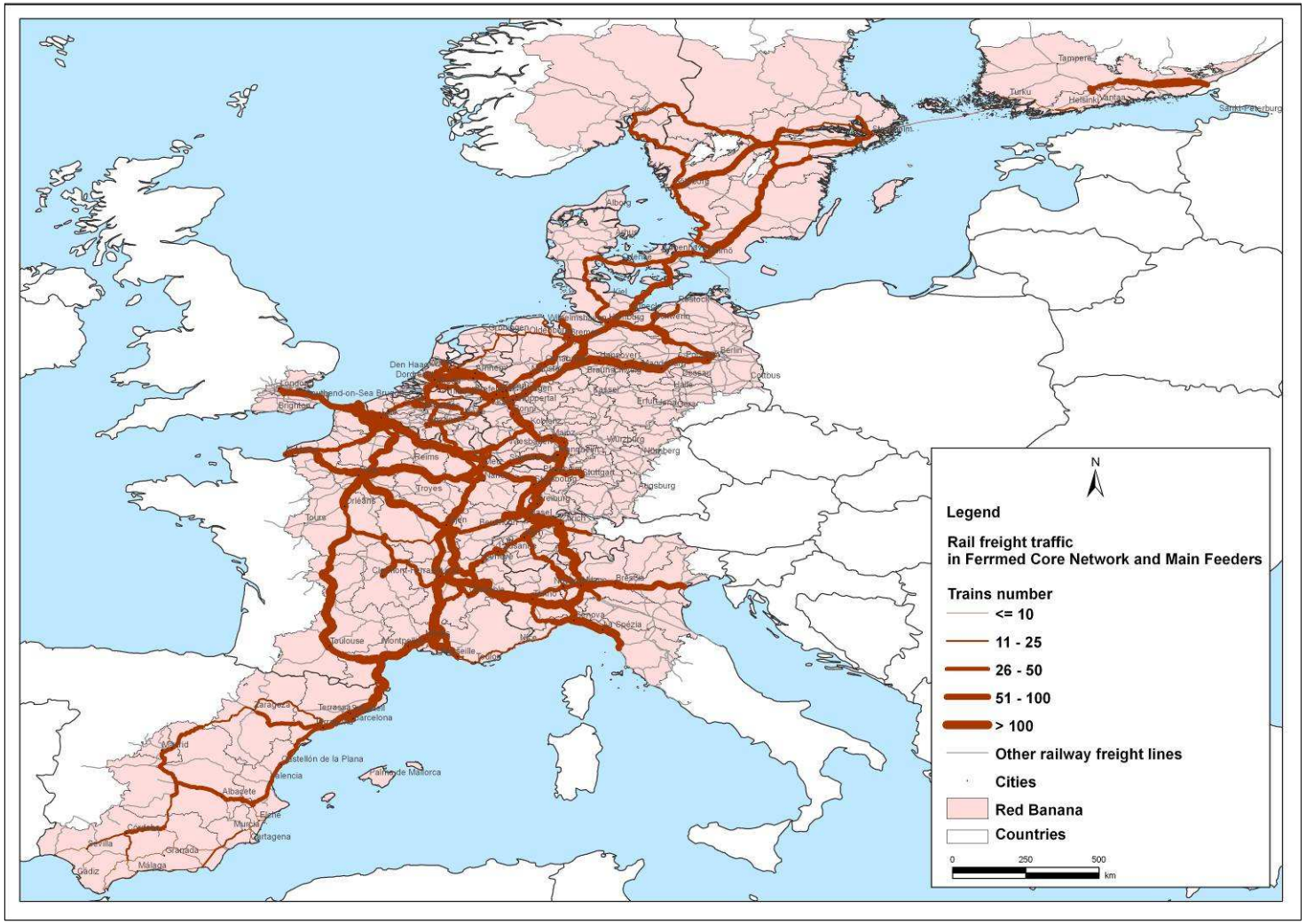
	1. 2005 Base Year	3. 2020 Reference 2nd Run	5. 2020 Medium FERRMED 2nd	7. 2025 Reference 2nd run	9. 2025 Medium FERRMED 2	11. 2025 Full FERRMED 2 nd run	12. 2025 Southern ports enhancement	13. 2025 Obj. achieved: RAIL 35% (>500Km)
IWW	14,4%	15,1%	14,7%	15,5%	15,1%	14,7%	15,1%	14,7%
Rail	24,1%	24,7%	26,4%	25,2%	26,4%	28,2%	28,9%	39,8%
Road	61,5%	60,2%	58,9%	59,3%	58,5%	57,1%	56,0%	45,4%

(Measured in tonnes-km)

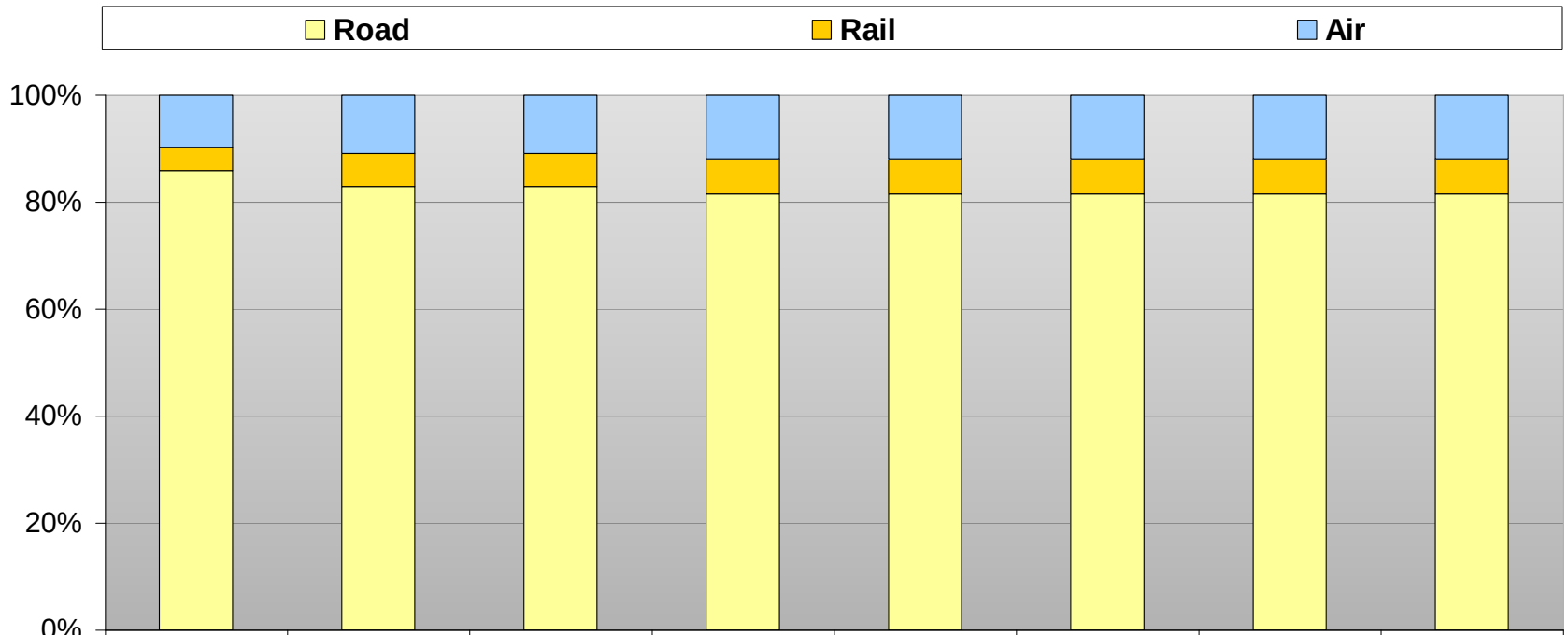
2025 REFERENCE Scenario
Rail Freight Traffic (trains/day)



2025 FULL FERRMED Scenario
Rail Freight Traffic (trains/day)



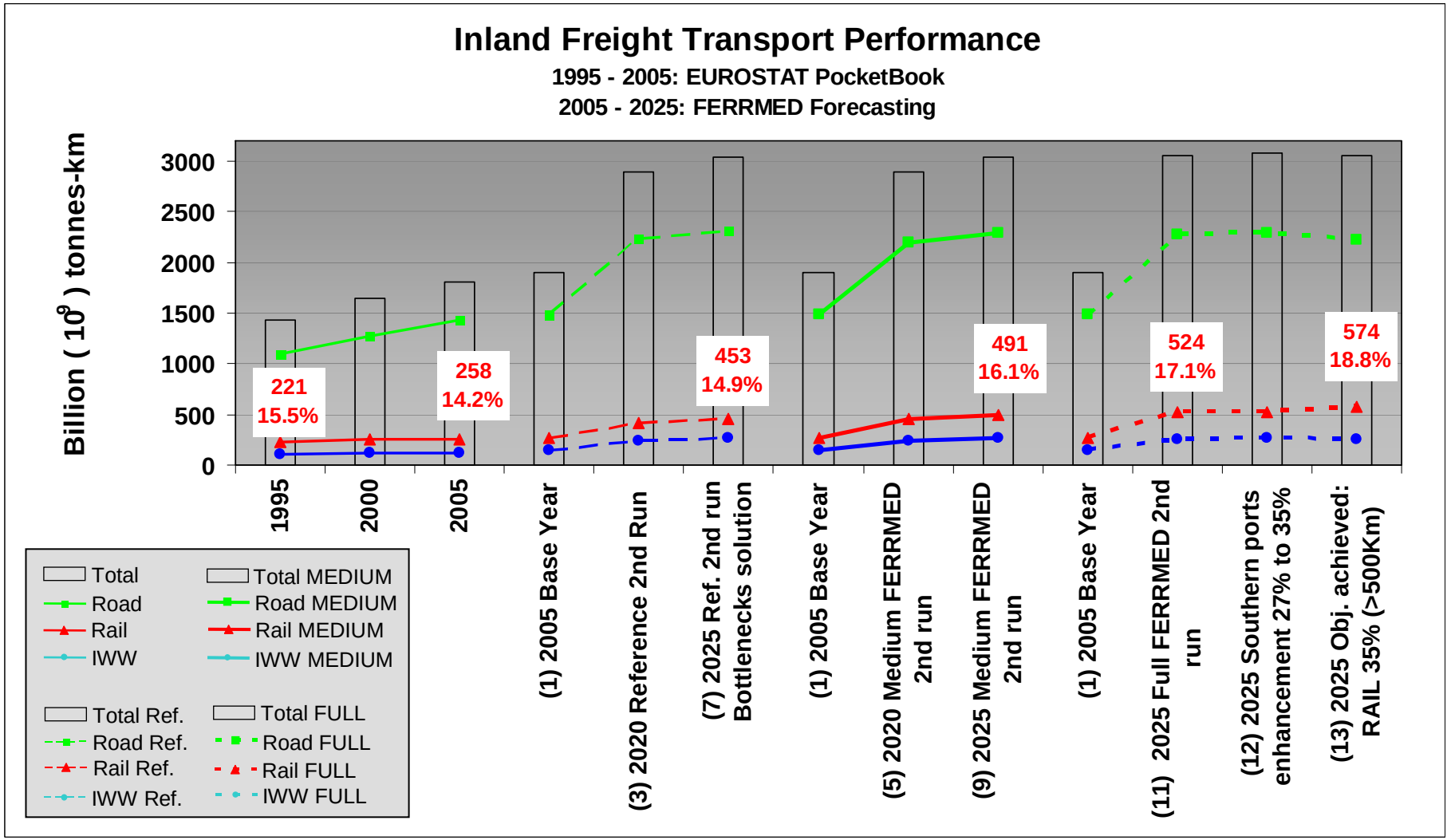
Passenger Modal Split



	1. 2005 Base Year	3. 2020 Reference 2nd run	5. 2020 Medium FERRMED	7. 2025 Reference 2nd run	9. 2025 Medium FERRMED 2	11. 2025 Full FERRMED 2nd run	12. 2025 Southern Ports enhancement	13. 2025 Obj. achieved: RAIL 35% (>500Km)
Air	9,6%	11,0%	11,0%	11,9%	11,9%	11,9%	11,9%	11,9%
Rail	4,5%	6,1%	6,1%	6,6%	6,6%	6,6%	6,6%	6,6%
Road	85,9%	82,9%	82,9%	81,5%	81,5%	81,5%	81,5%	81,5%

(Measured in passenger - km)

FERRMED: Reversing the trend (I)



FERRMED: Reversing the trend (II)

- Planned and committed projects plus European policies and global trends **stop the trend** of losing modal share by the **freight rail sector**, achieving also a slight **increase** in share (9.4% in 2005 to 10% in 2025)
- FERRMED Standards implementation **REVERSES THE TREND** with 16% growth in tonnes-km in rail market and 2% decrease by road in 2025
- Railway (inland, +750 km trips) modal share increases from 22.6% (2005) to 23.1 (2025 Reference), while **Full FERRMED further increases the share to 26.1%**.