Logistical and environmental considerations for the Far East to Europe corridor

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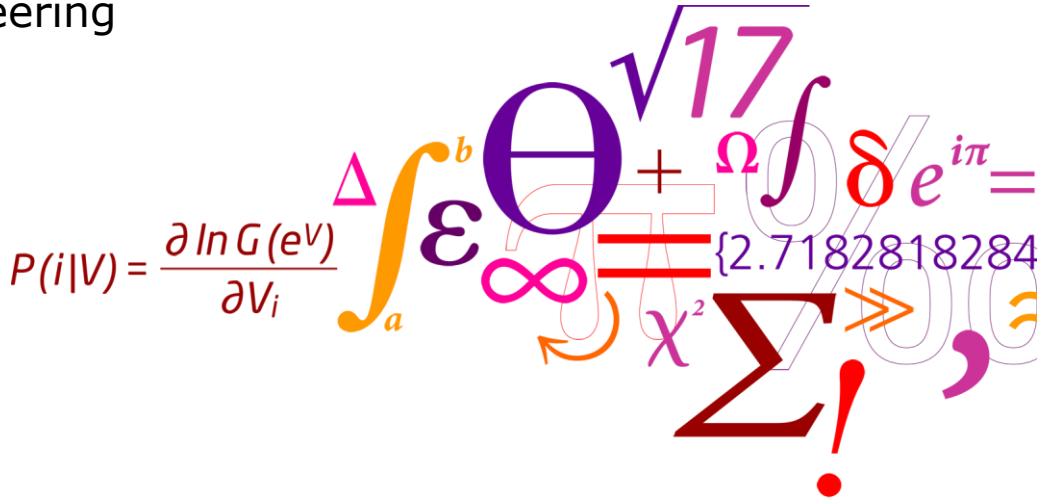


Overview

- EU SuperGreen project on green corridors
- One of the 9 corridors analysed was the ”Silk Way” corridor (Far East to Europe)
  - –2 modes, maritime and rail

- Part I: Background
- Part II: Results from corridor benchmarking
- Part III: Role of ICT
- Part IV: Modal shift considerations

Part I

Background

- Theme title: Transport (including Aeronautics)
- Type of project: Coordination and Support Action
- Project full title: Supporting EU's Freight Transport Logistics Action Plan on Green Corridors Issues
- Project acronym: SuperGreen

- Duration: 15 Jan. 2010- 15 Jan. 2013
- Total budget: 3,453,747 EUR
- EC contribution: 2,634,698 EUR

- www.supergreenproject.eu

The consortium

1 (Coordinator)	National Technical University of Athens	NTUA	Greece
2	Norsk Marinteknisk Forskningsinstitutt AS, MARINTEK	MAR	Norway
3	Sito Ltd (Finnish Consulting Engineers Ltd)	SITO	Finland
4	D'Appolonia S.p.A.	DAPP	Italy
5	Autoridad Portuaria de Gijon Gijón Port Authority-	PAG	Spain
6	DNV Det norske Veritas	DNV	Norway
7	via donau Österreichische Wasserstraßen-Gesellschaft mbH	VIA	Austria
8	NewRail - Newcastle University	UNEW	UK
9	CONSULTRANS	CONS	Spain
10	PSA Sines	PSAS	Portugal
11	Finnish Maritime Administration	FMA	Finland
12	Straightway Finland Ry	SWAY	Finland
13	SNCF Fret Italia	SFI	Italy
14	Procter & Gamble Eurocor	PG	Belgium
15	VR Group	VRG	Finland
16	Lloyd's Register-Fairplay Research	LRFR	Sweden
17	Hellenic Shortsea Shipowners Association	HSSA	Greece
18	Dortmund University of Technology	DUT	Germany
19	TES Consult Ltd	TES	Ukraine
20	Turkish State Railways	TCDD	Turkey
21	DB Schenker AG	SCH	Germany
22	The Bellona Foundation	BEL	Norway

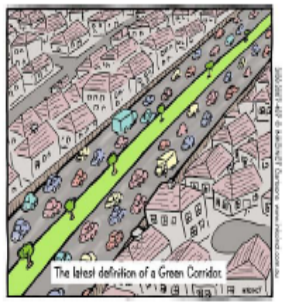
Project objectives

- Support the EC on green corridors
- Encourage co-modality
- Benchmark green corridors
- Undertake networking activities between stakeholders (public and private)
- Deliver policy recommendations
- Provide recommendations concerning new calls for R&D

Green corridor definitions

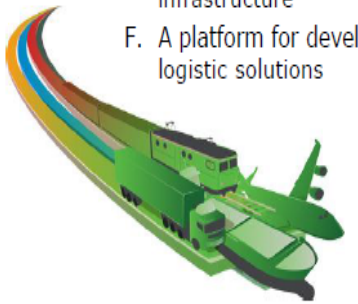
EU Commission:

1. Concentration of freight traffic
2. Co-modality and advanced technology
3. Adequate transhipment facilities
4. Green propulsion
5. Demonstrate innovative transport units
6. Fair and non-discriminatory access



Swedish Transport Administration:

A. Sustainable logistic solutions
B. Integrated logistic concepts with utilisation of co-modality
C. A harmonised system of rules
D. National/international goods traffic on long transport stretches
E. Effective and strategically placed transhipment points and infrastructure
F. A platform for development and demonstration of innovative logistic solutions



Selection of corridors for analysis

The 9 SuperGreen corridors

BRIEF DESCRIPTION- BRANCHES	NICKNAME
Malmö-Trelleborg-Rostock/Sassnitz- Berlin-Munich-Salzburg-Verona-Bologna-Naples-Messina-Palermo Branch A: Salzburg-Villach-Trieste (Tauern axis) Branch B: Bologna-Ancona/Bari/Brindisi-Igoumenitsa/Patras-Athens	**Brenner**
Madrid-Gijon-Saint Nazaire-Paris Branch A: Madrid-Lisboa	**Finis Terrae**
Cork-Dublin-Belfast-Stranraer Branch A: Munich-Friedewald-Nuneaton Branch B: West Coast Main line	**Cloverleaf**
Helsinki-Turku-Stockholm-Oslo-Göteborg-Malmö-Copenhagen (Nordic triangle including the Oresund fixed link)- Fehmarnbelt - Milan - Genoa	**Edelweiss**
Motorway of Baltic sea Branch: St. Petersburg-Moscow-Minsk-Klapeida	**Nureyeev**
Rhine/Meuse-Main-Danube inland waterway axis Branch A: Betuwe line Branch B: Frankfurt-Paris	**Strauss**
Igoumenitsa/Patras-Athens-Sofia-Budapest-Vienna- Prague-Nurnberg/Dresden-Hamburg	**Two Seas**
Odessa-Constanta-Bourgas-Istanbul-Piraeus-Gioia Tauro-Cagliari-La Spezia-Marseille-Barcelona-Valencia-Sines Branch A: Algeciras-Valencia-Barcelona-Marseille-Lyon Branch B: Piraeus-Trieste	**Mare Nostrum**
Shanghai-Le Havre/Rotterdam-Hamburg/Göteborg-Gdansk-Baltic ports-Russia Branch:Xiangtang-Beijing-Mongolia-Russia-Belarus-Poland-Hamburg	**Silk Way**

”Silk Way” corridor

- Maritime branch: Shanghai-LeHavre/Rotterdam-Hamburg/Göteborg-Gdansk-Baltic ports-Russia

- Rail branch:Xiangtang-Beijing-Mongolia-Russia-Belarus-Poland-Hamburg

Silk Way vs Silk Road

SuperGreen

OBOR

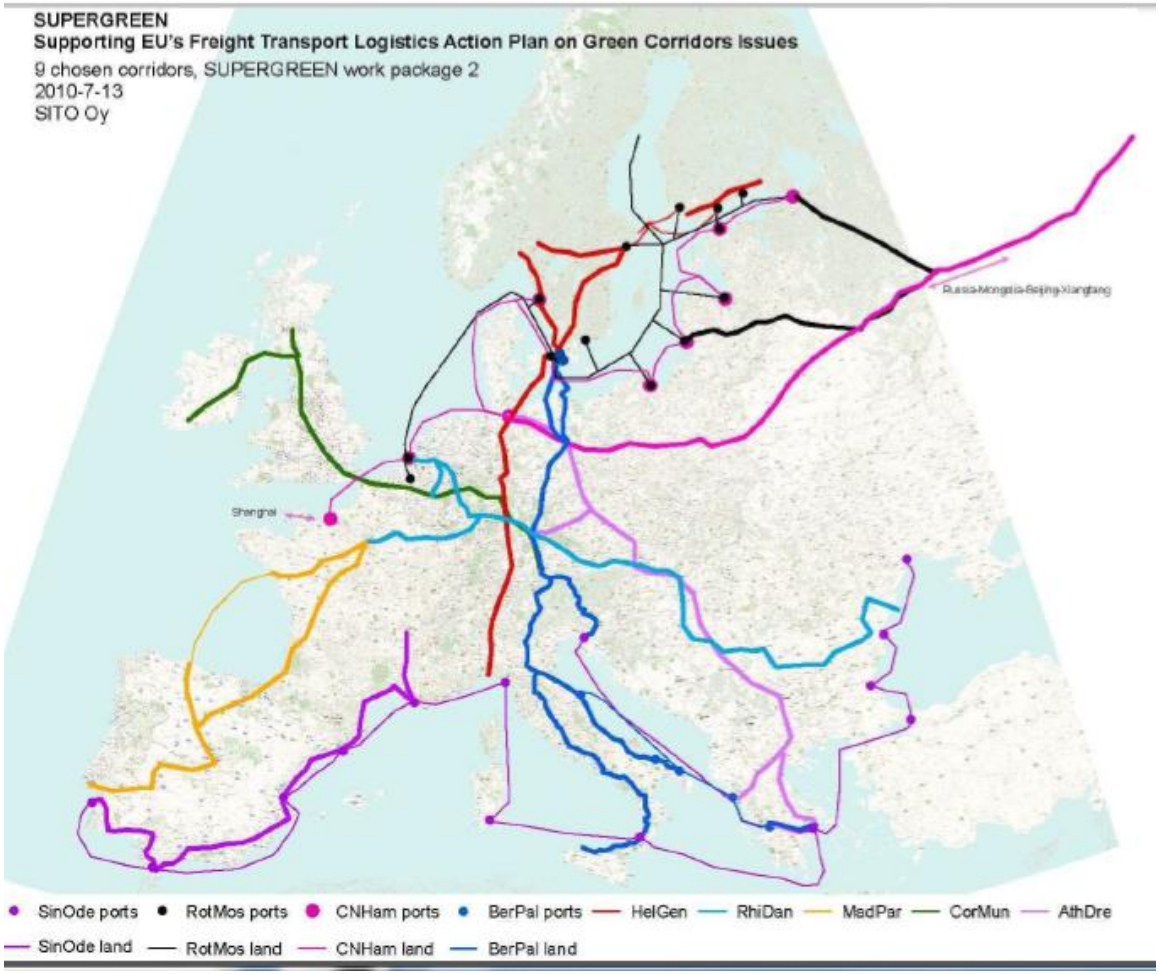
Why include "Silk Way" in this set?

(even though most of this corridor is outside the EU)

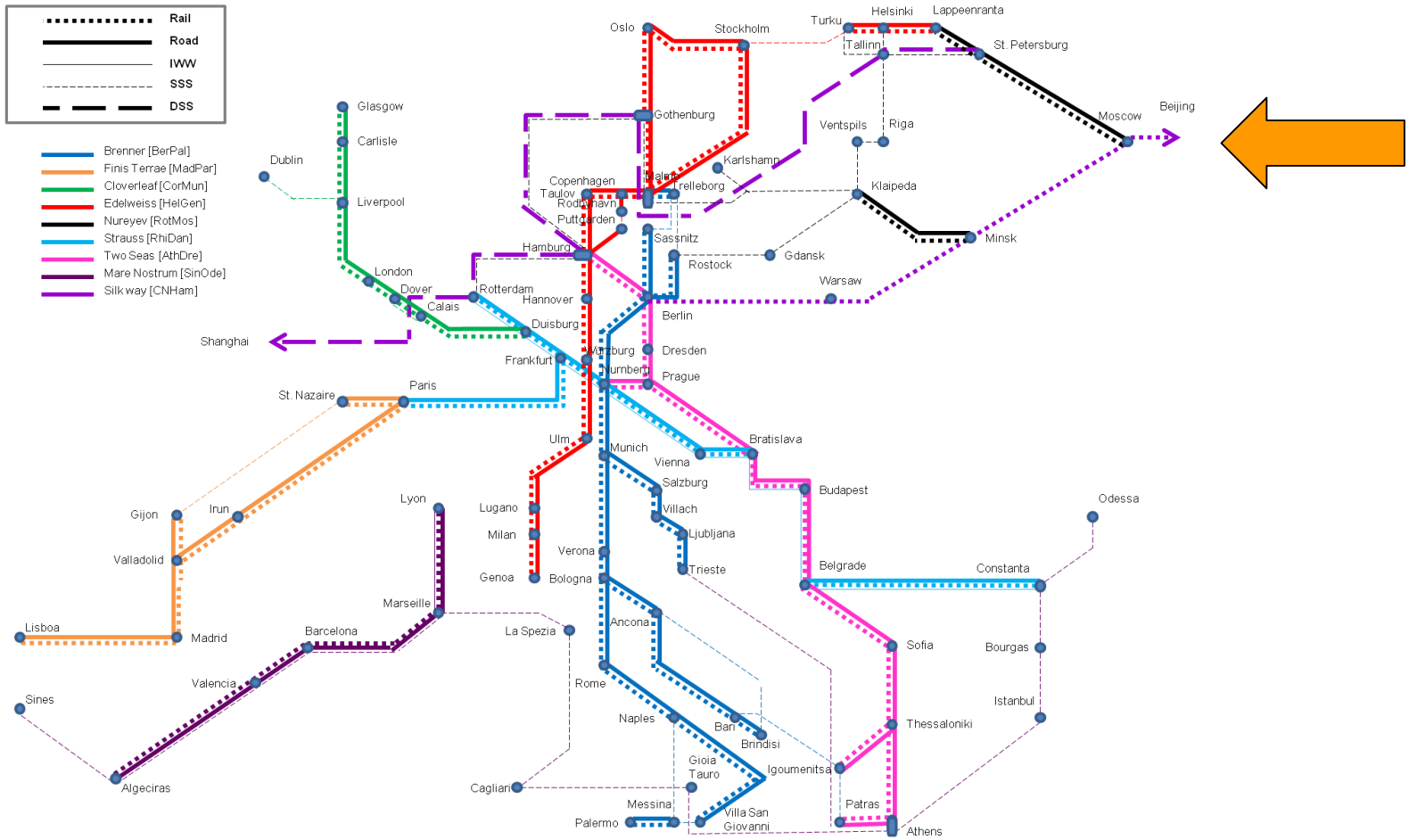
- Because this corridor was considered important for the trade relationship between Europe on the one hand, and the Far East on the other.

- Benchmarking it with the same methodology as in the pure intra-European corridors might be of interest.

The 9 SuperGreen corridors

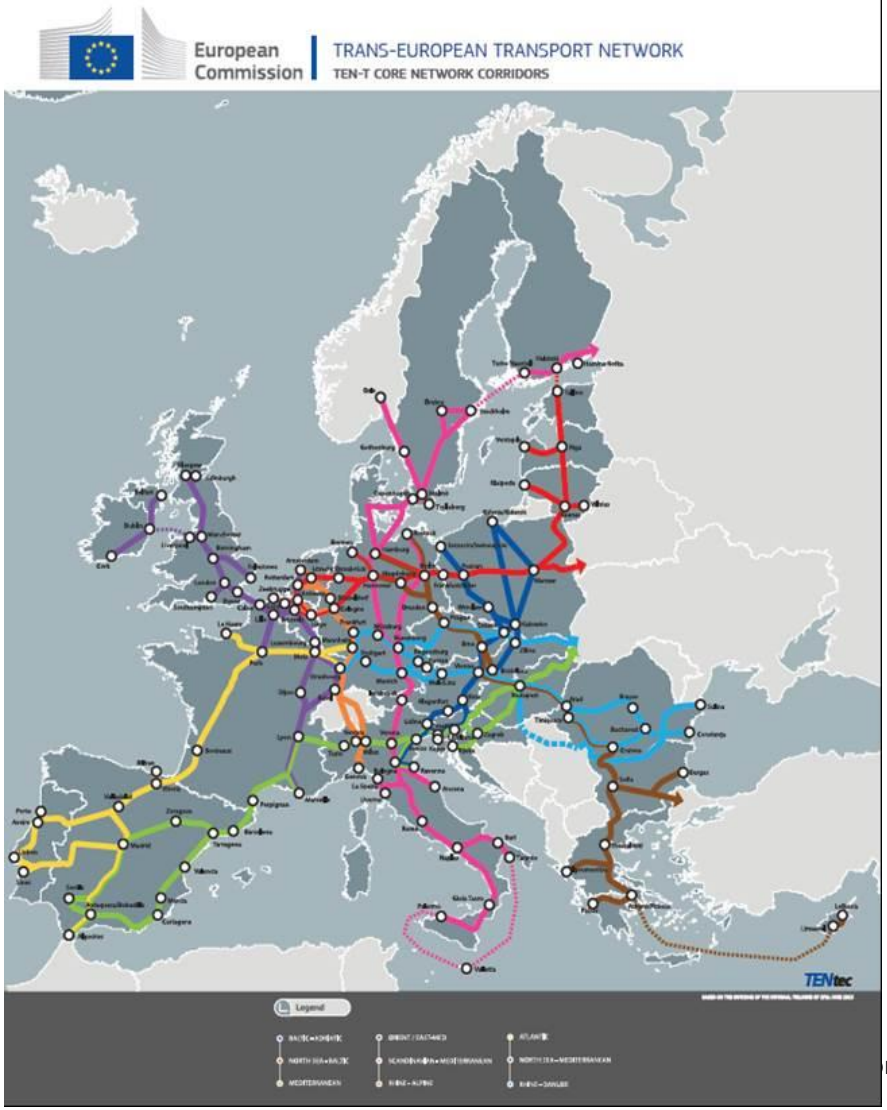


The 9 SuperGreen corridors in metro format



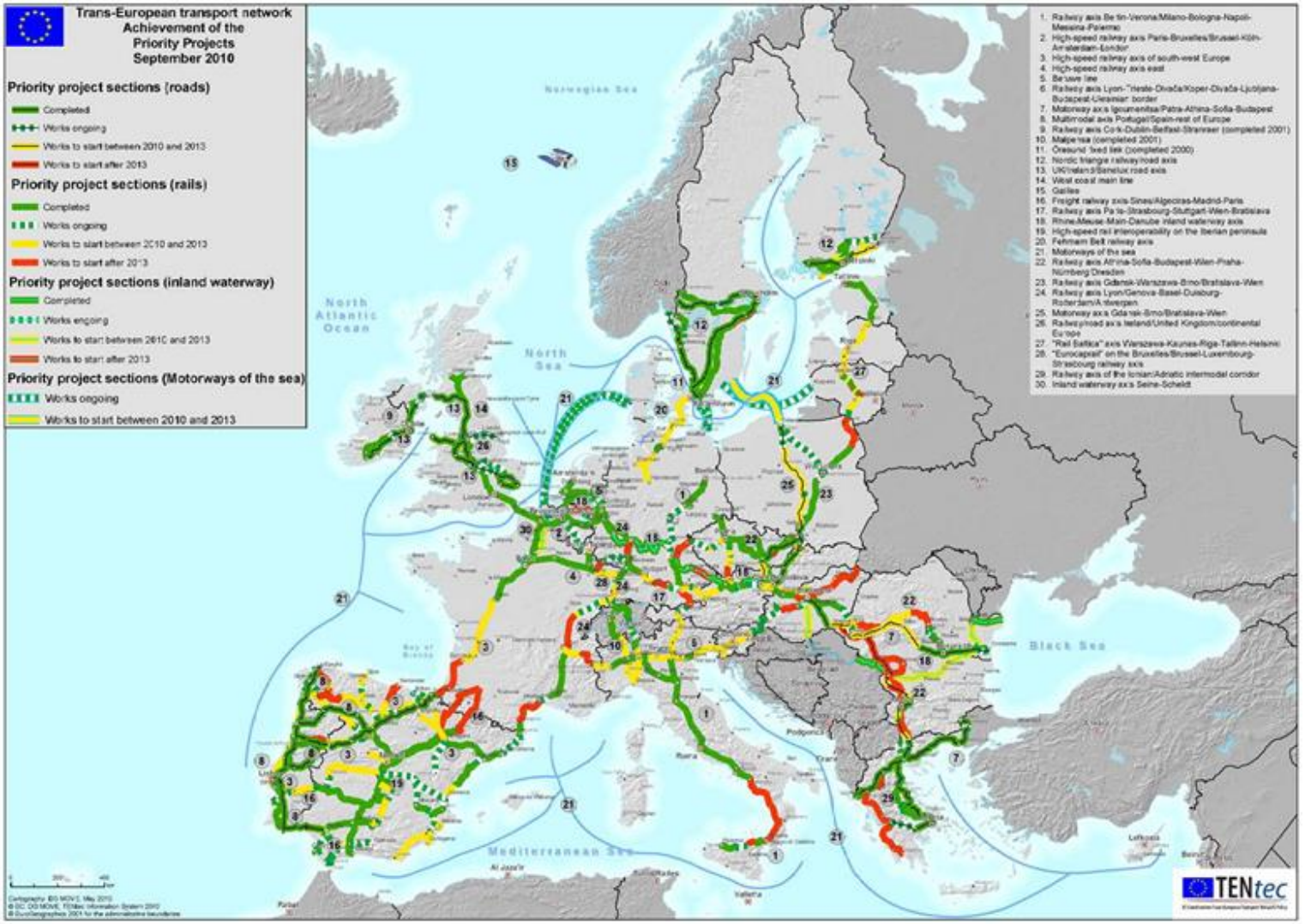
The TEN-T core network in metro format

TEN-T core network corridors

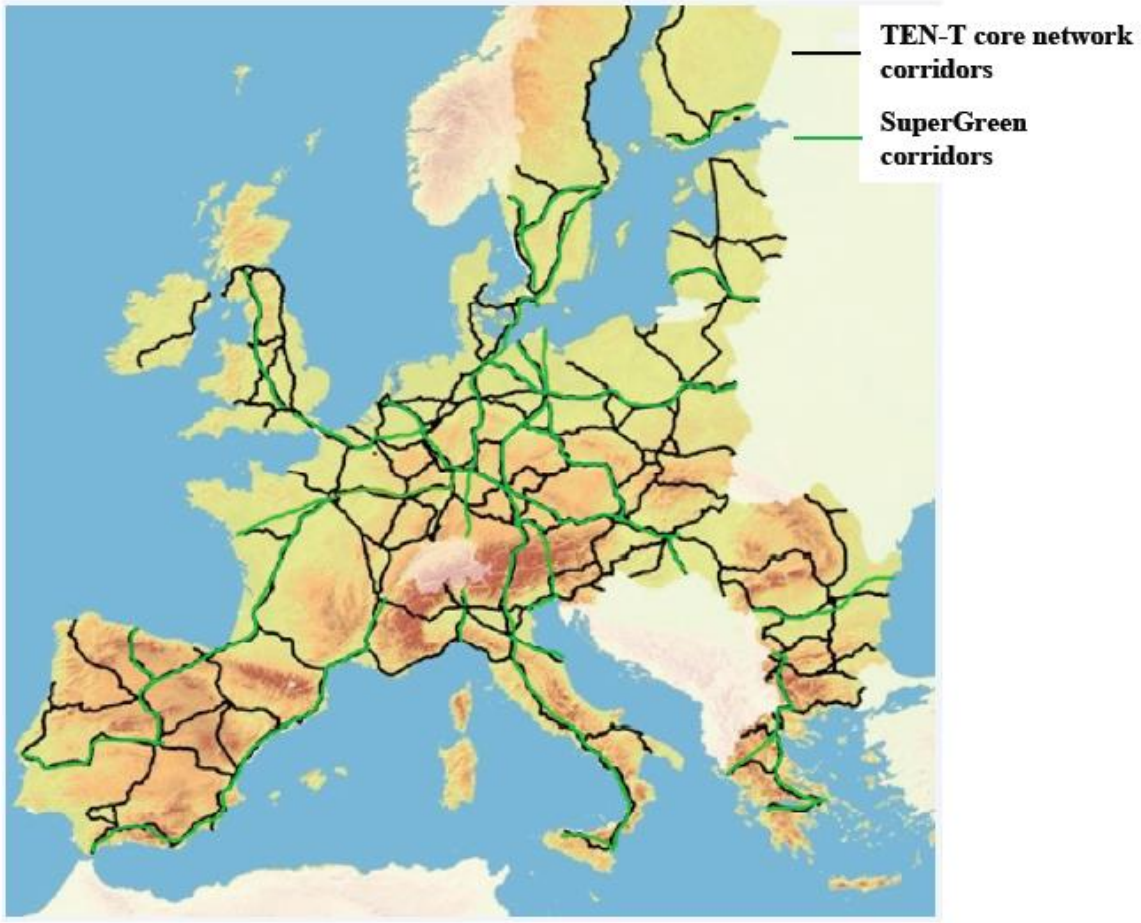


- Regulation EU 1315/2013 (TEN-T guidelines)
- Regulation EU 1316/2013 (Connect Europe Facility)

TEN-T: 30 priority projects



SuperGreen corridors (2010) vs TEN-T core network corridors (2011)



Part II: Corridor benchmarking and KPIs

Key Performance Indicators (KPIs)

- One of the central activities of the project
- What are reasonable KPIs?
- What is an appropriate approach?
- How is stakeholder input taken on board?

Initial list: 17 KPIs

Efficiency	Absolute cost	€/tonne
	Relative cost	€/ton-km
Service quality	Transport time	hours
	Reliability (time precision)	% of shipments on time
	Frequency of service	number per week
	ICT applications	scale 1-5
	Cargo security	incidents/shipments
	Cargo safety	incidents/shipments
Environmental Sustainability	CO_2-eq	g/ton-km
	SOx	g/1000 ton-km
	NOx	g/1000 ton-km
	PM_{10}	g/1000 ton-km
Infrastructural Sufficiency	Congestion	average delay/ton-km
	Bottlenecks	scale 1-5
Social issues	Land use (urban & sensitive areas)	% of buffer zone
	Traffic safety	fatal.& ser.injur./m tkm
	Noise	% of length >50/55 dB

Process

- 4 regional stakeholder workshops across Europe
- Feedback from Advisory Committee
- Consultation, consultation, & more consultation!

Final list: 6 main KPIs!

Relative transport cost (to the user)	€/ton-km
Transport time (or speed)	hours (or km/h)
Reliability (on-time delivery)	% of shipments
Frequency of service	number per year
CO_2-eq emissions	g/ton-km
SOx emissions	g/ton-km

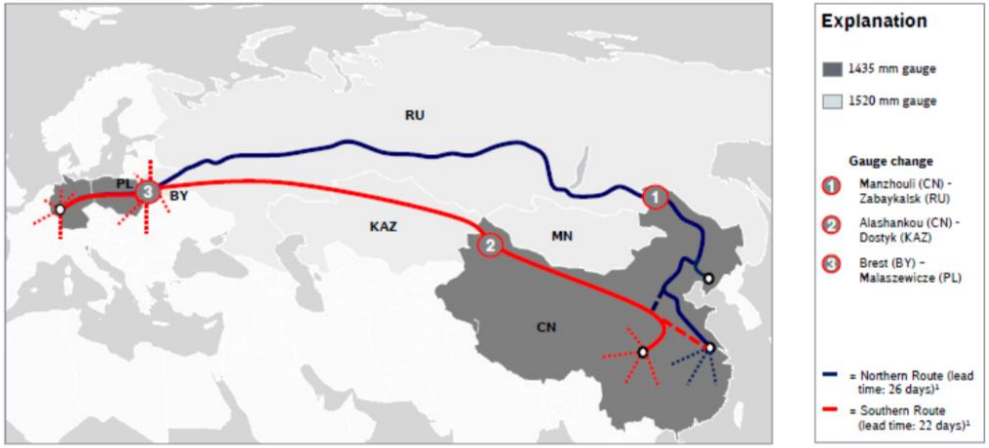
Benchmarking results

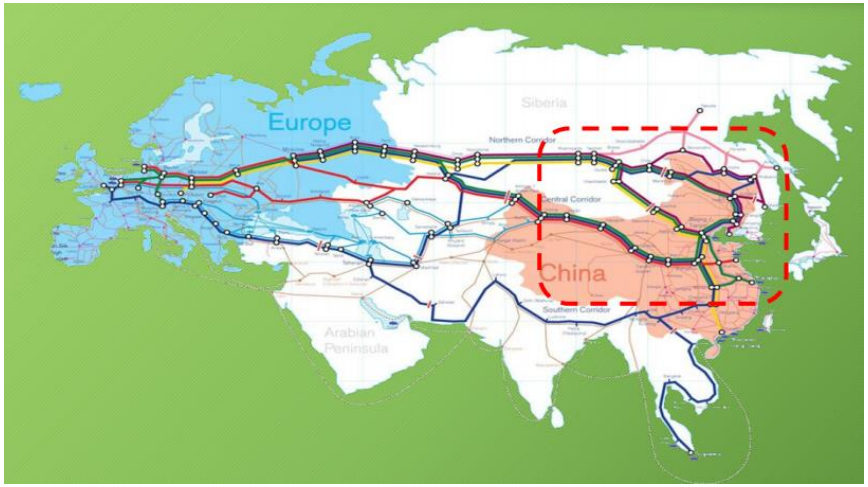
Corridor	Mode	Cost (€/tkm)	Av. speed (km/h)	Reliability (%)	Frequency (no/year)	CO_2 (g/tkm)	SOx (g/tkm)
Brenner	Intermodal	0.03-0.09	9-41	95-99	26-624	10.62-42.11	0.02-0.14
	Road	0.05-0.07	19-40	50-99	104-2.600	46.51-71.86	0.05-0.08
	Rail	0.05-0.80	44-98	50-100	208-572	9.49-17.61	0.04-0.09
	SSS	0.04	23	100	52	16.99	0.12
Cloverleaf	Road	0.06	40-60	80-90	4.680	68.81	0.09
	Rail	0.05-0.09	45-65	90-98	156-364	13.14-18.46	0.01-0.02
Nureyev	Intermodal	0.10-0.18	13-42	80-90	156-360	13.43-33.36	0.03-0.15
	SSS	0.05-0.06	15-28	90-99	52-360	5.65-15.60	0.07-0.14
Strauss	IWT	0.02-0.44	-	-	-	9.86-22.80	0.01-0.03
Mare Nostrum	SSS	0.003-0.20	17	90-95	52-416	6.44-27.26	0.09-0.40
	DSS	-	-	-	-	15.22	0.22
Silk Way	Rail	0.05	26	-	-	41.00	-
	DSS	0.004	20-23	-	-	12.50	-

The Silk Way rail alternative

- Via Trans-Siberian Railway (TSR)

Variants





Courtesy: students of 13420
Green Transport Logistics

TSR

Pluses

- Shorter trip time
- Electric traction (cleaner mode of transport?)

Minuses

- Limited capacity
- Different gauges
- Several border crossings
- Limited interoperability

Rail Cost KPI

Table 6 - Calculation of transport cost in €/tkm for the Silk Way railway service

Quotation specifics	Cost elements
Freight main haul/train (40' HC)	$ 8,230
Cross-docking Rail Terminal China (loaded)	$ 122
Insurance main haul/train China	$ 25
Security costs Russian Federation	$ 100
Re-expedition costs	$ 35
Other administration	$ 210
Liability insurance	$ 35
Given Total cost per container	**$ 8,757 (€ 6,159)[10]**
Distance covered in km	11 000
Average net tonnes transported per TEU	12
Total transported net tonnes	1200
Cost per ton in € (6 158,60/12 net tonnes per TEU)	513
Cost in €/tkm	**€ 0.05**

From Trans-Eurasia Logistics

Up to 9 weekly trains heading both directions

40'GP/HC COC in China, Germany, and other select locations

Rates starting from USD 2,400

Transit time starting from low as 14 days

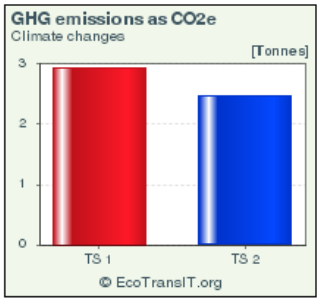
KPI summary

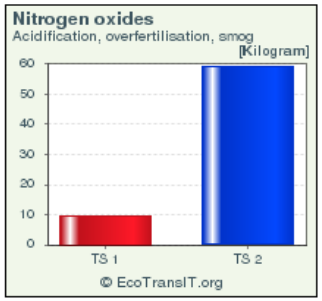
Table 7 - Benchmarks for the Silk Way corridor

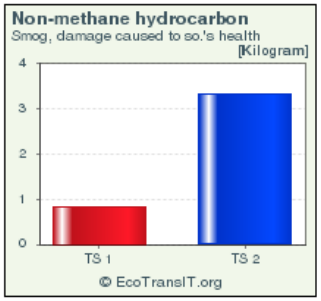
	Rail	Road	DSS	SSS
CO2 (g/tkm)	41[11]	-	12.5[12]	-
SOx (g/tkm)	-	-	-	-
Cost (€/tkm)	0.05	-	0.004	-
Average speed (km/h)	26	-	20 – 23	-
Reliability (%)	-	-	-	-
Frequency (no per year)	-	-	-	-

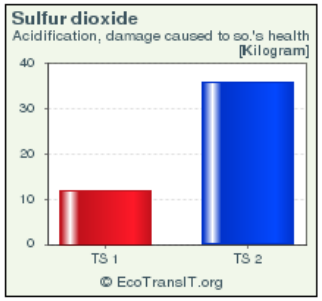
- Reliability, SOx and frequency KPIs: No analysis

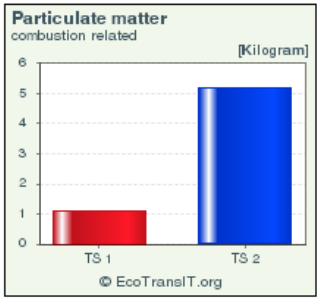
Use EcoTransIT World emissions calculator

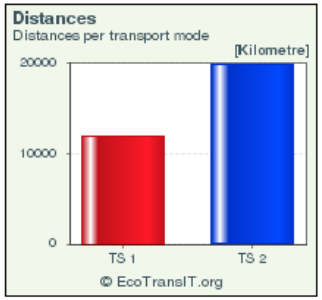












Observations

Maritime branch

- Silk Way's maritime branch ranks No. 1 among the 9 corridors on the cost and CO_2 KPIs.
- Maritime branch achieves better KPIs than rail in terms of cost and CO_2.

Rail branch

- Has significantly lower capacity compared to maritime.
- Has considerable lower transport time and on that criterion has a competitive advantage compared to maritime.

Part III: Potential role of ICT

Table 8 Main application areas for smart ICT systems at Silk Way corridor. Source: Zacharioudakis et al. (2012).

Segment or transport chain	Transport Modes		Specific ICT technology	Data / Information	Installation Requirements (technology, software, data)	Bottleneck / Motivation	Related KPIs or Attributes
	Major Mode	Other Direct Beneficiary Users					
Beijing - Hamburg	rail		ERTMS-European Railway Traffic Management EREX metering system				
Shanghai-Rotterdam/ Hamburg	Deep Sea		AIS – Automatic Identification System LRIT – Long Range Identification and Tracking Radar SafeSeaNet	Vessel position, speed, ship ID, ETA, ETD, type of cargo	Transponder onboard ship (mandatory), on shore AIS infrastructure	Improved systems for port logistics and traffic monitoring, increases efficiency and safety	Absolute and relative costs Service quality Transport time Reliability Congestion Bottlenecks Cargo security and safety (AIS – hazardous cargo tracking), fewer emissions.
Shanghai-Rotterdam/ Hamburg	Deep Sea		GNSS (GPS, Glonass, Galileo)	Position	GNSS receiver on board ship Not a specific ICT system, but is important input to ICT systems	Provide position to other systems	--
Shanghai-Rotterdam/ Hamburg	Deep Sea		Port Community Systems Single Window solutions	Time schedules, port resource management, electronic information exchange (EDI), traffic statistics	IT systems, sensors, web cameras	Port logistics, traffic monitoring, cargo tracking	Absolute and relative costs Service quality Transport time Reliability Congestion Bottlenecks ICT applications

Focus: European Rail Traffic Management System (ERTMS)

Serious **interoperability** problems in rail transport:

- More than 20 signalling systems in Europe
- Trains need to be equipped with several on-board systems to cross borders
- Drivers need to be trained to use these systems
- Sometimes even trains have to be changed at the border

In 2009, six priority corridors for the deployment of ERTMS (by 2020) were established:

- Corridor A: Rotterdam-Genoa
- Corridor B: Stockholm-Naples
- Corridor C: Antwerp-Basel
- Corridor D: Budapest-Valencia
- Corridor E: Dresden-Constanta
- Corridor F: Aachen-Terespol

The ERTMS corridors

No system like ERTMS in Silk Way rail corridor

But it could

- Improve interoperability
- Reduce delays
- Reduce congestion
- Increase corridor capacity
- Improve all corridor KPIs

Part IV: Modal shift considerations

- Possible modal shifts to rail due to slow steaming

TRANS EURASIA EXPRESS

The issue

- Slow steaming is much prevalent these days.
- Slow steaming may induce some cargoes to prefer the (faster) rail mode.
- Is there an impact?
- A slow steaming scenario of 30% speed reduction was assumed: from 18 to 12.6 knots

Modal split model

Transportation Research Part D 15 (2010) 458–462

Contents lists available at ScienceDirect

Transportation Research Part D

journal homepage: www.elsevier.com/locate/trd

Balancing the economic and environmental performance of maritime transportation

Harilaos N. Psaraftis *, Christos A. Kontovas

Laboratory for Maritime Transport, National Technical University of Athens, Greece

Use logit model

- New shares

$$\frac{x_1^*}{x_2^*} = \frac{x_1}{x_2} e^{-\lambda\left(p_1^* - p_1 + k\frac{L_1 \Delta V}{V(V-\Delta V)}\right)}$$

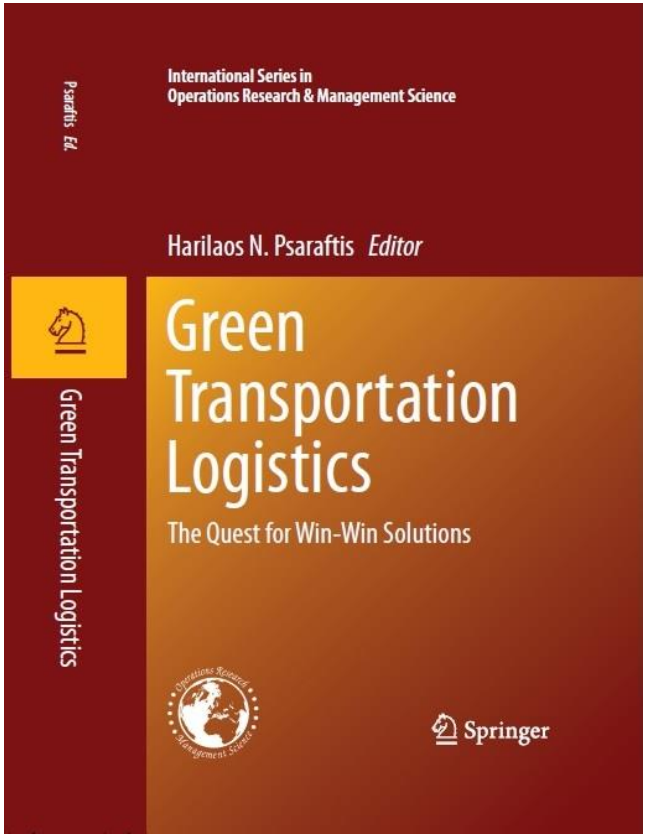
$$\frac{x_1^*}{x_2^*} = \frac{x_1}{x_2}\left(1 - \lambda\left(p_1^* - p_1 + k\frac{L_1 \Delta V}{V(V-\Delta V)}\right)\right)$$

Net result

- Share reductions were found to be marginal.
- Reducing CO_2 in one mode may result in more CO_2 overall.
- Total ΔCO_2 may be >0 or <0, depending on scenario.

Other SuperGreen results

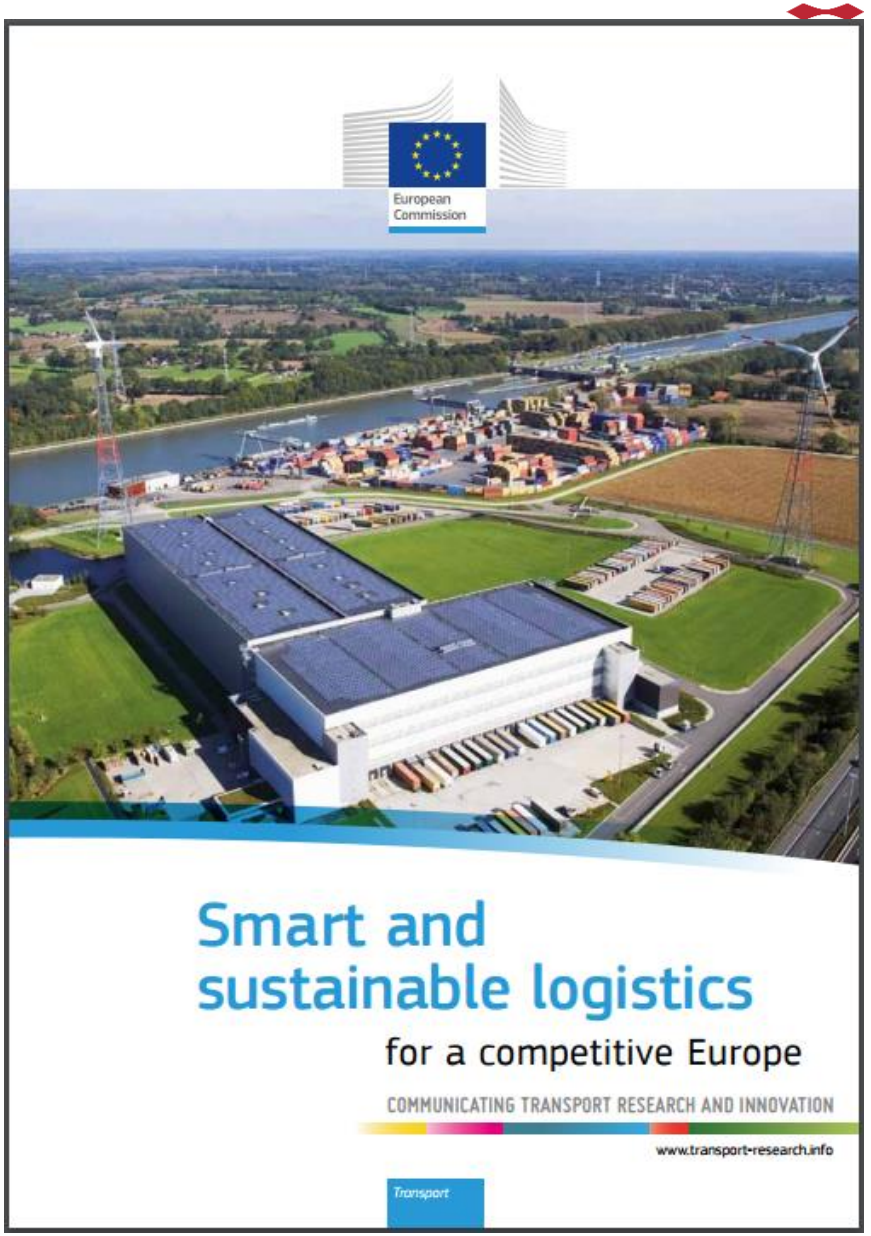
- Corridor benchmarking
- Policy recommendations
- SuperGreen Handbook
- Extensive dissemination
  - 8 papers in journals, book chapters and papers in scientific conferences
  - 3 plenary workshops
  - 4 regional workshops
  - Close to 50 presentations in other external events
  - **A book -→**



Latest news

SuperGreen was selected by the European Commission as a **success story** for a Policy Brochure on logistics for the Transport Research and Innovation Portal (TRIP)

Success stories = Research projects whose results are recognized as highly successful in supporting EU policy



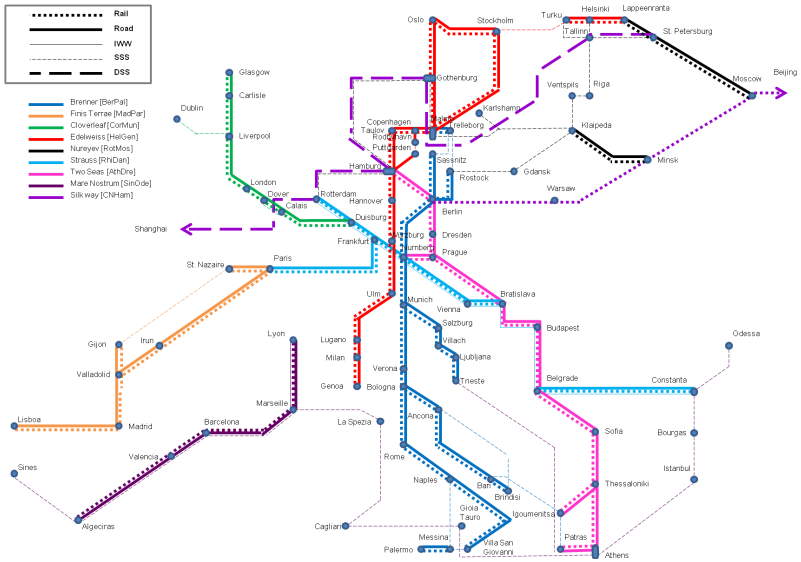
Conclusions

- Deep sea shipping still the predominant mode
- Potential of the rail mode on the Far East to Europe corridor is largely untapped
- Advances in ICT and other technologies would move rail in that direction
- A niche market for which rail could be able to be attractive in this corridor is the market of relatively expensive products, for which faster delivery times are more important.

Conclusions ii

- The rail option's main competitor on the Far East to Europe corridor is not so much the maritime mode, but air cargo.
- Rail is already far superior to air in terms of emissions and cost KPIs.
- Whether it can also provide a credible alternative in terms of the time, reliability and other KPIs on that corridor remains to be seen.

THANK YOU VERY MUCH



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