2016 REPORT ON

COMBINED TRANSPORT IN EUROPE

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BSL Transportation Consultants

INTERNATIONAL UNION OF RAILWAYS

2016 REPORT ON

COMBINED TRANSPORT IN EUROPE

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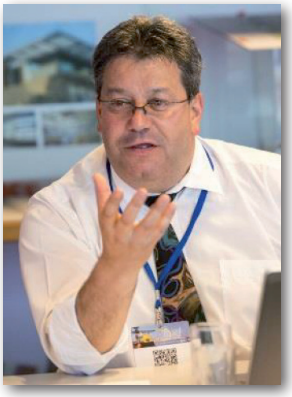
Foreword by the UIC Combined Transport Group Chairman



Now in its 6th edition, the 2016 Combined Transport report once more shows the continued expansion of combined transport across Europe. The European economy is already shifting to greener modes of transport, and this process now needs to be supported by meaningful action.

2016 was a year of consolidation for continental and maritime volumes, but also – indeed, especially – a year of growth for intercontinental markets, particularly as regards traffic to and from China. One of the leitmotifs here was “One Belt, One Road”.

2016 also saw initial experience garnered with the rollout of the European freight corridors defined in Regulation 913/2010. Cohesion, harmonisation and coordination of action all stand to gain, whilst fuller integration of all stakeholders in the decision-making process can only be beneficial.

2017 will be an exciting year in many respects:

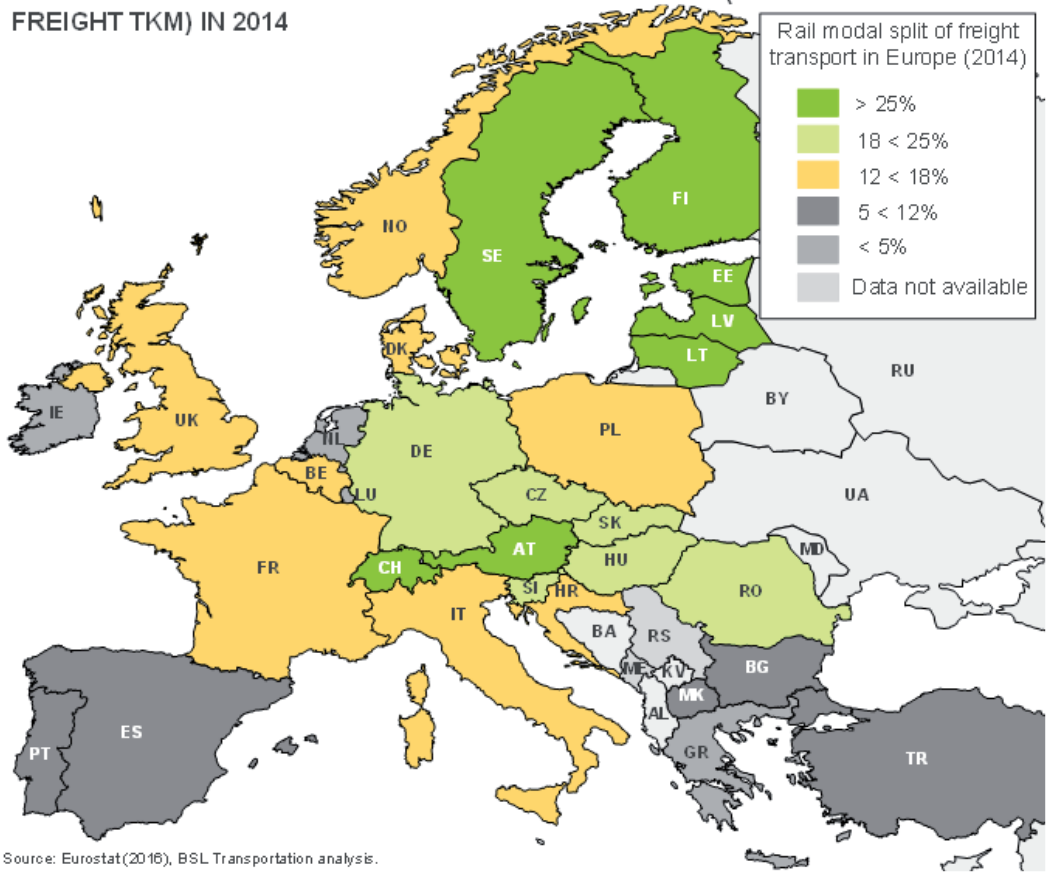
- Firstly at regulatory level, with the forthcoming revision procedure for Directive 92/106,
- Then at operational level, with the arrival in Germany of extra-long HGVs (“Lang-LKW”), gigaliners and other Eurotrailers,
- And lastly in design terms, with new aerodynamic designs being proposed for road vehicles.

This biannual report is a one-of-a-kind tool in that it supplies a time-series of practical data, enabling us to track developments in combined transport for over 10 years now. I would like to thank the members of the UIC Combined Transport Group and our partners, without whose input this report would not have been possible.

Eric Lambert

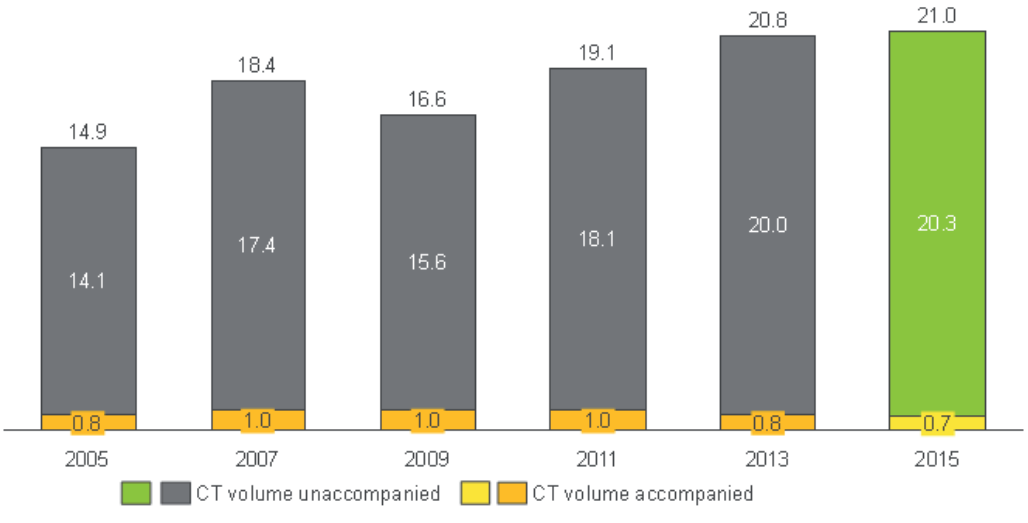
1. Rail/road combined transport in Europe at a glance

RAIL MODAL SPLIT OF FREIGHT TRANSPORT IN EUROPE (% IN TOTAL INLAND FREIGHT TKM) IN 2014



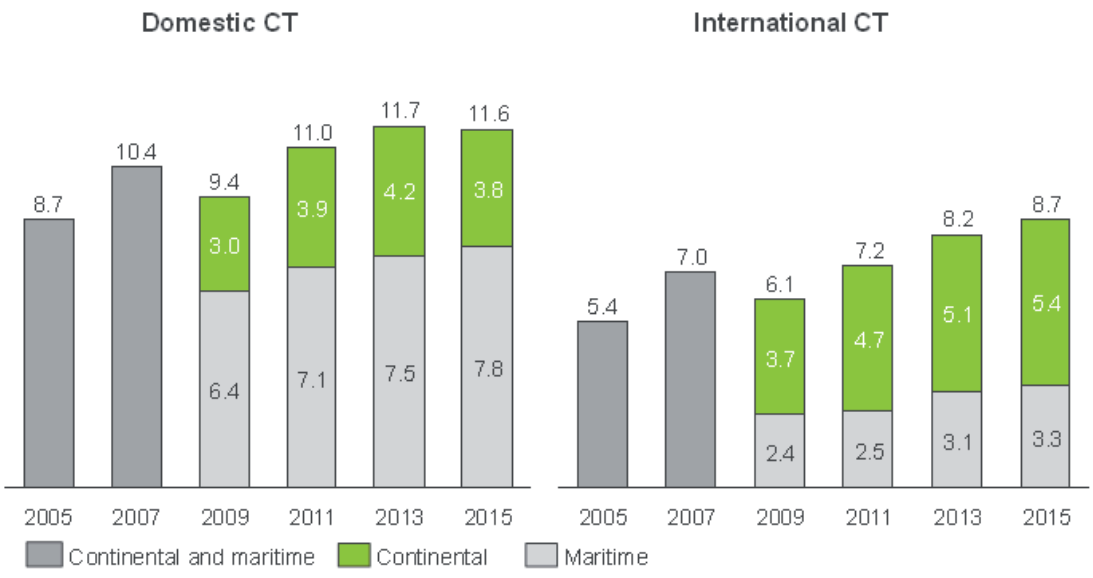
Source: Eurostat (2016), BSL Transportation analysis.

DEVELOPMENT OF TOTAL CT VOLUMES 2005 TO 2015 [M TEU]



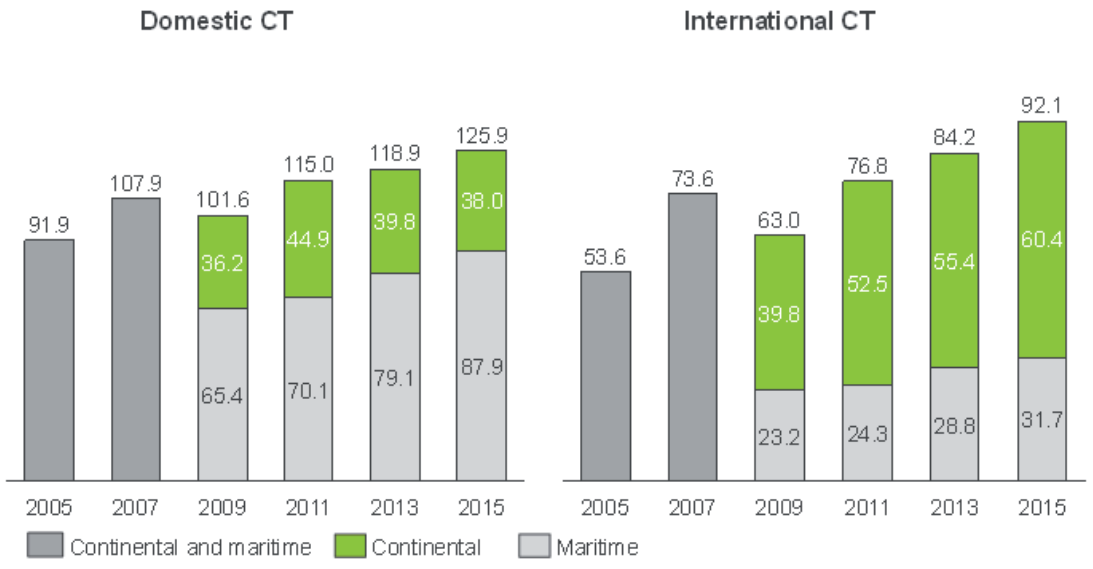
Source: BSL Transportation Consultants, UIC

DEVELOPMENT CT VOLUMES BY MARKET SEGMENTS 2005 TO 2015 [M TEU]



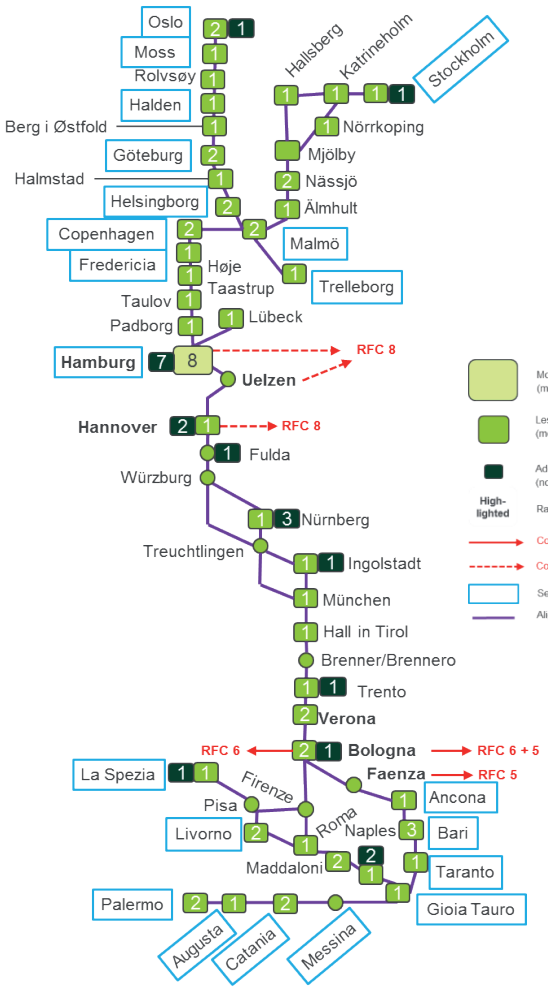
Source: BSL Transportation Consultants, UIC. Rounding differences may occur

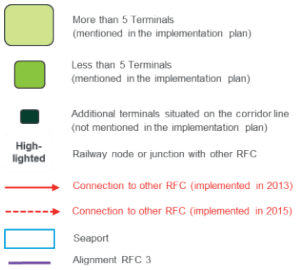
DEVELOPMENT CT VOLUMES BY MARKET SEGMENTS 2005 TO 2015 [M TONNES]



Source: BSL Transportation Consultants. UIC. Rounding differences may occur

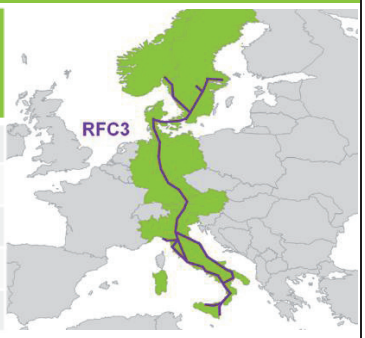
Key corridor characteristics of Rail Freight Corridor 3 (Example)





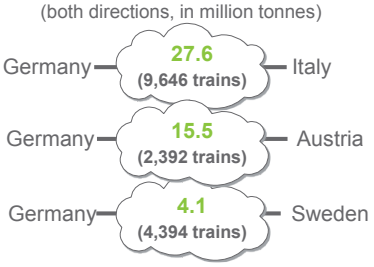
Countries connected by RFC3

- Norway
- Sweden
- Germany
- Austria
- Italy

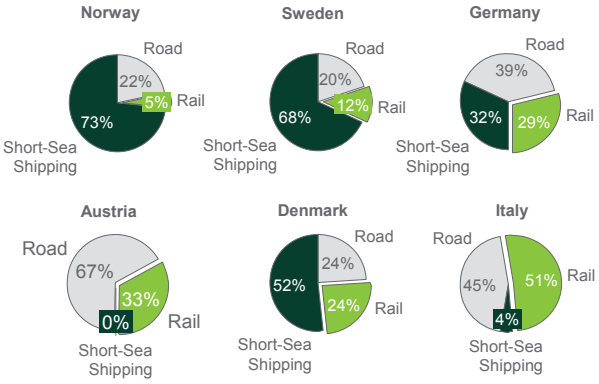


Rail freight

Most important trade relations in corridor area
(both directions, in million tonnes)



Modal split in freight transport (1,000 tonnes) in RFC3 corridor area [2012]*

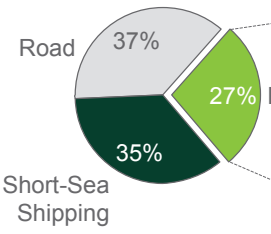


Principal route:

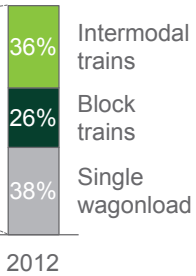
Oslo Stockholm	Malmö-Padborg-Hamburg-München-Brennero-Bologna	-Ancona - Rome	-Palermo

	2012	Forecast 2017
Number of trains operating on RFC 3	~29,600	31,309
International rail freight volumes covering RFC 3 Corridor countries in 2012 (in 1.000 net tonnes)		
	As Origin	**As Destination**
Norway	1,781	471
Sweden	3,523	4,500
Denmark	817	1,253
Germany	28,084	20,658
Austria	10,486	10,079
Italy (via Brennero)	13,285	21,015
Total		**57,976**

Modal split (1,000 tonnes) all countries in RFC3 corridor area [2012]*



Corridor train traffic
rail freight production system used on RFC 3



* Estimation based on freight transport demand displayed in RFC3 Implementation Plan

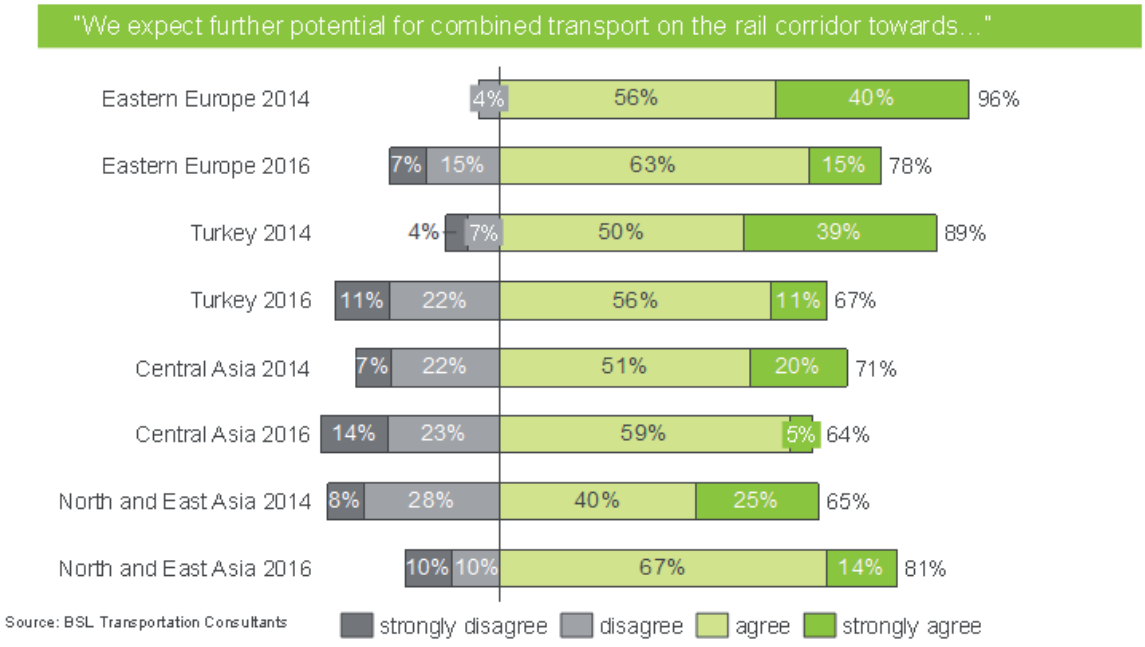
Source: BSL Transportation Consultants Research, RFC3 Implementation Plan, RFC 3 Transport Market Study.

TRADE RELATIONS AND VOLUMES OF ACCOMPANIED CT IN 2015 [BASED ON NUMBER OF SHIPMENTS/TRUCKS]

Country A	Volume	Country B
UK	1,48m	France
Germany	0,29m	Italy
Austria	0,13m	Slovenia
Austria	0,07m	Italy
France	< 0,01m	Italy
Greece	< 0,01m	Macedonia
Macedonia	< 0,01m	Serbia

Source: BSL Transportation Consultants

EXPECTED FURTHER GEOGRAPHICAL MARKET POTENTIAL FOR CT (2014 TO 2016)



Source: BSL Transportation Consultants

2. General framework and key elements of combined transport in Europe

2.1. Combined transport as major element of the European freight market

Combined transport represents an important cornerstone of the European freight market. According to the European **Council Directive 92/106/EEC**[1] combined transport (CT) is defined as follows:

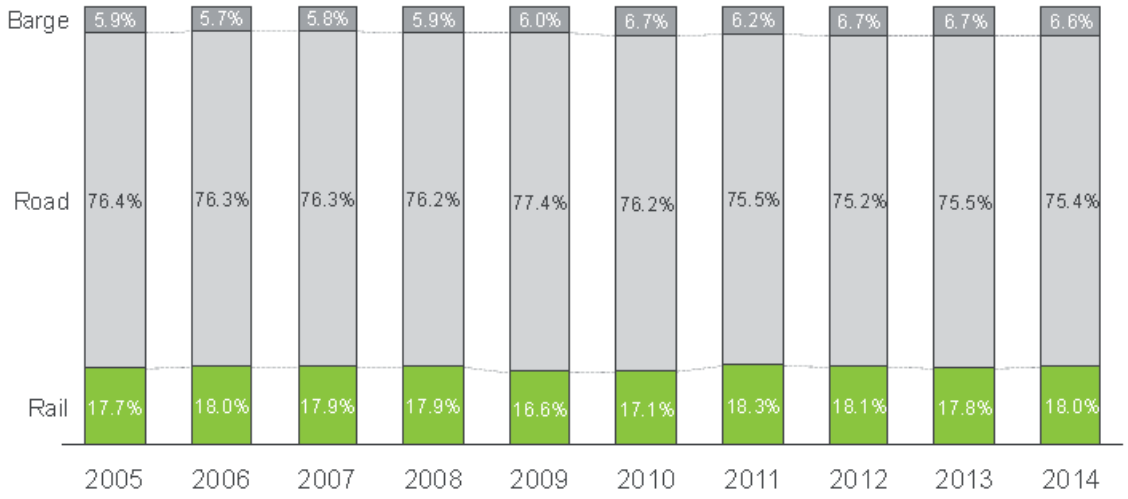
> ***Combined transport*** *means the transport of goods*
>
> - *between Member States where the lorry, trailer, semi-trailer, with or without tractor unit, swap body or container of 20 feet or more uses the road on the initial or final leg of the journey and, on the other leg, rail or inland waterway or maritime services where this section exceeds 100 km as the crow flies and make the initial or final road transport leg of the journey;*
> - *between the point where the goods are loaded and the nearest suitable rail loading station for the initial leg, and between the nearest suitable rail unloading station and the point where the goods are unloaded for the final leg, or*
> - *within a radius not exceeding 150 km as the crow flies from the inland waterway port or seaport of loading or unloading.*

This report will focus on rail/road combined transport activities in Europe. For an overview of the countries examined see chapter 3.

Based on tonne-kilometres rail transport in Europe has a share of about 18% in total freight traffic – as Figure 1 shows. There is a slight increase of rail share in modal split within the last five years (2009 to 2014). Nevertheless, over a period of ten years there is nearly no development in rail transport.

1. However, there are plans currently to revise the Directive in near future.

Figure 1: Development of rail share in modal split of European freight transport (in tkm, EU-28)

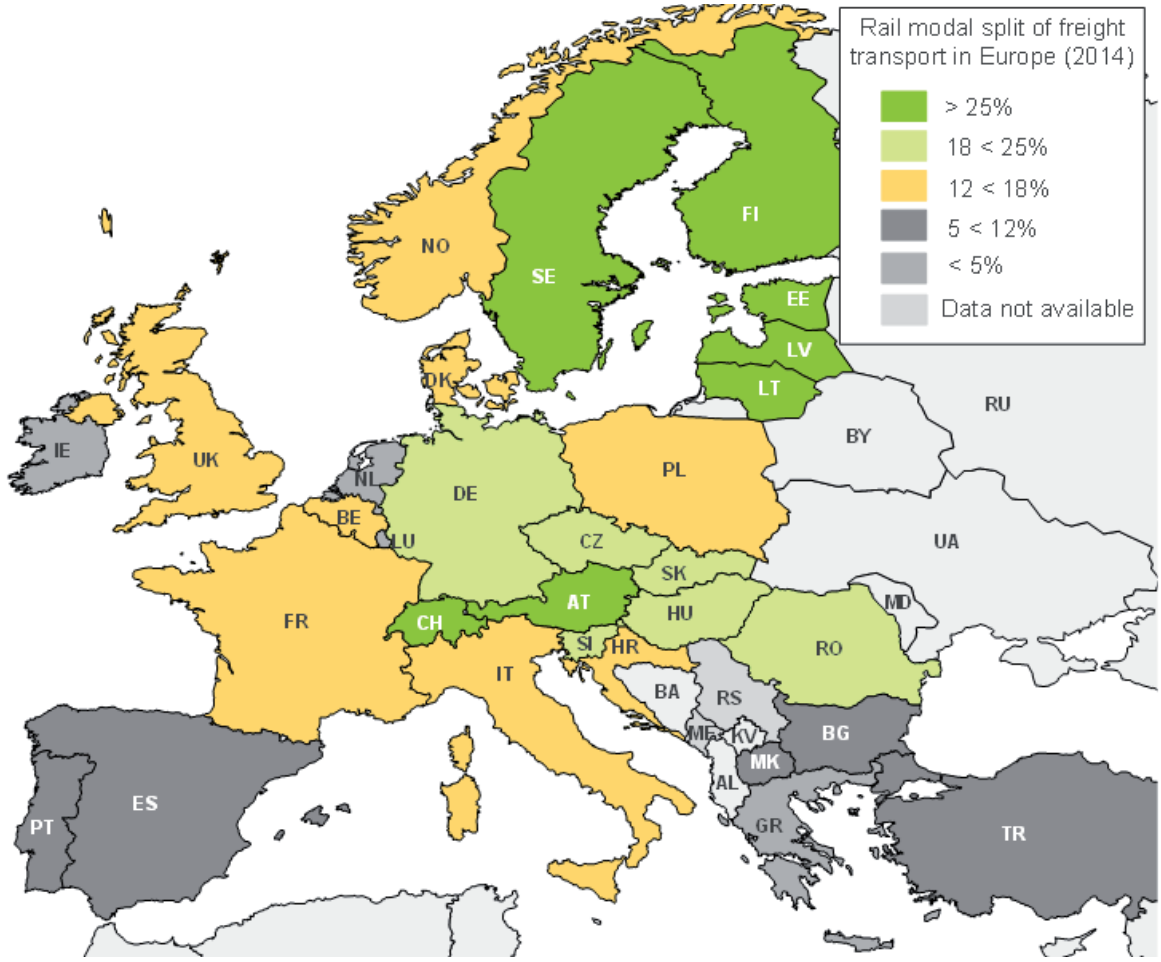


Source: Eurostat (2016), BSL Transportation analysis.

Particularly in Central European countries, due to their character as major transit regions, rail has a larger share in modal split; e.g. Switzerland or Austria have a respective rail share of more than 40% of the inland freight transport. But also in North-Eastern Europe the rail transport has a share of more than a quarter of total transport activities, as shown in Figure 2. As the share is measured in tonne-kilometres, the nature of cargo transported also affects the statistics. This is, for example, the case in Finland or Eastern European countries where traditionally a lot of heavy bulk cargo is transported by rail.

Compared to 2012 especially Spain, Denmark and Slovenia could noticeably increase the rail share, while in Croatia rail transportation lost market share.

Figure 2: Rail modal split of freight transport in Europe (% in total inland freight tkm) in 2014



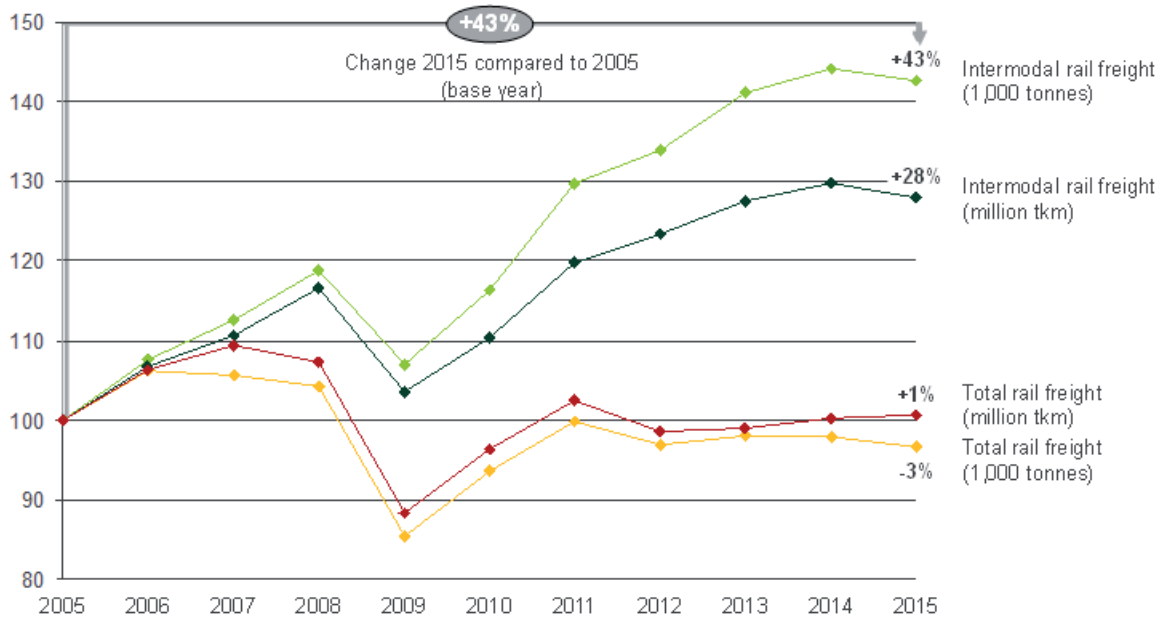
Source: Eurostat (2016), BSL Transportation analysis.

The following Figure 3 depicts that the total absolute volume of goods transported by rail in Europe (in 1,000 t, million tkm) in 2015 is nearly the same like ten years before, experiencing several fluctuations over the years, particularly in the context of the financial crisis 2009[2].

Despite the slight decline in overall rail traffic of all market segments (including "conventional" wagonload traffic and intermodal traffic), the market segment of intermodal rail transportation developed particularly well during the last decade.

2. Methodology: The development in total rail freight transport performance of selected major European countries has been compared with the development of the annual railway transport of goods in intermodal transport units (thereof containers and swap bodies). This basically corresponds to the market segment of unaccompanied combined transport. Selection has been based on availability of time series in Eurostat, single years interpolated or estimated. Country sample includes CZ, DK, DE, EE, EI, EL, ES, FR, HR, IT, LT, HU, NL, AT, PL, PT, RO, SI, SL, FI, SE, UK, NO and TR.

Figure 3: Development of total rail freight performance vs. rail transport of goods in intermodal transport units in Europe (Index 2005 = 100)



Source: Eurostat (2014), BSL Transportation analysis.

In terms of tonnes as well as in tonne-kilometres there was a significant total growth in intermodal rail freight volume between 2005 and 2015. Conventional rail freight traffic, on the contrary, remained nearly at the same level. Particularly the single wagonload segment has been experiencing a significant decrease in volume for some time now due to a rationalisation and reduction of services.

Major drivers for the fast growth of rail freight transport in intermodal units were:

- an increase in intermodal hinterland transportation, which was positively influenced by the dynamic development in container throughput at European seaports during the last decade, and
- the rising number of international transport services. Here intermodal transport benefited from the standardisation in railway infrastructure and by improvements regarding the interoperability on the European rail network, which both facilitated cross-border traffic.

However the positive development of intermodal rail freight faltered in 2015. The figures with a slight regress compared to 2014, showing that the positive development over the last decade is not for granted. The combined transport market also has to improve constantly to stay competitive in Europe in the future – even in times of increasing cost advantages of road transport especially by declining diesel prices within the last three years.

2.2. Market structure and key elements of combined transport

Basically, combined transport can be differentiated based on:

- the form of transport offered,
- the geographical scope, and
- the focus of the transport chain.

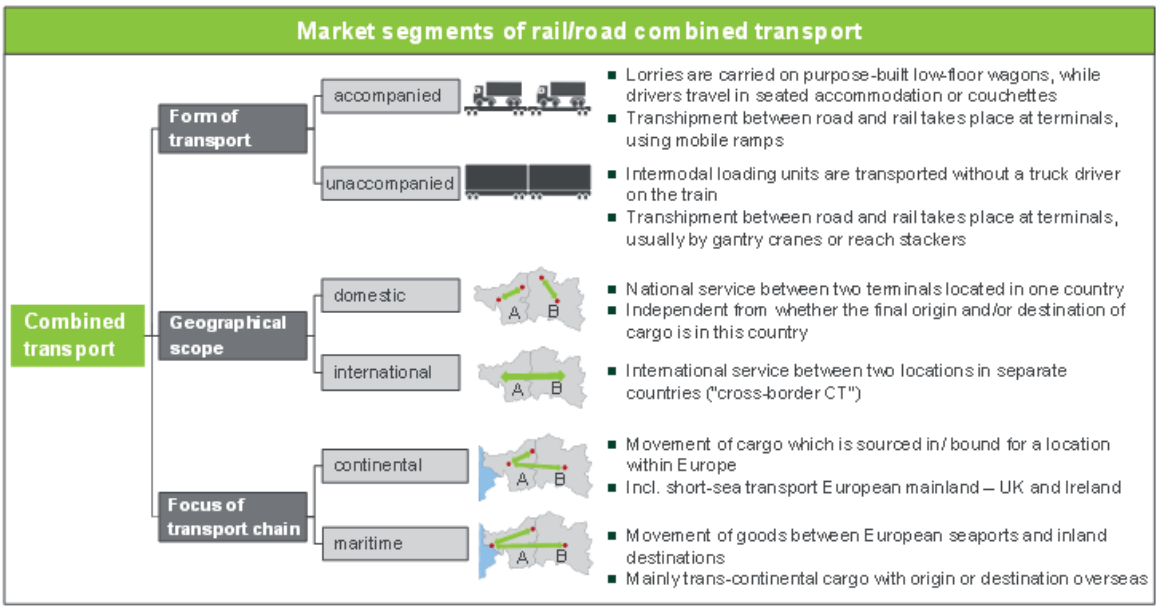
The basic segmentation in the form of transport offered focused on whether the combined rail/road transport is carried out accompanied (with a truck driver) or unaccompanied (without a truck driver) during the rail transport of the loading unit. Both unaccompanied as well as accompanied combined transport can be distinguished applying a strictly territorial principle related to the geographical scope of the transport of a CT loading unit. These market segments differentiates whether domestic or international ("cross-border") CT services are carried out.

It has to be considered, that for specific cases there could be an inaccurateness, as the primary origin or final destination of the goods are not necessarily the specific countries taken into account. For instance, "domestic" goods could arrive from or be forwarded to another country, by road pre- or post-carriage or in case of gateway services, without knowledge of the CT provider. In international transport the goods transported could also originate from or go to a third country with the pre- or on-carriage. Lastly, the combined transport market can also be segmented based on the focus of the transport chain, i.e. continental or maritime:

Continental CT concerns both cargo originating from or being destined for locations within Europe. Maritime CT involves trans-continental cargo routed over a seaport to or from an inland destination. Whereas Continental CT uses particularly domestic freight containers, 45' non-ISO containers, swap bodies and semi-trailers, equipment used in Maritime CT are almost exclusively standard ISO containers (8' wide, 8'6'' high, 20', 40' or 45' long). There are also differences in the scope of logistical services: Continental CT are mainly terminal-to-terminal services but also more and more pre- and post-haulage on road. Maritime CT on the other hand usually are port-to-door services including supplementary logistics services such as pre- or on-carriage by road, customs clearance or empty depot services.

The named differentiations result in six market segments of combined transport (see Figure 4) which are further examined in this report.

Figure 4: Overview of market segments in rail/road combined transport



Source: BSL Transportation.

Combined transport services are provided by CT operators who act as independent intermediaries or brokers between railway companies and potential customer groups. They purchase transport capacity from rail companies with volumes ranging from a wagon-by-wagon basis up to full trains for multiple customers or company trains for a single customer. Increasingly, other stakeholder groups such as railway undertakings, logistics service providers, shippers, terminal or port operators which act as CT operators[3] also offer CT services.

Although the business model of the "classical" CT operator still prevails in the European market, the trend of past years towards more logistics service providers taking over the operator role continues, particularly in Western Europe. Key target customer groups of CT services are shippers, shipping lines, logistics service providers and truck companies. Other relevant players in the CT market are seaports or CT terminals among others (e.g. inland ports).

In order to gather a comprehensive overview of the current situation of combined transport in Europe, up-to-date information on rail/road combined transport volumes has been collected by means of a survey for CT providers. The methodology and key results of the survey are presented in detail in the next chapter.

3. For a detailed analysis of the different business models see the report's 2012 edition.

3. The European rail/road combined transport market - facts and figures

3.1. Methodology and approach

The report provides an overview of combined transport in Europe in regards to:

- the actual volume of overall combined transport volumes,
- the development of market structures,
- the use of market technologies and
- the estimation of future developments.

All relevant market players in Europe were asked for specific data about their companies and its CT activities in terms of volumes, geographical scope and a market assessment. The participants represent Combined Transport-activities in more than 30 European countries from Portugal to Russia and from Norway to Turkey.

The figures are focussed on the reference year 2015 and are evaluated and shown anonymously. All figures for combined transport are based on the above CT definition and focus on rail/road-services.

The presentation of an overall market overview certainly represents a challenge due to the facts that:

- there is no existing database of the European combined transport market at present,
- data compilation, counting methodology and definitions differ among the stakeholders.

In order to master the challenge and to provide a solid methodology, this report is based on different complementary sources which also include a plausibility check:

- desk research involving the most relevant data sets and statistics for the different market segments,
- a comprehensive data base from a questionnaire for all relevant market players,
- a matching with UIRR-database,
- additional checks, bilateral discussions and adjustments in case of implausibility.

In 2015 for instance a couple of substantial CT operators change their approach and classification to measure volumes. On the one hand the revised methodologies should lead to improved data quality and reduced double counts of CT activities (especially between CT operators and railway undertakings and in case of different providers for bidirectional cross-national transports). On the other hand the volumes of previous years are not fully comparable to current figures of 2015.

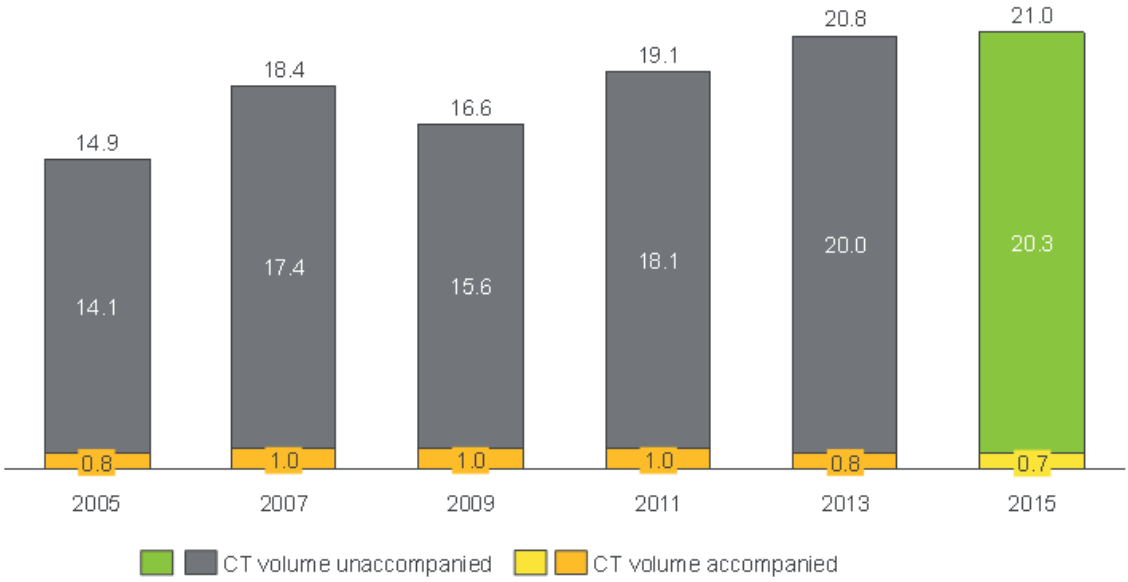
In total data volumes of more than 100 operators with combined transport activities in approximately 30 European countries are included in this report.

Based on this procedure coherence in terms of market volumes and market development is ensured. Changes within the market by new foundations, changes of names, mergers and acquisitions as well as closures of businesses were also taken into account within the report.

3.2. Combined rail/road transport volumes

The total volume of combined transport in Europe, including unaccompanied and accompanied CT, adds up to 21.0m TEU in 2015. Compared to 2013, the total CT volume recorded a slight increase of +1% (see Figure 5).

Figure 5: Development of total CT volumes 2005 to 2015 [in million TEU]



Source: BSL Transportation analysis, UIRR.

Based on the total CT tonnage transported, the increase amounts to approx. +8.5% from 2013 to 2015 and is therefore considerably higher than the growth in TEU. The positive development of the overall CT market is the same for both measurements in TEU and in tonnes. However, the stronger growth of tonnes in contrast to TEU indicates a trend towards transporting heavier shipments than some years ago. The following table depicts the total CT market development from 2005 to 2015.

Table 1: Development of total CT volumes 2005 to 2015 [in million tonnes]

Segment	2005	2007	2009	2011	2013	2015
CT volume unaccompanied	145.5	181.5	164.6	191.8	203.0	218.0
CT volume accompanied	10.2	13.6	15.1	14.9	10.8	13.0
Total	**155.7**	**195.1**	**179.7**	**206.7**	**213.8**	**231.0**

Source: BSL Transportation analysis, UIRR.

The total CT market increase is mainly driven by volumes of the unaccompanied segment, while the accompanied CT volume increased in tonnage and is approaching the level of 2011. In 2015, the unaccompanied CT segment's market share amounts to approx. 94% of the total CT market.

Consequently, nearly 90% of the CT providers offer unaccompanied CT services, while only 1% is focused on accompanied CT and approx. 10% provide both unaccompanied and accompanied CT services.

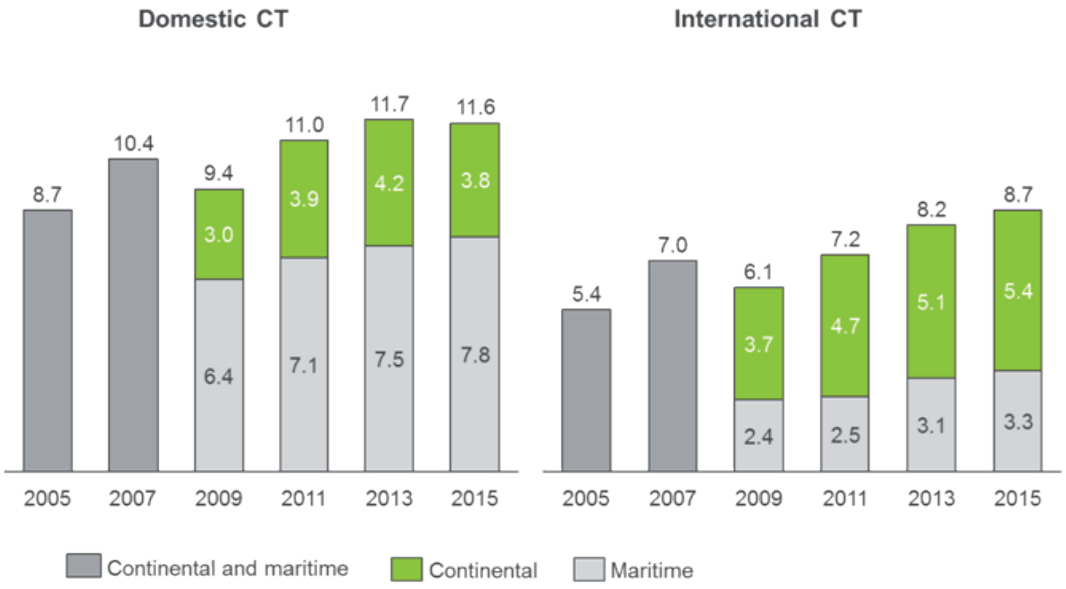
Unaccompanied combined transport

The continuous growth of unaccompanied combined transport since the downturn in volumes due to the global economic crisis in 2009 has continued in the past two years. However, the volume increase in the CT market is lower than some years ago and the development of combined transport matches the average of the overall rail freight trend (see chapter 2.1).

The market segment of international combined transport is still the main driver for this development with an increase of about 6% (see Figure 6). Although there is a slight decrease of -1% compared to 2013 unaccompanied domestic CT continues to be the biggest market segment of CT with 11.6m TEU transported in 2015.

In cross-border CT, maritime and continental transportation grew nearly parallel by +7% and +5% respectively.

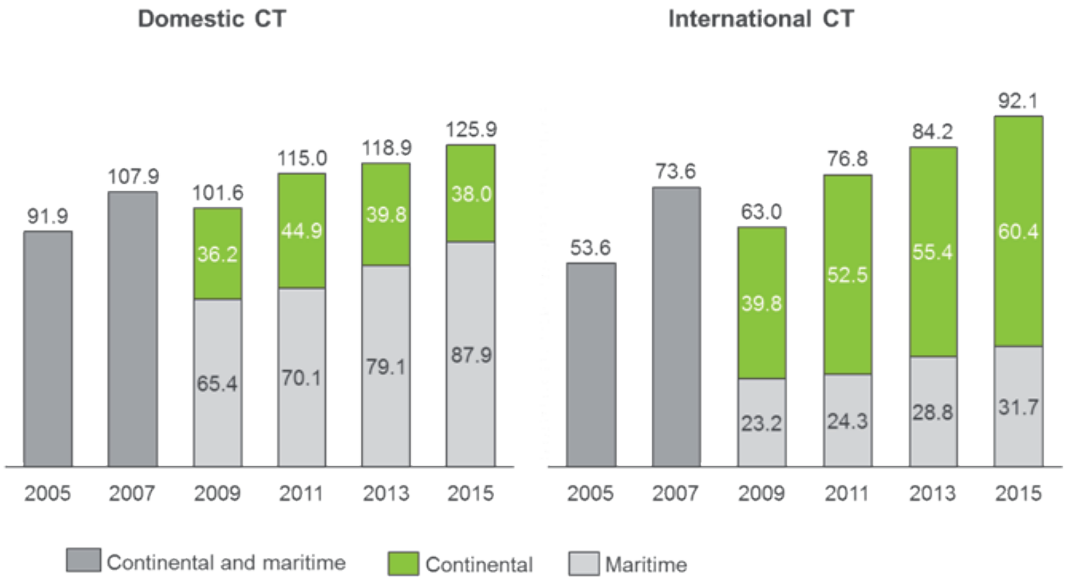
Figure 6: Development of domestic and international unaccompanied CT 2005 to 2015 [in million TEU]



Source: BSL Transportation analysis, UIRR.

The volume increase in the market development in tonnes is considerably higher for both the domestic and the international unaccompanied CT market from 2013 to 2015 (see Figure 7). Consequently, the average loading units have become heavier in the past two years.

Figure 7: Development of domestic and international unaccompanied CT 2005 to 2015 [in million tonnes]



Source: BSL Transportation analysis, UIRR.

In domestic unaccompanied CT, the TOP 10 countries account for more than 85% of the total European domestic market. Table 2 shows the domestic unaccompanied CT of European countries for 2015 and 2013.

Table 2: Development of domestic unaccompanied CT per country [in TEU and tonnes]

Unaccompanies domestic CT by countries						
Country	TEU			Tonnes		
	2013	2015	Development (2013-2015)	2013	2015	Development (2013-2015)
Austria	370,205	400,993	8%	3,593,138	4,409,791	23%
Belgium	294,261	202,718	-31%	2,177,167	1,273,904	-41%
Bosnia and Herzegowina	-	1,401		-	14,015	
Bulgaria	-	32,834		-	330,059	
Croatia	24,651	40,231	63%	332,254	269,633	-19%
Czech Republic	484,500	499,843	3%	5,215,181	5,379,001	3%
Denmark	-	287		-	2,837	
Finland	10,400	10,717	3%	125,000	128,813	3%
France	631,086	663,419	5%	5,716,155	6,245,535	9%
Germany	4,007,646	3,334,870	-17%	37,139,367	35,629,640	-4%
Greece	-	4,122		-	51,525	
Hungary	46,438	3,109	-93%	462,840	41,362	-91%
Ireland	-	25,982		-	311,790	
Italy	1,609,472	1,554,882	-3%	12,921,434	12,318,072	-5%
Latvia	-	589		-	1,300	
Netherlands	366,836	326,639	-11%	3,544,381	3,958,563	12%
Norway	386,859	322,815	-17%	3,712,541	3,172,657	-15%
Poland	464,938	719,079	55%	4,117,769	5,913,613	44%
Portugal	214,471	290,731	36%	2,117,525	2,896,420	37%
Romania	256,127	262,407	2%	3,087,754	3,163,094	2%
Russia	-	32		-	136	
Serbia	-	13,892		-	138,922	
Slovakia	55,832	54,112	-3%	473,892	482,377	2%
Slovenia	66,734	66,836	0%	507,979	508,756	0%
Spain	490,064	503,697	3%	4,750,169	5,194,814	9%
Sweden	425,900	438,906	3%	4,498,145	4,635,490	3%
Switzerland	342,546	351,000	2%	4,324,165	4,430,744	2%
United Kingdom	1,121,120	1,446,514	29%	19,171,147	24,955,867	30%

Note: Figures for Poland partially include transit. Some deviations of 2015 to 2013 figures also due to modified statistics or changes in methodology of CT providers.

Source: BSL Transportation analysis, UIRR.

Just as in the past 4 years Germany continues to be the largest domestic CT market in terms of transport volume, followed by Italy and the United Kingdom which also have important domestic CT markets. However, both Germany and Italy has faced decreasing domestic CT markets in the past two years. Besides several reasons like railway strikes and infrastructure bottlenecks it must be pointed out, that the volumes of relevant central European players have changed due to modified approaches of measure volumes (see chapter 3.1).

Whereas the domestic CT market declined slightly between 2013 and 2015, the segment of international CT grew by +6%. The most relevant trade lanes still are the corridors from the North Range seaports to Italy and also trade relations on the East-West-axis keep increasing.

Table 3 provides an overview of the major trade relations in international unaccompanied CT and their volume in TEU and tonnes. The figures given for each trade relation cover the total volume transported in both directions.

Table 3: Major European trade lanes in international unaccompanied CT [in million TEU and tonnes]

Trade lane		TEU			Tonnes		
		2013	2015	Develop-ment	2013	2015	Develop-ment
Germany	Italy	1,344,827	1,300,386	-3%	15,792,121	17,012,547	8%
Germany	Netherlands	550,647	667,378	21%	5,632,196	6,215,813	10%
Germany	Czech Republic	700,053	659,792	-6%	6,257,721	6,000,182	-4%
Belgium	Italy	682,452	448,653	-34%	7,925,357	5,643,471	-29%
Czech Republic	Slovakia	292,719	316,845	8%	2,568,714	2,927,300	14%
Germany	Austria	349,912	268,860	-23%	3,603,502	3,090,075	-14%
Slovakia	Slovenia	156,023	258,921	66%	1,043,331	1,887,370	81%
Germany	Hungary	167,328	241,296	44%	1,820,804	2,322,884	28%
Czech Republic	Poland	199,994	231,041	16%	1,771,949	2,020,219	14%
France	Italy	201,080	194,123	-3%	2,335,242	2,371,238	2%
Sweden	Germany	151,339	193,878	28%	1,639,185	2,067,542	26%
Hungary	Slovenia	166,823	179,215	7%	1,692,925	1,597,440	-6%
Luxemburg	France	119,264	178,766	50%	1,715,404	2,281,597	33%
Germany	Spain	136,212	174,381	28%	1,855,066	2,312,509	25%
Netherlands	Italy	298,696	168,572	-44%	3,169,014	1,924,664	-39%
Germany	Poland	245,248	160,475	-35%	2,178,846	1,274,739	-41%
Germany	Switzerland	164,057	148,188	-10%	1,633,675	1,871,791	15%
Belgium	France	124,266	131,878	6%	900,216	1,128,225	25%
Belgium	Germany	182,251	54,567	-70%	1,842,848	560,402	-70%

Source: BSL Transportation analysis, UIRR[4].

Although the positive overall development of the international unaccompanied CT market is also reflected in the top European trade lanes there are some notable specific shifts, such as the ongoing positive development on the international trade relations in particular between Eastern European countries (see above).

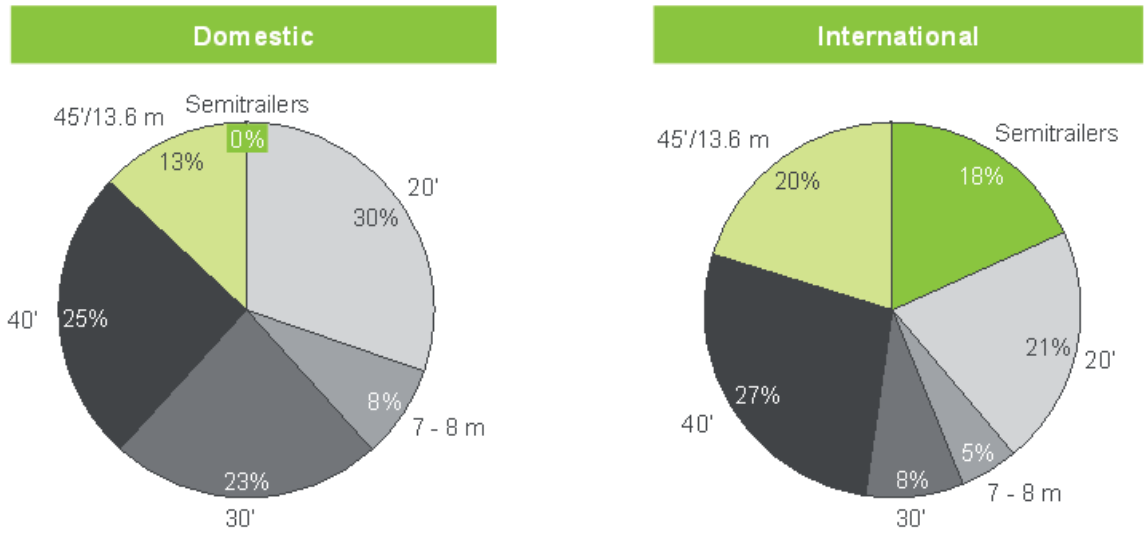
The full O-D-matrix with all trade lanes in international unaccompanied CT in Europe (in TEU and tonnes) is provided in the Annex.

The domestic and international market segments shows some similarities regarding the structure of loading unit (see Figure 8). In both segments between 48% and 55% of the intermodal loading units used are twenty- and fourty-foot equivalent units.

In international services, however, the share of semitrailers continues much higher than in domestic combined transport.

4. Complete Origin-Destination-Matrix TEU/ Tonnes can be found in the Annexes.

Figure 8: Loading unit structure in combined transport



Source: BSL Transportation analysis. Samples between 1/4 and 1/5 of the market volume 2015. Note: Rounding differences may occur.

Accompanied combined transport

Accompanied combined transport is a niche market with a volume of approximately 0.74m TEU transported across Europe in 2015, which is nearly 8% less than two years before. An additional volume of 1.484 million trucks (equalling 742 thousand TEU) is related to Cross-Channel transport activities between UK and France.

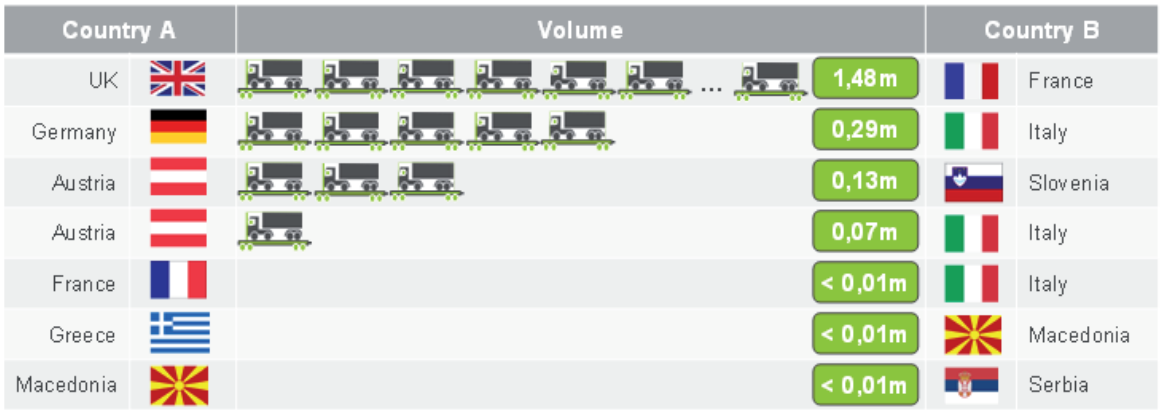
Accompanied transport services are provided by ten companies with very small accompanied CT volumes transported in some cases.

The market segment of accompanied transport has its focus on several international trade relations across the Alps between:

- Germany and Italy,
- Austria and Slovenia and
- Austria and Italy.

Some combined transport activities from Austria to Italy and from France to Italy are also conducted in the accompanied system. In addition, several smaller accompanied CT services were offered between Macedonia and Greece/Serbia with less than 10,000 trucks in 2015. Figure 9 gives an overview of the trade relations and volume structure of accompanied Combined Transport in 2015.

Figure 9: Trade relations and volumes of accompanied CT in 2013 [based on number of shipments/trucks]



Source: BSL Transportation analysis, UIRR.

Furthermore, there is the above-mentioned Cross-Channel accompanied freight traffic between the United Kingdom (Folkestone) and France (Calais) with a total volume of nearly 1.5m trucks passing the Eurotunnel in 2015 (see Table 4)[5].

Table 4: Accompanied Cross-Channel transport between UK and France [number of trucks]

Eurotunnel	Trucks		
	2011	2013	2015
Cross-Channel UK - France	1.263.327	1.362.849	1.483.941

Source: Eurotunnel Group

Compared to 2013, the Eurotunnel freight activities in 2015 increased by +8.8% - divergent to the overall accompanied market trend on the European continent.

Domestic accompanied CT services operated in 2015 mainly focused on Austria (more than 300 thousand TEU), Switzerland (approx. 10 thousand TEU) and Macedonia (9 thousand TEU).

Altogether, the total accompanied CT market developed as follows (see Table 5). Particularly in the international market segment, volumes dropped compared to the 2013 figures and particularly compared to the figures of 2011. Based on tonnes the volume also decrease compared to 2011, but increase since 2013.

Table 5: Development of domestic and international accompanied CT market [in TEU and tonnes]

Country	TEU				Tonnes			
	2011	2013	2015	Develop-ment	2011	2013	2015	Develop-ment
Domestic CT	347,530	303,668	303,642	0%	5,421,430	4,873,801	6,044,886	24%
International CT	662,650	498,883	438,591	-12%	9,448,570	5,933,825	6,920,760	17%
Total	**1,010,180**	**802,551**	**742,233**		**14,870,000**	**10,807,626**	**12,965,646**	

Source: BSL Transportation analysis, UIRR.

5. In order to keep the total volume of accompanied CT comparable to former UIC reports, where Channel Tunnel data was not considered, the Cross-Channel Tunnel accompanied CT volumes are displayed separately.

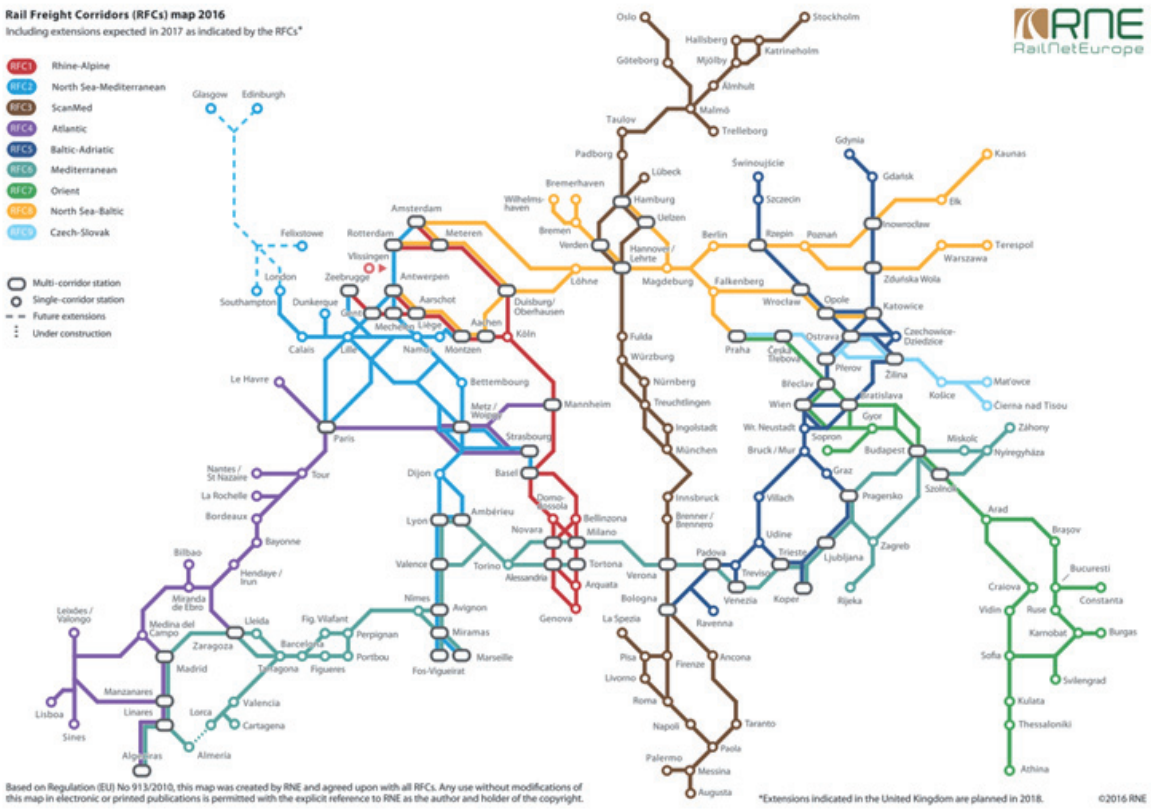
The overall decline in accompanied CT during the last years can mainly be traced back to a restructuring of the Austrian market and Rail Cargo Austria (RCA). In this context, relevant market players in accompanied CT either stopped their business activities completely (Hungarokombi), extensively reorganised their services or were integrated into RCA.

4. Spotlight analyses

4.1. EU Rail Freight Corridors

Based on Regulation 913/2010 concerning a European Rail Network for Competitive Freight, nine **EU Rail Freight Corridors (RFCs)** have been established by the European Commission in order to strengthen the competitiveness of the European rail freight network and to improve cross-border rail traffic in terms of infrastructure harmonisation, management and investments. Of the nine Rail Freight Corridors (see Figure 10) six RFCs had already been launched in November 2013, while the remaining three corridors (RFCs No. 3, 5 and 8) were implemented in November 2015.

Figure 10: Overview of the nine EU Rail Freight Corridors (2016)



Source: RailNet Europe (2016).

Since a key objective of the Rail Freight Corridors is to foster intermodality between rail and other transport modes by integrating terminals into the corridor management and development, the implementation of RFCs is of particular importance for the rail/road combined transport market.

For this reason, this report is - like the last reports' edition two years ago - paying special attention to the nine RFCs. The three corridors implemented in November 2015 are analysed in regards to:

- Volume assessment and main origins of the goods transported,
- Market share of each corridor (modal split),
- Relevance of intermodal transport on the respective corridor.

For the other six Rail Freight Corridors implemented in 2013 updated analyses are provided, including:

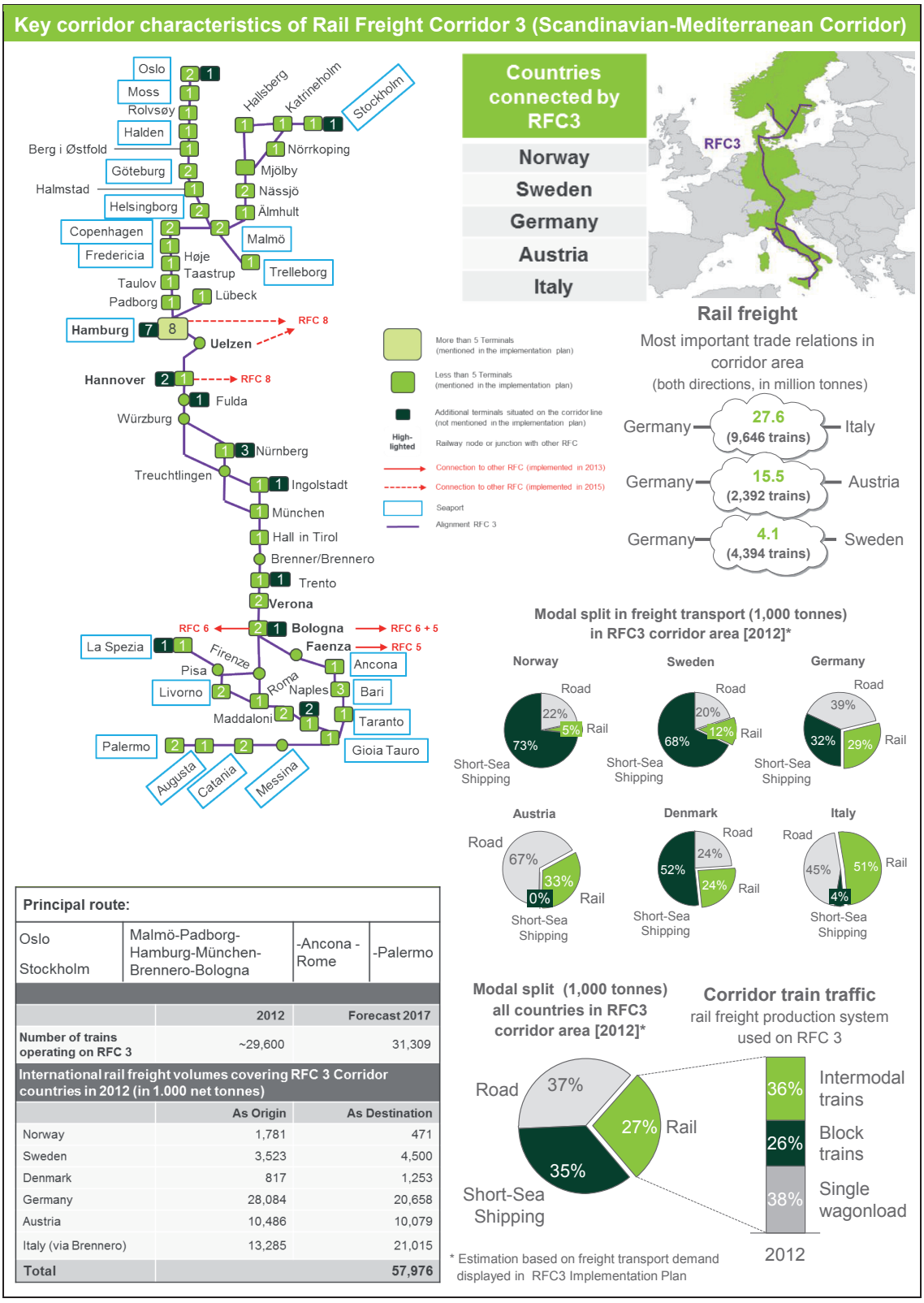
- up-to-date information on corridor development (Key Performance Indicators, e.g. volumes, no. of trains, punctuality), and
- comparison with data from the 2014 report – where possible –

The assessment of rail corridor implementation for Combined Transport by CT providers complements the RFC analysis[6].

The transport market studies refer to data from the year 2012. Therefore we focus on this reference year (unless otherwise stated). Transport volumes and modal split information mainly focus on tonnage. In the following, the basic corridor characteristics relevant for the CT market are presented for RFC 3, 5 and 8. In addition, for each of the three corridors operational since November 2015 a list of terminals which are integrated into the corridor is presented.

6. For examining the three RFCs operational since 2015, data has been collected from the corridor implementation plans and transport market studies published for each of the corridors. Nevertheless, the depth of analysis and extent of data varies from corridor to corridor and they are, therefore, only partially comparable. Further differentiation of the modal split for rail traffic on the corridors in intermodal and other services (e.g. single wagon-load) is only available in some cases:The figures on the different rail market segments/types of trains given for the corridors are based on the corridor-specific transport market studies and their respective definitions. For further information on the particular definitions and terms we therefore refer to the individual RFC corridor offices.

Figure 11: Key corridor characteristics of Rail Freight Corridor 3 (Scandinavian-Mediterranean Corridor)

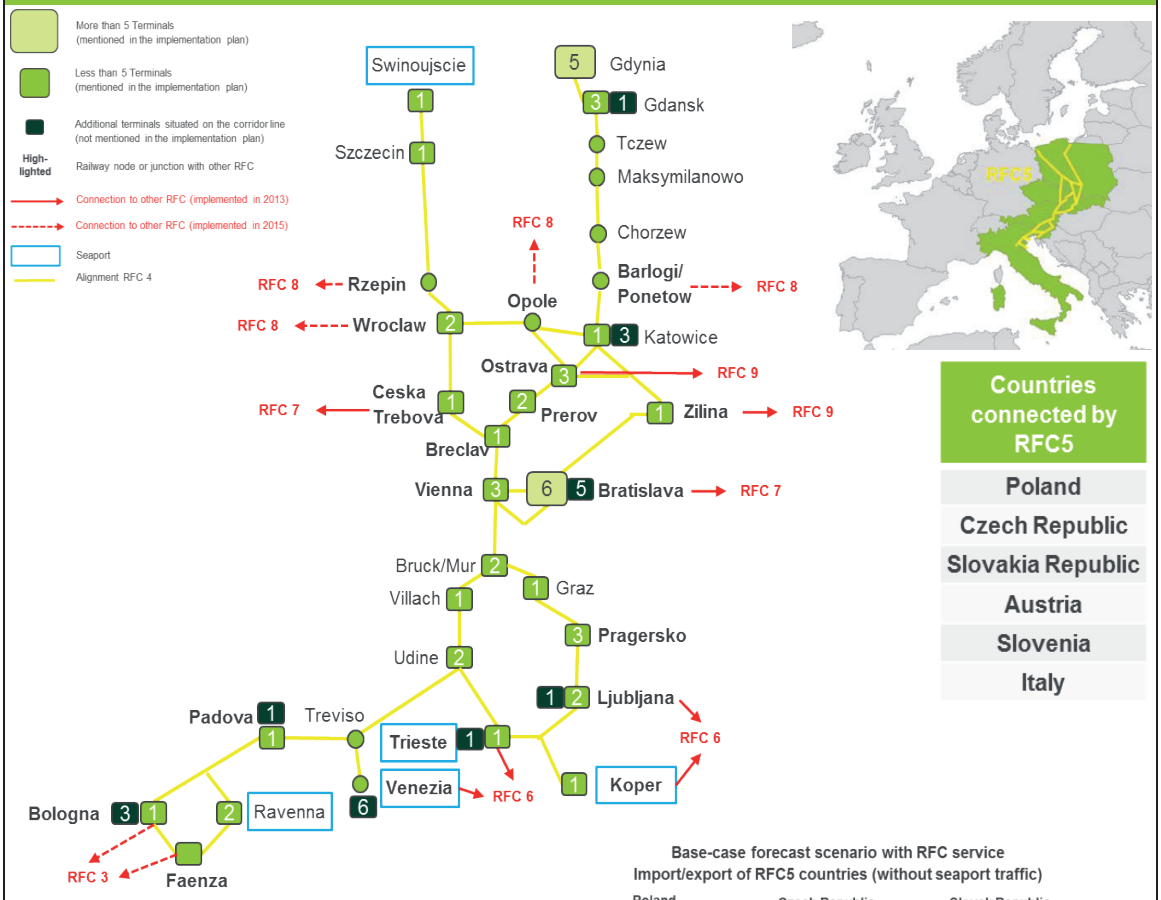


Principal route:			
Oslo Stockholm	Malmö-Padborg-Hamburg-München-Brennero-Bologna	-Ancona - Rome	-Palermo

	2012	Forecast 2017
Number of trains operating on RFC 3	~29,600	31,309
International rail freight volumes covering RFC 3 Corridor countries in 2012 (in 1.000 net tonnes)		
	As Origin	**As Destination**
Norway	1,781	471
Sweden	3,523	4,500
Denmark	817	1,253
Germany	28,084	20,658
Austria	10,486	10,079
Italy (via Brennero)	13,285	21,015
Total		**57,976**

Source: BSL Transportation Consultants Research, RFC3 Implementation Plan, RFC 3 Transport Market Study.

Key corridor characteristics of Rail Freight Corridor 5 (Baltic-Adriatic Corridor)



Countries connected by RFC5

- Poland
- Czech Republic
- Slovakia Republic
- Austria
- Slovenia
- Italy

RFC 5 Baltic-Adriatic Corridor

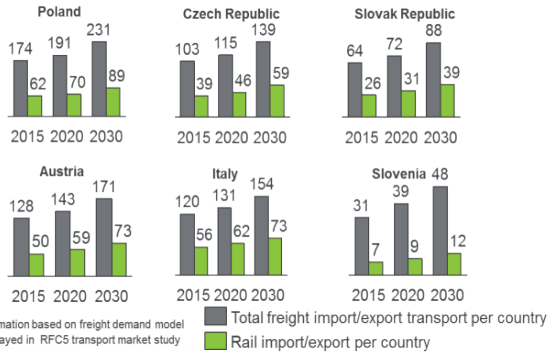
Principal routes:

Gdansk	Gdynia – Katowice – Ostrava/Zilina	Bratislava/Vienna/Klagenfurt-Udine-Venice/Trieste/Bologna/Ravenna/Graz-Maribor-Ljubljana-Koper/Trieste
Świnoujście		

Rail freight transport 2012 - Import/export between RFC5 countries (in million net tonnes), exclusive RFC5 ports

	As Origin	As Destination
Poland	14.13	5,62
Czech Republic	14.30	13.02
Slovak Republic	8.90	12,07
Austria	6.80	13.10
Italy	2.01	4.60
Slovenia	5.37	3.10
Total		**51.51**

Base-case forecast scenario with RFC service
Import/export of RFC5 countries (without seaport traffic)

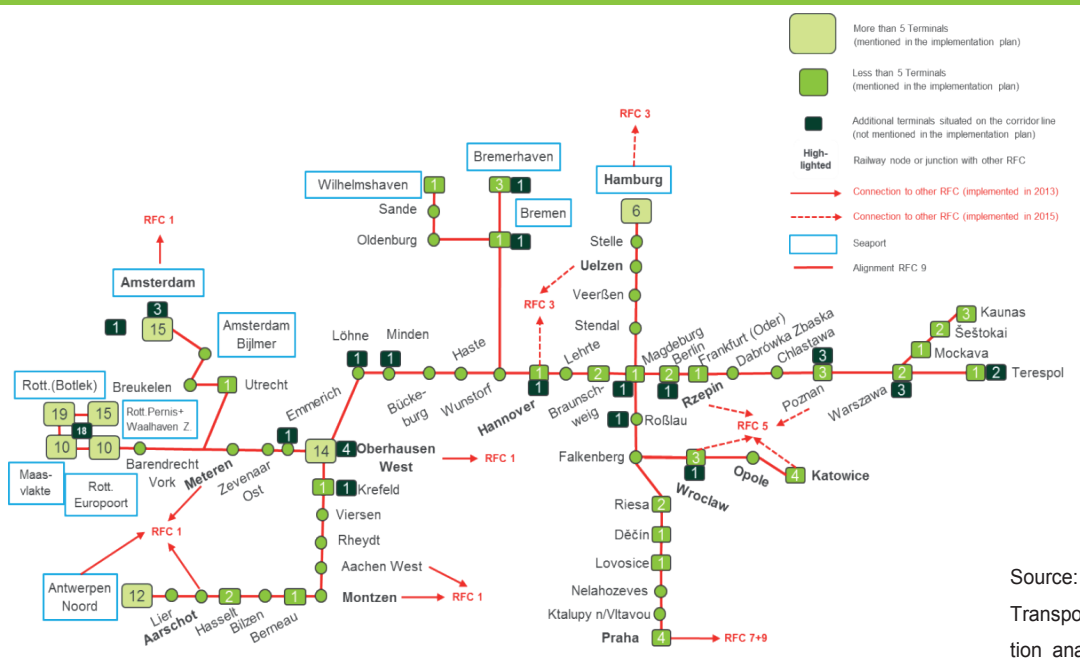


* Estimation based on freight demand model displayed in RFC5 transport market study

Rail share in transport flows [base year 2012 , in m net tonnes]

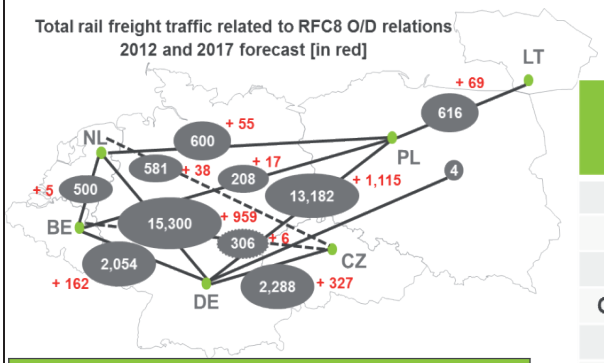
Destination / Origin	PL	CZ	SK	AT	IT	SI	Total Origin
PL		60%	63%	58%	27%	9%	**58%**
CZ	43%		52%	52%	31%	57%	**48%**
SK	26%	52%		46%	22%	67%	**45%**
AT	28%	11%	17%		46%	54%	**38%**
IT	16%	8%	15%	34%		4%	**22%**
SI	6%	20%	79%	66%	5%		**52%**
Total Destination	**34%**	**50%**	**54%**	**52%**	**34%**	**42%**	

Key corridor characteristics of Rail Freight Corridor 8 (North Sea-Baltic Corridor)



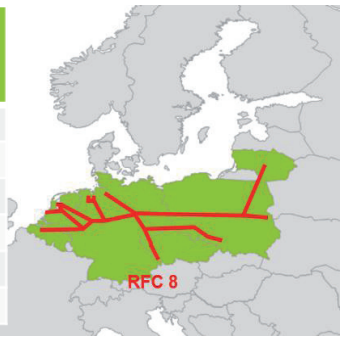
Source: BSL Transportation analysis, RFC5 implementation

Total rail freight traffic related to RFC8 O/D relations 2012 and 2017 forecast [in red]



Countries connected by RFC8

- Belgium
- Netherlands
- Germany
- Czech Republic
- Poland
- Lithuania



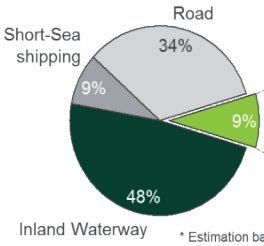
RFC 8 North Sea-Baltic Corridor

Principal route:
Wilhelmshaven, Bremerhaven, Hamburg and Amsterdam, Rotterdam, Antwerpen - Aachen – Hannover/Berlin – Warsaw – Terespol (Poland-Belarus border) / Kaunas / Falkenberg – Prague / Wroclaw – Katowice.

Rail volume and modal split on RFC 8 country relations 2012

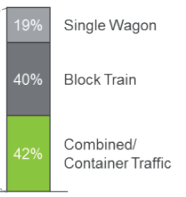
	Bidirectional rail traffic (in 1,000 t)	Rail modal split
NL – BE	3,632	3.3%
NL – DE	21,004	11.7%
NL – PL	137	1.5%
NL - LT	0	0.0%
BE – DE	6,416	12.1%
BE – PL	173	3.3%
BE – LT	0	0.0%
DE – PL	8,649	14.2%
DE – LT	25	0.4%
PL – LT	39	9.1%
Total	40,426	9,23%
Total number of trains on RFC8 in 2012		35,639

Modal split on RFC8 (based on tonnes) [2012]



Corridor train traffic

Rail freight production system used on RFC 8*



* Estimation based on personal Interviews and online questionnaire in Transport Market Study

For the six Rail Freight Corridors which are already operational since November 2013 first conclusions on corridor development and performance can be drawn. The Key Performance Indicators (KPIs) defined for the corridors may provide evidence on corridor development. Nevertheless, the availability of data on corridor performance, the KPIs used and their measurement vary between the six corridors as the following table depicts:

Table 6: Availability of selected KPIs for RFC development and performance analysis

KPI	RFC 1 Rhine-Alpine	RFC 2 North Sea-Med	RFC 4 Atlantic	RFC 6 Mediter-ranean	RFC 7 Orient - Med	RFC 9 Czech-Slovak
Capacity						
Offered capacity / PaPs [1]	✓	✓	✓	✓	✓	✓
Requested capacity / PaPs	✓	✓	✗	✓	✓	✗
Allocated capacity / PaPs	✓	✓	✓	✓	✓	✓
Reserve capacity	✗	✓	✗	✓	✓	✓
Allocated reserve capacity	✗	✓	✗	✓	✓	✗
Conflicting PaPs/ double bookings	✓	✓	✗	✓	✗	✗
Traffic / Performance						
Corridor int. traffic volume (No. of trains)	✓	✓	✓	✗	○ [2]	✓
Modal split of freight traffic	✓	✗	✗	✗	✗	✗
Ton-km (average)	✗	✓	✗	✗	✗	✗
Corridor punctuality (ratio/ no. of trains)	✓	✓	✓	✓	○ [2]	✓
Commercial train speed	✓	✓	✓	✗	✗	✓

1) Pre-arranged train path - dedicated capacity for international rail freight, published in a path catalogue for the following timetable
2) Mentioned in RFC annual report, but no data published

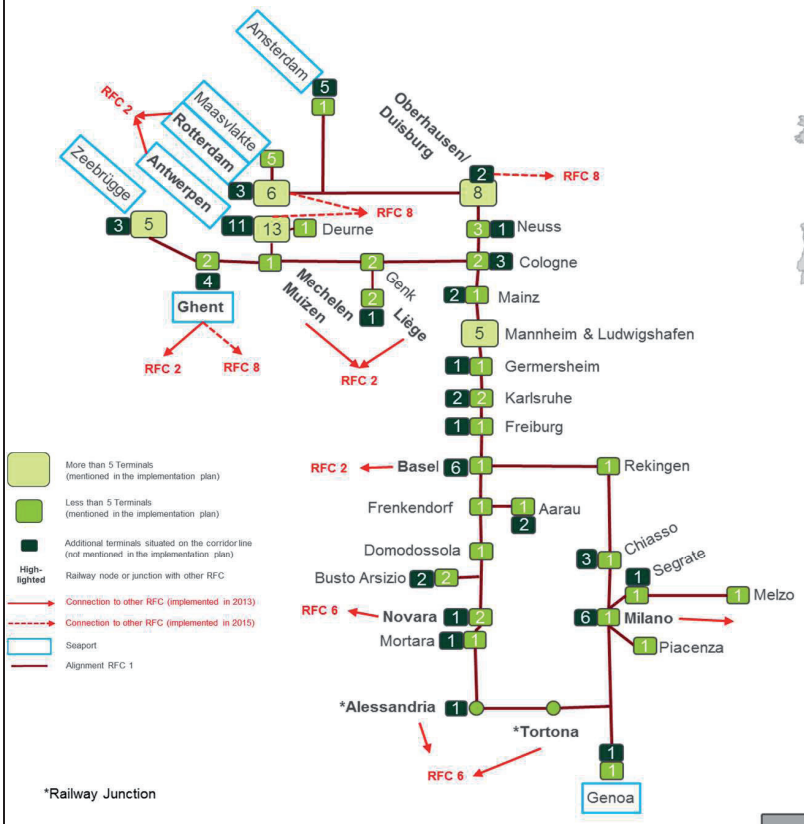
Source: BSL Transportation Consultants Research, RFC Implementation Plans, RFC Annual Reports

For several reasons, the first evidence on corridor development and performance presented in the following is limited and thus has to be handled with care:

- Owing to the short time period covered (only two years of operation so far), the existing data on corridor performance have only limited significance as most RFC objectives are set for the long-term,
- As shown above, the structure of data on corridor performance, the KPIs published and their measurement are only partly harmonized between the different corridors, so that database and level of detail of evaluation differ significantly among corridors (from a selection of KPIs published in the Annual Report to a detailed Report of Results),
- Not all KPIs mentioned in the Implementation Plan or Annual Report of a specific corridor are published,
- For most corridors, the 2010 transport market studies have not yet been updated so far in terms of volumes. According to information from corridor representatives a general update for all corridors in one study is planned for 2017/18.

In addition to their annual reports, the corridors have conducted yearly satisfaction surveys to measure the satisfaction level of their users. The survey results can be retrieved at the specific corridor websites.

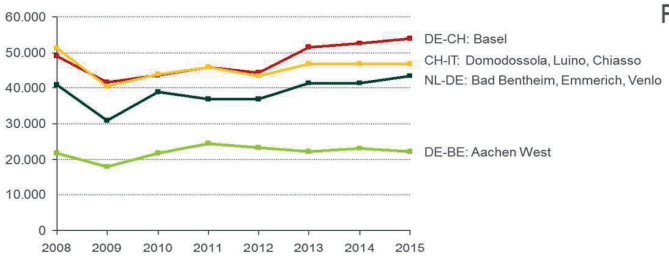
Corridor development of Rail Freight Corridor 1 (Rhine-Alpine Corridor)



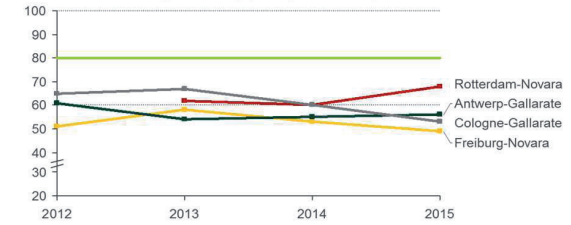
Countries connected by RFC1

- The Netherlands
- Belgium
- Germany
- *Switzerland*
- Italy

Trains **KPI international traffic volume 2008-2015[1]**



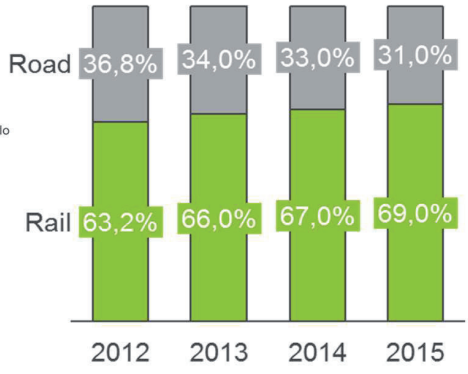
% **KPI arrival punctuality (0-30') in %, Comparison 2012-2015[2]**



1) Definition: Number of international freight trains per year crossing a border of Corridor Rhine-Alpine in both directions, regardless of origin or destination. If more than one line crosses a border results have been summarized

2) [2)] Definition: Multiannual average punctuality level (arrival at destination within a 30 minutes time span) for selected relations. A level of 80% is targeted.

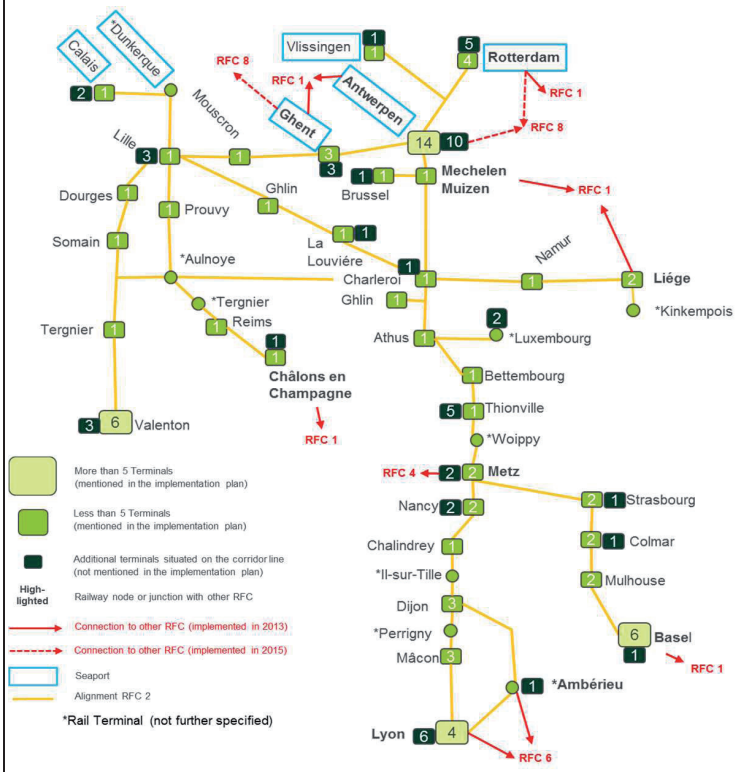
RFC 1 - Modal Split Trans-Alpine



Additional Information

- Unaccompanied combined intermodal traffic was the second strongest growing modality behind single wagon load traffic
- Factors impeding better results were extensive strikes in Germany, but also severe weather conditions in Italy
- The outlook for 2016 is slightly less optimistic, due to
  - the ongoing volatile environment regarding global trade development
  - political and economic risks (Brexit) and
  - restructuring in the railway sector
- Substantial market potential for rail freight is seen for RFC1, especially on the long haul market segment

Corridor development of Rail Freight Corridor 2 (North Sea-Mediterranean Corridor)

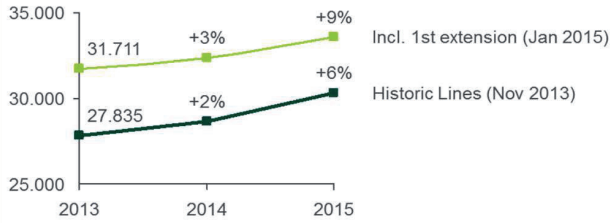


Countries connected by RFC2

- The Netherlands
- Belgium
- France
- Luxemburg
- United Kingdom
- *[Switzerland]*

Total Traffic Corridor Traffic[1]

(no. of corridor train runs per month)

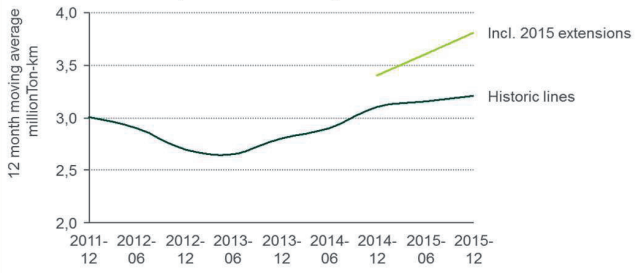


RFC2 Corridor punctuality[2]

Yearly RFC punctuality (30min on selected corridor trains)	2013	2014	2015
Punctuality evolution compared to TimeTable 2013	77,9%	+1% (78,7%)	+1%

[2] For the calculation of the total corridor punctuality, the average puctuality of the selection of corridor trains in 26 pre-defined measuring points across the corridor is taken into account. A corridor train is punctual when it has a delay of maximum 30 minutes.

Tons transported over RFC2 per km



Ton-km evolution compared to 2013	2014	2015
Historic lines (Nov 2013)	+2%	+13%

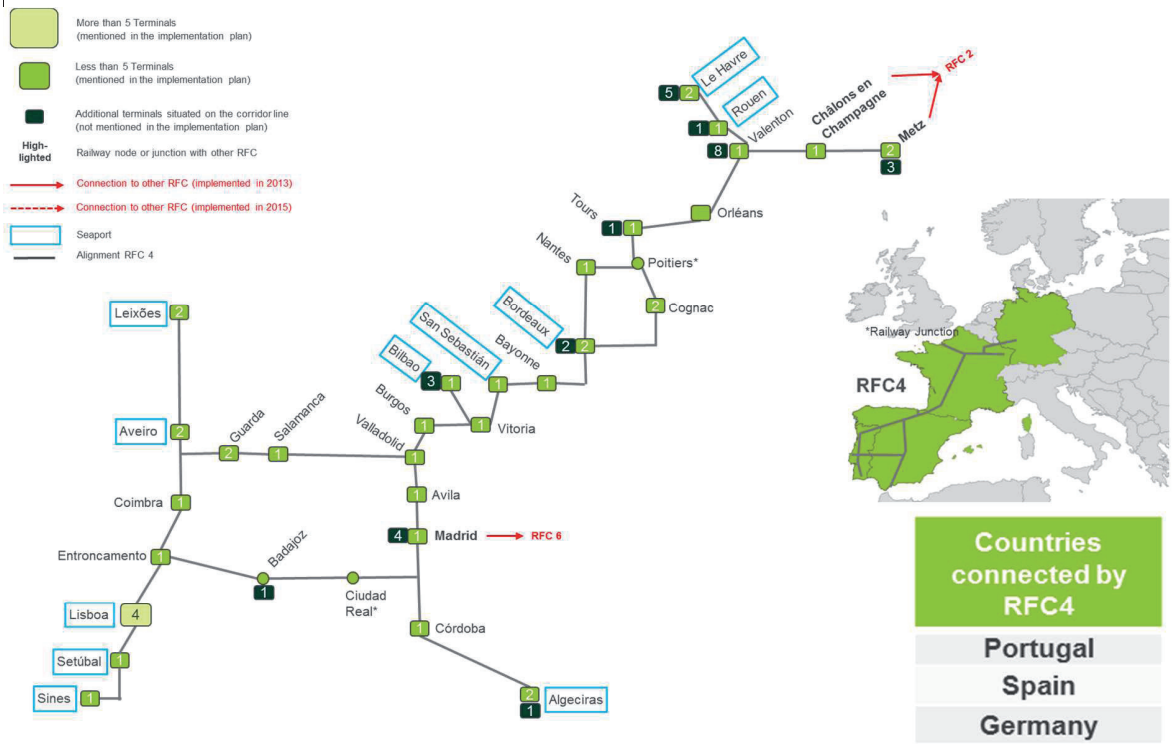
RFC2 corridor extension in 3 phases:

- **1st phase: January 2015** to Dunkirk, Calais, Liège (Montzen) and Paris
- **2nd phase: January 2016** to London, Zeebrugge, Amsterdam and Marseille
- **3rd phase: November 2018** to Edinburgh, Southampton and Felixstowe

Additional Information

- By corridor extension towards the UK a doubling of the number of trains p.a. is expected from 2,547 in 2013 to approx. 5,000 in 2018

Corridor development of Rail Freight Corridor 4 (Atlantic Corridor)



Countries connected by RFC4

- Portugal
- Spain
- Germany
- France

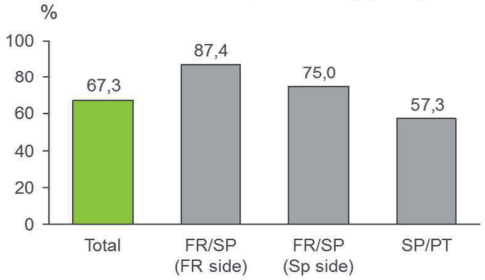
Selected Key Performance Indicators RFC4 [2015]

2015	Annual (trains)			∑ IT @ FR/SP & SP/PT borders
	FR/SP		SP/PT	IT distance > 500 km
	FR side	SP side		
Paths reserved	3.482	3.698	2.563	6.261
Trains running	2.401	2.669	2.050	4.719
% running trains	69,0%	72,2%	80,8%	75,4%
Trains delayed >30min	303	668	876	1544
% delayed trains	12,6%	25,0%	42,7%	32,7%

Paths reserved	3.482	3.698	2.563	6.261
Trains running	2.401	2.669	2.050	4.719
Trains delayed >30min	303	668	876	1544

KPIs RFC4	2015
Annual number of pre-arranged freight paths offer TT2016	28
Annual number of daily pre-arranged freight paths.km offer TT2016	29,335.36
Number of paths allocated by the one sop shop	35

RFC4 Corridor punctuality [2015][2]

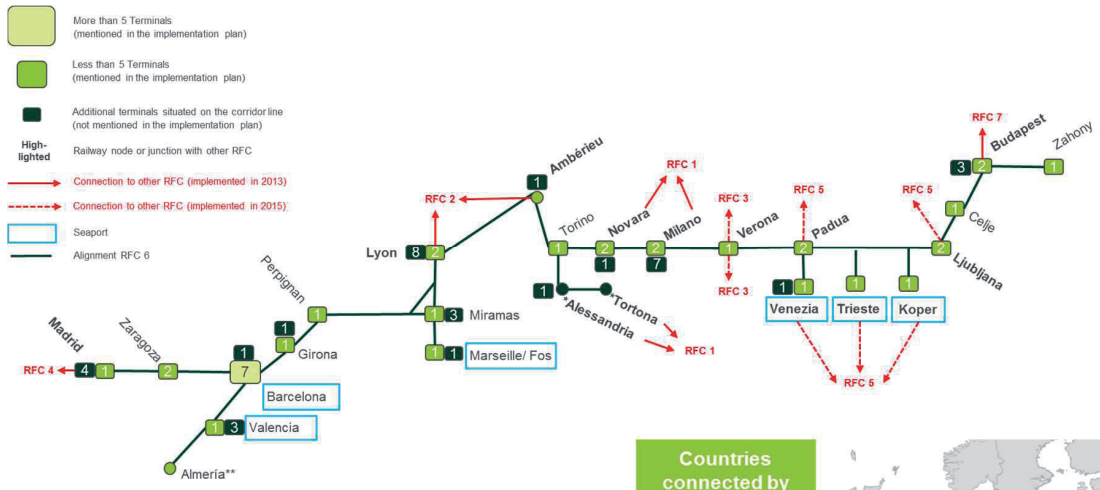


[2] Punctuality of international traffic 2015 at the border (delay <30 min)

Additional Information

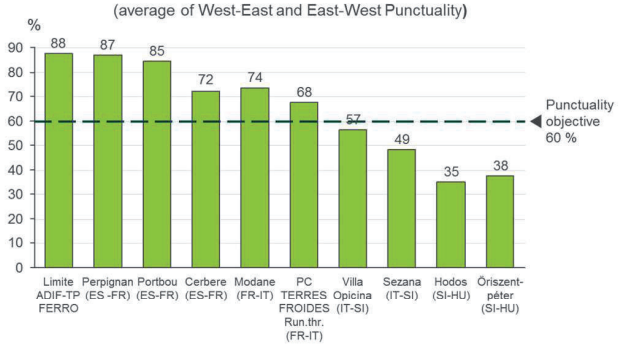
- The goal is a triplication of international rail traffic in the next 20 years by
  - increasing the capacity offer for the next timetable 2017/2018
  - improving the performance of the PaP between Germany and the French/Spanish border and Portugal and Spain
- To improve the train performance management, RFC4 plans to
  - improve the data quality
  - record a bigger number of trains
  - allow effective punctuality monitoring

Corridor development of Rail Freight Corridor 6 (Mediterranean Corridor)



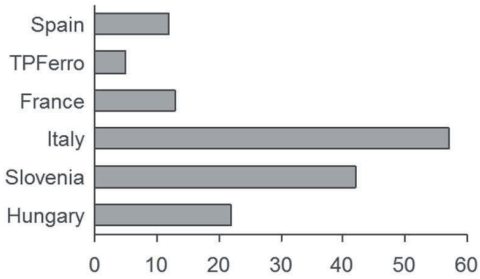
Countries connected by RFC6
Spain
France
Italy
Slovenia
Hungary
Croatia

KPI RFC6 – Train punctuality[1] at defined border points [2015]
(average of West-East and East-West Punctuality)



- **January 2015:** Corridor extension in Spain from Madrid to Algeciras
- **November 2016:** Corridor extension from Slovenia and Hungary to Croatia (Zagreb and Rijeka)

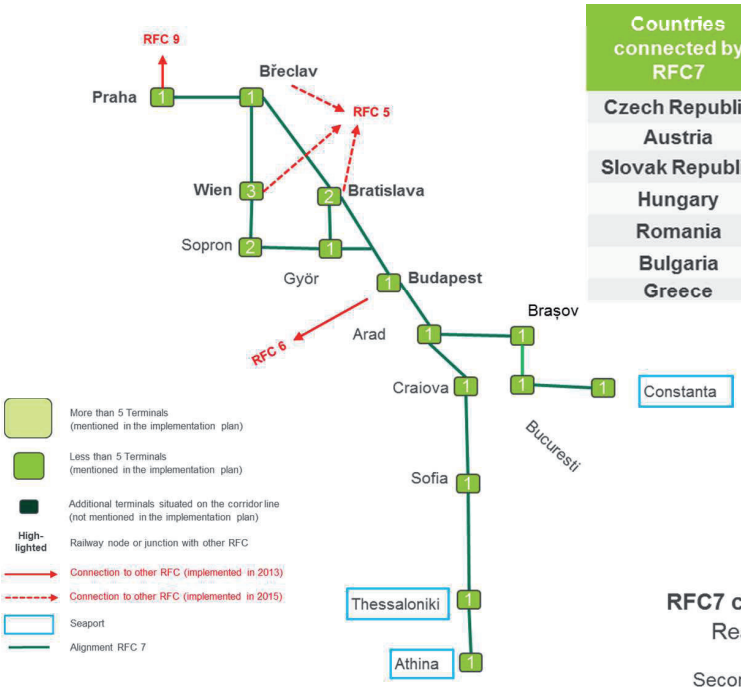
No. of PaPs offered for TT 2015



KPIs Capacity RFC6	TT2014	TT2015	TT2016
Number of PaPs (Standard) offered	51	140	197
Total number of requests		37	77
Number of requested PaPs		46	98
Number of PaPs allocated by C-OSS[2]	4	46	92
Number of conflicting applications (double booking) [of which could be solved by consultation]		2 [2]	15 [2]

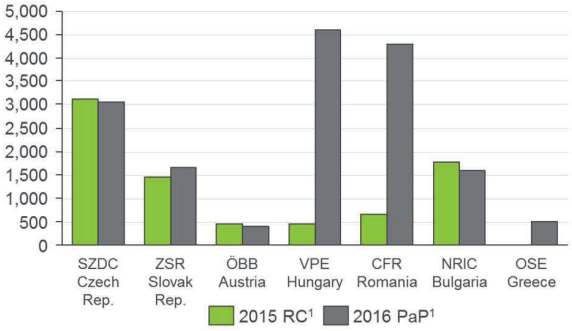
1) All international freight trains excl. national trains, service trains, isolated locomotives and empty wagons
2) Equal to the no. of oaths which reached the active TimeTable phase

Corridor development of Rail Freight Corridor 7 (Orient –East Med Corridor)



Countries connected by RFC7
Czech Republic
Austria
Slovak Republic
Hungary
Romania
Bulgaria
Greece

Offered capacity (days*km) [in 1,000]

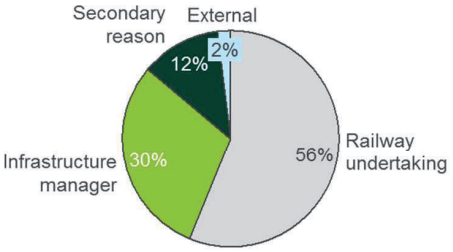


KPIs Capacity RFC7	2015
Annual path requests for TT2016	16 for 65 PaP dossiers
PaP capacity allocated by the C-OSS TT 2016 (% of available corridor capacity)	9%
Total requested running days	3,119
Average running days per request	195
Average PaP distance per request [km]	698
Reserve capacity published by the C-OSS TT 2015	7.8 m PaP km*days
Reserve capacity allocated by the C-OSS TT 2015	1.3 m PaP km*days

1) Reserve Capacity (RC), Pre-arranged paths (PaP)
2) KPI punctuality of corridor trains (trains with less than 30 delay minutes) monitored for 2015, but not published in RFC7 Annual Report

RFC7 corridor punctuality [2015]2

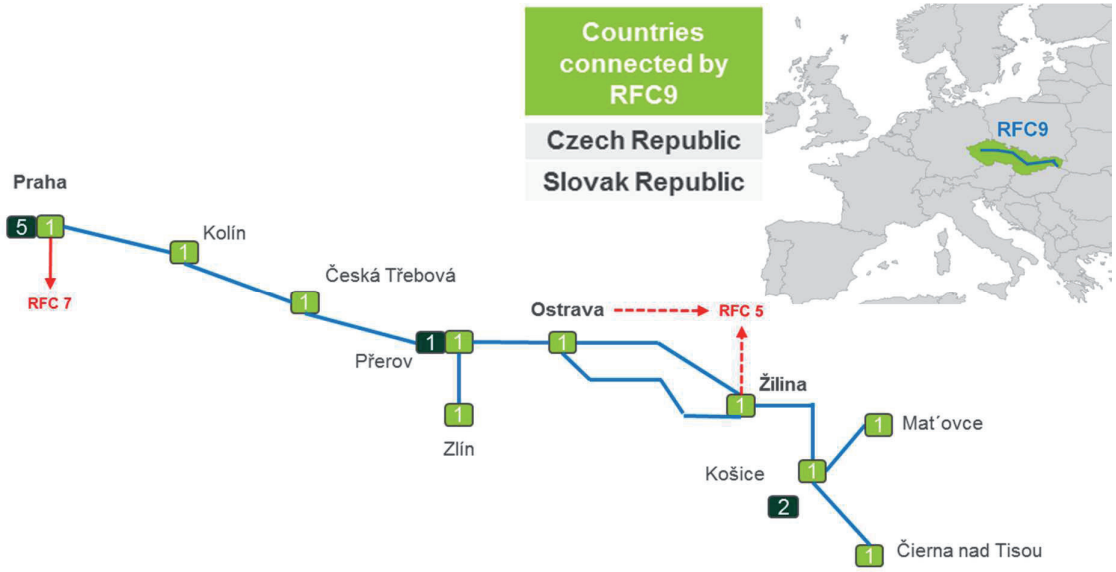
Reasons for delay minutes

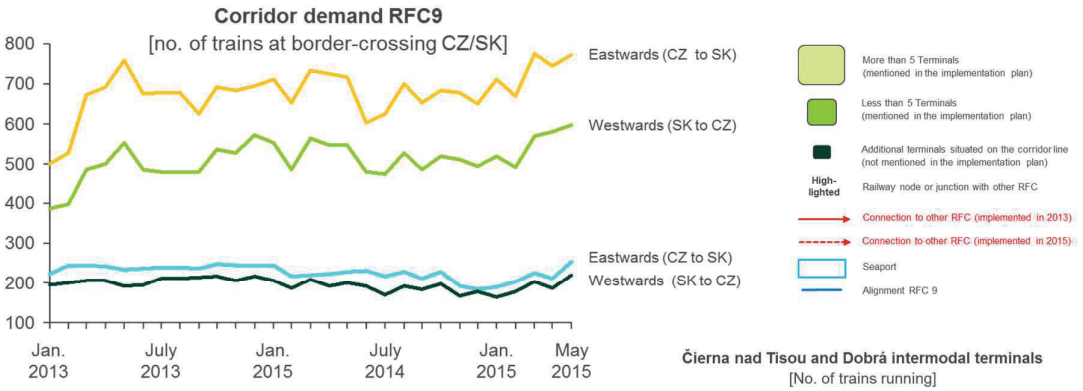


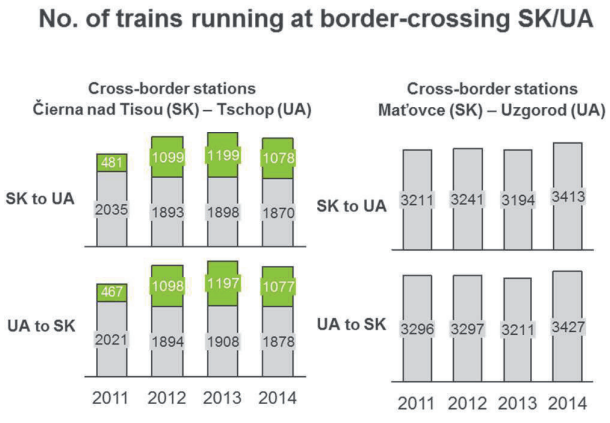
Additional Information

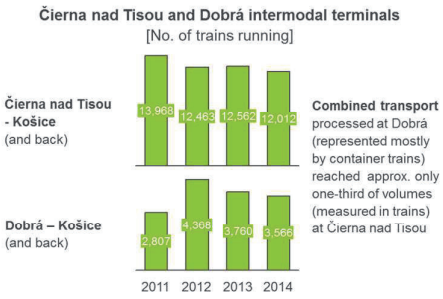
- Due to the large availability of capacity railway under-takings tend to plan ad hoc
- Clear interest in long-distance traffic from Germany towards Turkey and from the Czech Republic/Slovakia to the Mediterranean ports has been observed
- Crucial improvements for further corridor developments are
  - implementation of infrastructural measures
  - harmonisation of operational procedure
  - development of the intermodal terminals and last-mile infrastructure
- Further milestones for RFC7 will be the extension to Germany and to the Bulgarian-Turkish

Corridor development of Rail Freight Corridor 9 (Czech-Slovak Corridor)









Additional Information

- Key reasons to the lack of success are
  - small cross sections and only two involved countries
  - difficult market environment due to the Russian-Ukrainian crisis
- Intensive modernisation works led to mediocre punctuality on the corridor
- An extension to Bavaria offers future potential, as well as an open access intermodal terminal in Žilina

As stated above, one key objective of the corridors is to promote rail freight transport in Europe, increasing the rail share on the transport market. Therefore – as in the last report's edition – the survey participants were again asked for their assessment of EU Rail Freight Corridors implementation.

Compared to the results two years ago, overall the survey participants still remain quite optimistic regarding the positive impact from Rail Freight Corridor implementation on combined transport volumes. Nevertheless, more respondents only have answered "agree" instead of "strongly agree" the first years of operation.

Figure 12: Assessment of EU Rail Freight Corridor implementation by survey participants

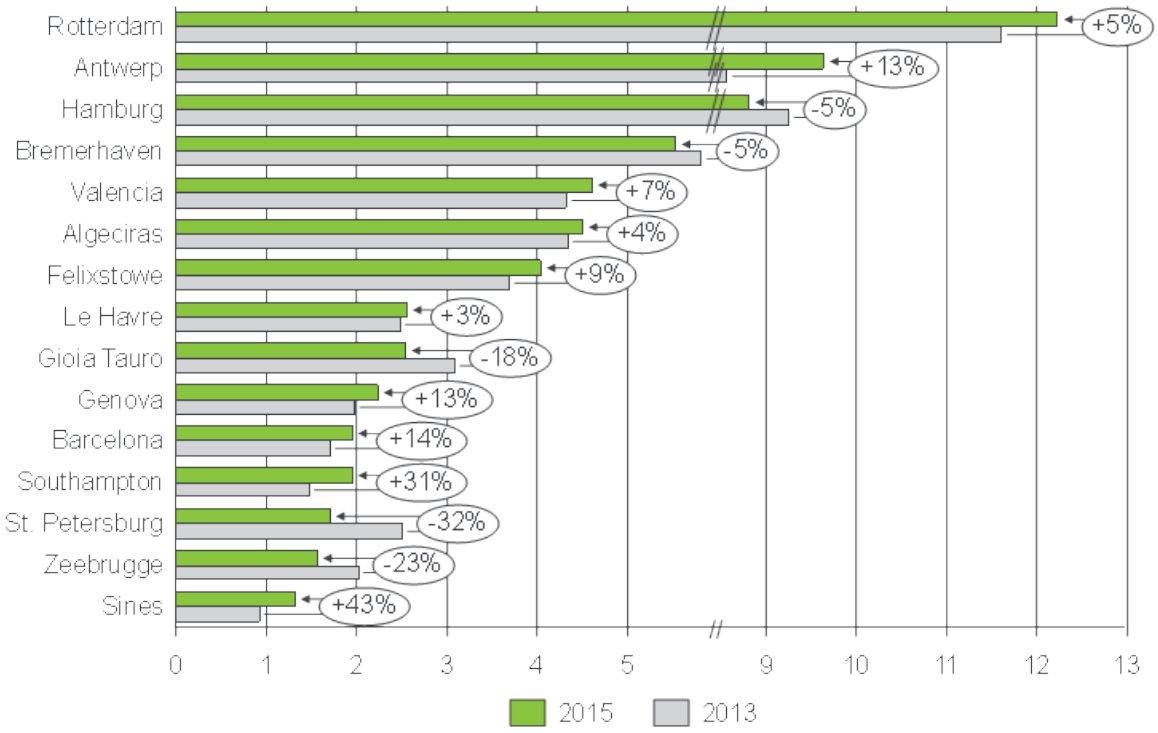
Source: BSL Transportation analysis. Note: No consideration of the statement "no comment". Rounding differences may occur.

As the RFC objectives regarding rail freight volume and modal split development are set for the long-term and a notable shift takes its time, a positive impact will most probably become obvious only after a longer period of corridor operation.

4.2. Seaport activities and hinterland transportation

Maritime or hinterland CT continues to be a key segment of the European CT market which is closely related to the development of seaborne container throughput volumes at major seaports. For this purpose, the development of port traffic in major European seaports provides relevant information on general trends for the CT market, also highlighting prospects for further development.

Figure 13: Development of container throughput 2015 vs. 2013 in major European container ports [in million TEU]



Source: BSL Transportation analysis, various port authorities, ESPO, Drewry, Eurostat.
Note: Only mainland Europe, without port of Tanger.

Among the four North Range ports, the development of container handling volumes between 2013 and 2015 varied. While Antwerp and Rotterdam gained container throughput volumes, Hamburg and Bremerhaven witnessed a decline, mainly due to less transhipment traffic.

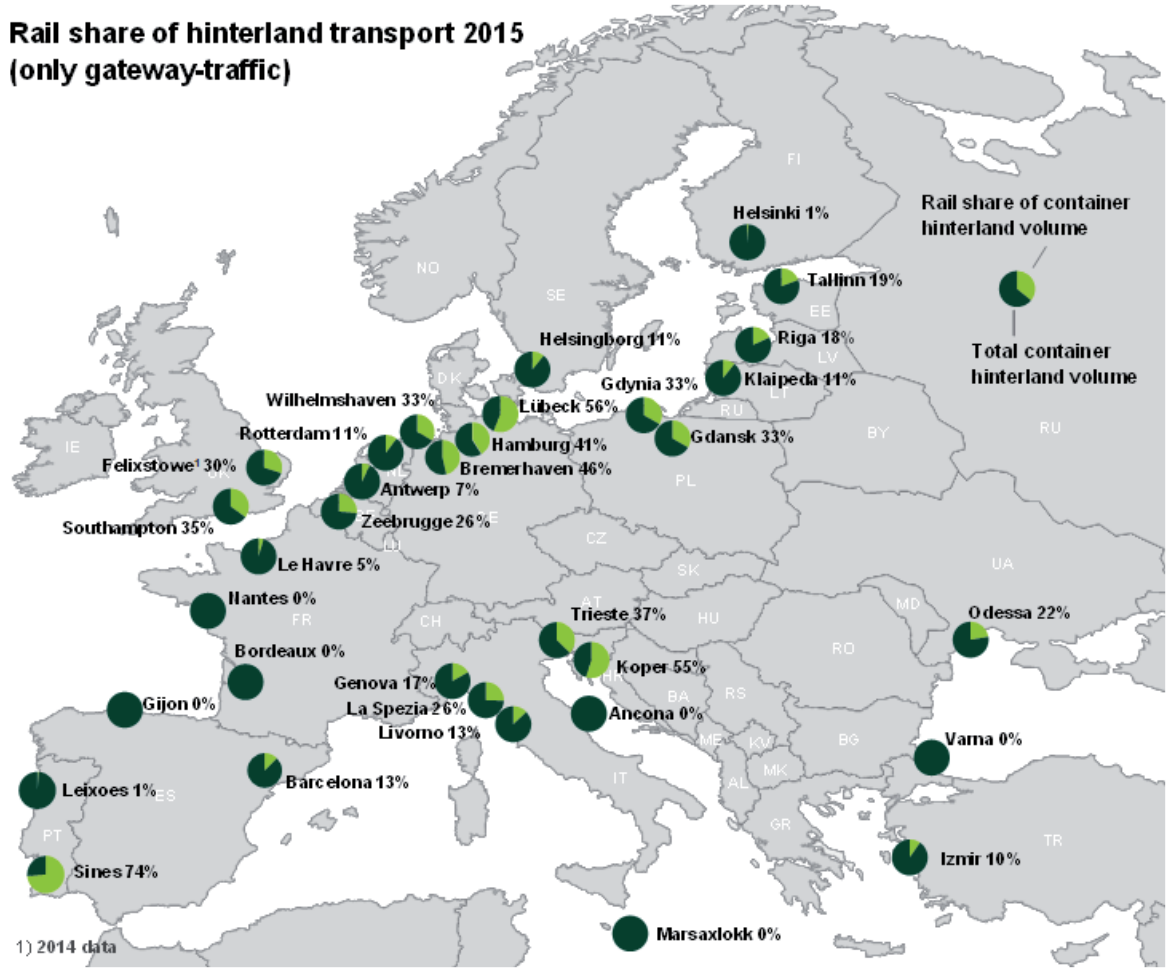
While several Mediterranean ports have grown significantly Baltic ports but also Odessa were severely affected by the Russian crisis and lost volumes.

For the CT market, the assessment of rail's market share of hinterland transportation of a certain port is particularly relevant. Its development (and thus the rail volume to and from the port) does not necessarily coincide with the development of total container throughput. This is particularly the case, if changes in volume primarily affect only transhipment/ feeder traffic.

The following figure gives an overview of rail's share[7] of hinterland container transport (only gateway traffic) of selected European ports in 2015.

7. The rail share can either be calculated as a share of total seaborne container throughput or as a share of hinterland transportation, only taking into account the port's gateway traffic (total seaborne container throughput less sea-sea-transhipment container volume).

Figure 14: Rail share of container hinterland transport (only gateway traffic) in selected European ports 2015



Source: BSL Transportation analysis, various port authorities, in single cases estimates[8]

Notable rail modal split-shares of more than 30% for container gateway traffic can only be observed in German, British and Polish seaports as well as for Koper, Trieste and Sines.

For maritime CT, not only the current rail share is relevant, but also the development of rail's share over time as it may reveal an overall trend for a particular port's rail traffic. Table 7 shows the development of the rail shares of seaborne throughput and of hinterland transportation for selected European ports between 2012 and 2015. The full table on rail transport volume of selected European ports 2012-2015 (in TEU) is provided in the Annex.

In some ports, rail does not play any role in hinterland transportation at all (yet), which is often due to a missing rail connection or no adequate rail hinterland network. According to port information the steep increase in rail volume in Gdansk is caused by changes in the correlation of containers hinterland transport to/from the terminal. One of the major reasons for this situation is the method of hinterland transport calculation, which applies in all Polish ports.

8. Note: In single cases, rail shares and volumes projected from terminal operator data or estimated based on port container throughput in tonnes.

It has to be pointed out, however, that looking only at the ports' rail shares could be somewhat misleading. Owing to the role of feeder traffic (as the example of the port of Hamburg shows) the absolute rail volumes should also be taken into account. It may occur that the total rail transport volume actually increases, while the rail share remains stable. This is the case, for example, if a port witnesses a strong growth in total container throughput volume but which is mainly related to transhipment traffic. Typically, in ports with a transhipment hub function, rail's share of hinterland transportation will be higher than the rail share of total throughput.

Table 7: Development of rail share of seaborne throughput and hinterland transport for selected ports 2012-2015

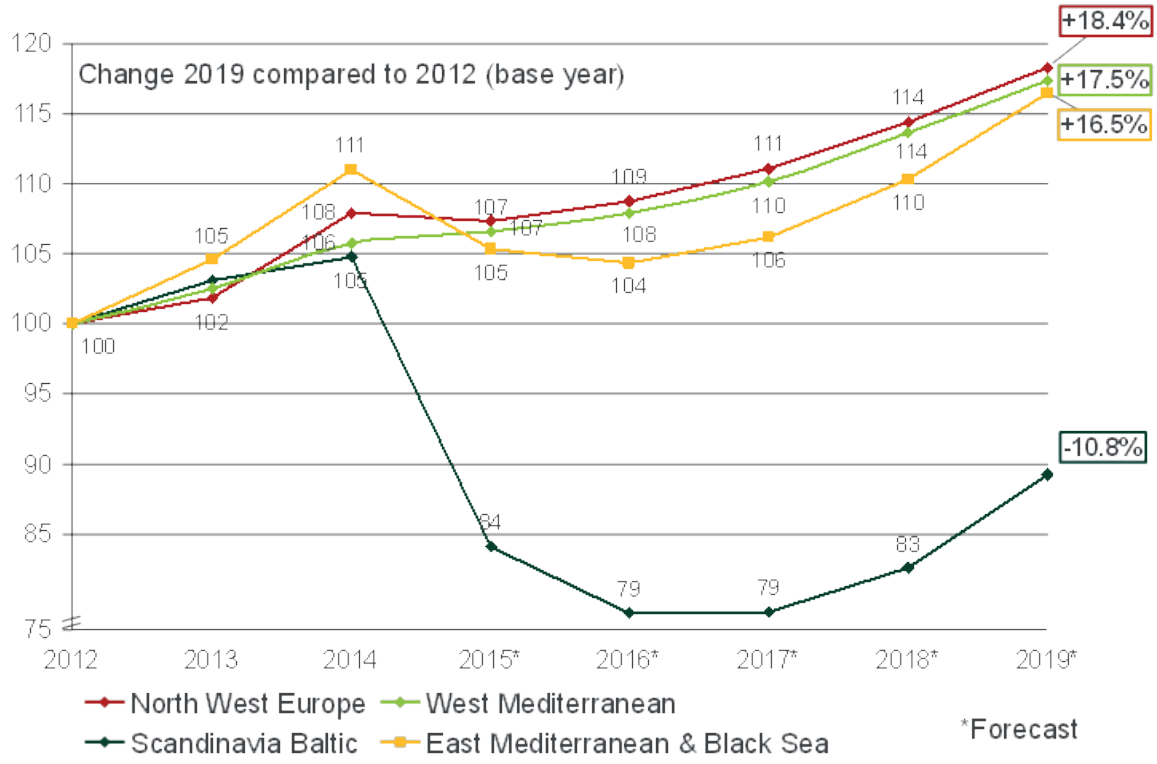
Seaport / Country		Rail share of seaborne container throughput				Rail share in hinterland transport			
		2012	2013	2014	2015	2012	2013	2014	2015
Algeciras	ES	0.2%	0.4%			1.8%	4.7%		
Alicante	ES	0.0%	0.0%			0.0%	0.0%		
Ancona	IT	5.0%	5.0%	0.2%	0.0%			2.1%	0.0%
Antwerp	NL	7.1%	4.8%	4.3%	4.3%	9.0%	7.0%	7.0%	7.0%
Barcelona	ES	8.5%	9.0%	10.0%	10.9%	11.3%	10.7%	12.0%	12.7%
Bilbao	ES	14.1%	17.0%						
Bordeaux	FR			0.0%	0.0%			0.0%	0.0%
Bremerhaven	DE	17.0%	18.0%	19.0%	19.4%	47.3%	46.6%	46.8%	46.4%
Cádiz	ES	0.0%	0.0%					0.0%	0.0%
Constantza	RO	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Felixstowe	UK		22.4%	21.9%	22.5%		28.0%	30.0%	
Gdansk	PL	12.6%	10.5%	10.6%	34.0%	34.4%	35.8%	32.6%	33.3%
Gdynia	PL		22.2%			32.0%	41.0%	31.4%	33.2%
Genova	IT	13.8%	14.9%	14.0%	13.6%	17.2%	17.8%	17.3%	16.8%
Ghent	BE	8.0%				8.0%			
Gijón	ES			0.0%	0.0%			0.0%	0.0%
Göteborg	SE	45.7%	45.8%						
Hamburg	DE	22.3%	22.8%	23.1%	26.1%	37.3%	39.3%	38.6%	41.0%
Helsingborg	SE			13.0%	10.9%			13.0%	10.9%
Helsinki	FI	2.1%	1.7%	1.4%	1.2%	2.1%	1.7%	1.4%	1.2%
Izmir	TR	14.8%	15.1%	12.2%	13.1%	12.4%	12.4%	9.2%	9.6%
Klaipeda	LT			12.8%	10.7%			12.8%	10.7%
Koper	SI		60.0%	54.5%	54.5%		60.6%	55.0%	55.0%
La Spezia	IT	22.2%	22.7%	24.8%	23.4%	24.0%	24.6%	26.7%	25.5%
Le Havre	FR	4.3%	3.3%	3.4%	3.4%	5.2%	4.5%	4.7%	4.5%
Leixões	PT			1.6%	0.9%	1.0%	1.0%	1.8%	1.0%
Livorno	IT	12.2%	12.4%	11.5%	9.7%	12.8%	13.1%	12.8%	13.0%
London/Tilbury	UK			n/a	n/a			n/a	n/a
Lübeck	DE			37.4%	43.7%			48.0%	56.0%
Marsaxlokk	MT			0.0%	0.0%			0.0%	0.0%
Nantes St-Nazaire	FR			0.0%	0.0%			0.0%	0.0%
Odessa	UA	17.4%	15.7%	16.2%	17.8%	22.2%	22.0%	21.5%	22.4%
Oslo	NO						10.0%		
Ravenna	IT	11.2%	11.6%			11.7%	11.9%		
Riga	LV	n/a	25.0%	n/a	18.0%	n/a	25.0%	n/a	18.0%
Rotterdam	NL	6.7%	6.8%	7.1%	7.2%	10.4%	10.5%	10.9%	10.5%
Sines	PT	24.3%	14.8%	15.5%	15.7%	72.7%	66.1%	71.5%	73.6%
Southampton	UK				not publ.			35.0%	35.0%
Tallinn	EE	21.5%	24.8%	27.2%	19.3%	21.6%	24.7%	27.2%	19.3%
Tanger	MA	0.2%	0.2%			4.8%	6.3%		
Trieste	IT			18.2%	22.2%	28.0%	30.0%	32.3%	37.3%
Varna	BG			0.0%	0.0%			0.0%	0.0%
Venezia	IT	0.7%	0.8%			0.7%	0.8%		
Vigo	PT	0.0%	0.0%			0.0%	0.0%		
Wilhelmshaven	DE			10.0%	10.0%			33.3%	33.3%
Zeebrugge	BE	27.4%	24.2%	23.1%	24.7%	34.6%	29.1%	29.1%	26.3%

n/a: not available not publ.: not published

Source: BSL Transportation analysis, various port authorities, Portopia, RFC1 progress report, partly estimated

For the CT market and particularly the segment of maritime CT, the future development of seaport throughput volumes is vital. According to a recent Drewry study the medium term growth perspectives for container handling in North West Europe, the Western Mediterranean and Eastern Mediterranean (incl. Black Sea) will remain positive, as Figure 15 shows. For the Scandinavia-Baltic region, however, a negative trend is expected with a recovery not until 2018. Nevertheless, for all European regions apart from the Western Mediterranean, which could continue its growth path, container growth perspectives were negative in 2015 and 2016, due weakening of the Euro to the Dollar, less economic growth in West Asian countries, in particular China, but also owing to the political and economic situation in Russia.

Figure 15: Growth perspectives for container throughput in European seaports 2012-2019 (Index 2012 = 100)



Source: BSL Transportation analysis, based on Drewry data (2015).

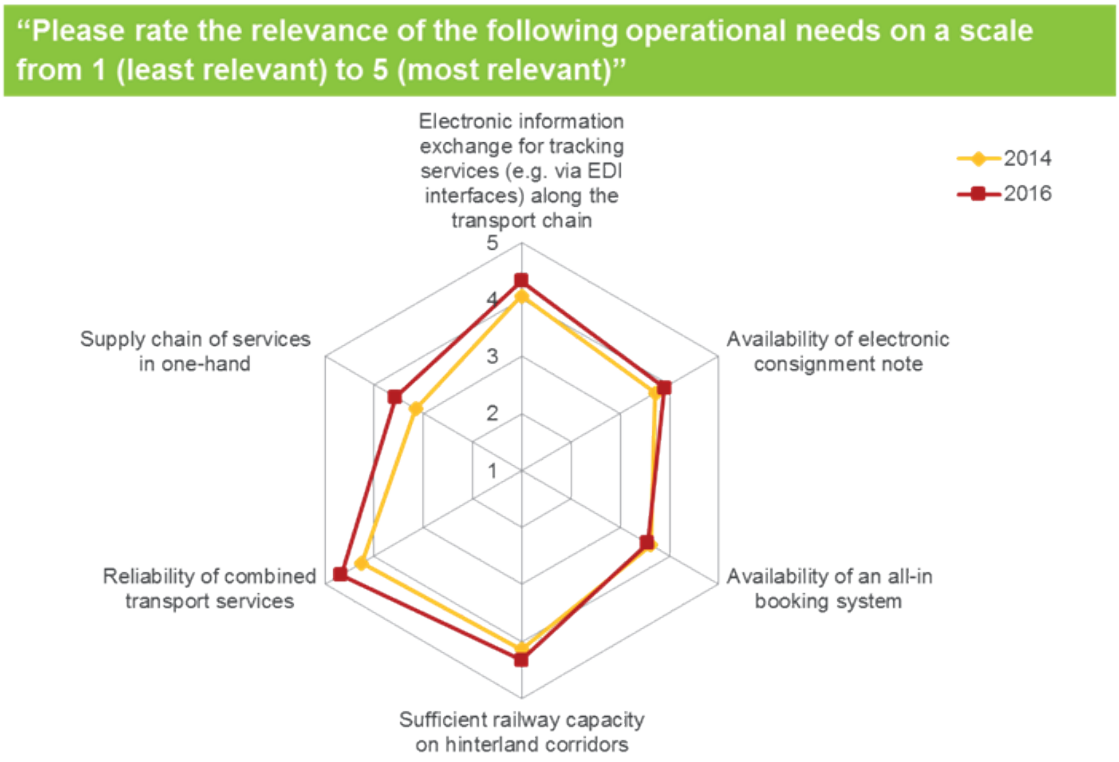
With recovery expected in 2017/18, it is anticipated that European container enter the growth path again, although particularly in Eastern Europe growth perspectives are lower than predicted some years ago. In Russia, the country's economic crisis along with trade sanctions have stopped its recent dynamic trade development and lead to a sharp downturn in Russian cargo. As the sanctions continue, a further negative impact for container trade in Baltic Sea ports and hinterland transportation is likely. This also holds for Turkey which economic development is affected by the recent political events and thus is most probably damped to some extent – with implications also for seaborne trade and rail hinterland traffic.

For container hinterland CT, this leads to the conclusion that stable demand for maritime intermodal solutions may be expected particularly in North West Europe and the Western Mediterranean, whereas the situation in the Baltic Sea remains difficult. For the Eastern Mediterranean the perspective is positive with a potential for further CT volumes which is also confirmed by the results of the market survey (see chapter 4.4). Nevertheless, as stated above, the situation in Turkey may be different as the growth expectations are most probably (negatively) affected by the recent political and economic developments.

Even though growth perspectives in seaborne container throughput are lower than they used to be, maritime/hinterland transport continues to be the backbone of European CT and it is vital to further promote CT in hinterland transportation and to improve the framework needed for this task.

For this purpose, CT providers were asked again for an assessment of main operational needs of hinterland transportation (Figure 16. The results of the 2016 market survey reveal that the most relevant factors to promote combined hinterland transport principally remain the same: more electronic information exchange, reliability of services and sufficient rail capacity on hinterland corridors. Compared to 2014, the importance of having all supply chain services in one hand, on the contrary, is rated higher for promoting CT in Europe by market players.

Figure 16: Assessment of main operational needs of hinterland transportation by survey participants

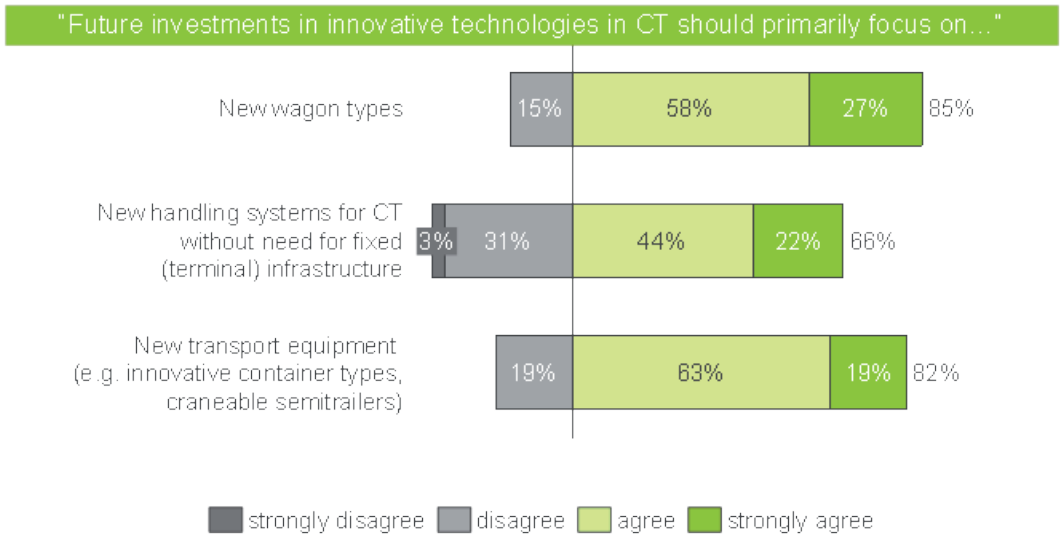


Source: BSL Transportation analysis.

4.3. Market technology and digitalisation

To further improve and develop the European CT market, new investments in innovative handling technologies are among the frequently-discussed aspects. In the market survey, CT providers were asked to assess where they see the need for new investments and how they evaluate existing innovative technologies and systems. The results show that according to the survey participants, future investments should rather focus on new wagon types and new transport equipment than on new handling systems for CT.

Figure 17: Assessment of new investment needs in Combined Transport



Source: BSL Transportation analysis. Note: No consideration of the statement “no comment”. Rounding differences may occur.

In order to gain further insights into the use and perception of innovative market technologies on the CT market, the most relevant innovative technologies in Combined Transport have been evaluated and assessed by the survey participants. This involves the following selection of 17 technologies:

Table 8: Selected innovative technologies in CT under study

Name of technology	Unacc. CT	Acc. CT	Since	Wagon-related	Terminal-related	Handling equipment	Use in practice
ACTS	x		1988				Yes, regular operation
BOXmover	x		2005				Yes, regular operation
BoxTango	x		2011				Regular operation planned
CargoBeamer	x		1998				Yes, regular operation
CargoRoo	x		2001				No, only theoretical concept
CargoSpeed	x		2001				No, only prototype
Flexiwaggon		x	2000				No, only prototype / singular use
Innovatrain Containermover	x		2012				Yes, regular operation
ISU-System	x		2006				Yes, regular operation
Megaswing/ Megaswing DUO	x		2010				Yes, trial operation
Metrocargo	x		2011				No, only prototype
Mobiler (KV-Roller)	x		1995				Yes, regular operation
Modalohr	x	x	2003				Yes, regular operation
NiKraSa	x		2014				Yes, regular operation
Rail-Tug	x		2010				No, only theoretical concept
ResoR@il	x	x	2010				No, only theoretical concept
Trimoder	x		2013				Yes, trial operation

Source: BSL Transportation analysis.

For each of the technologies a brief summary with its key characteristics, advantages and disadvantages is provided in the Annex.

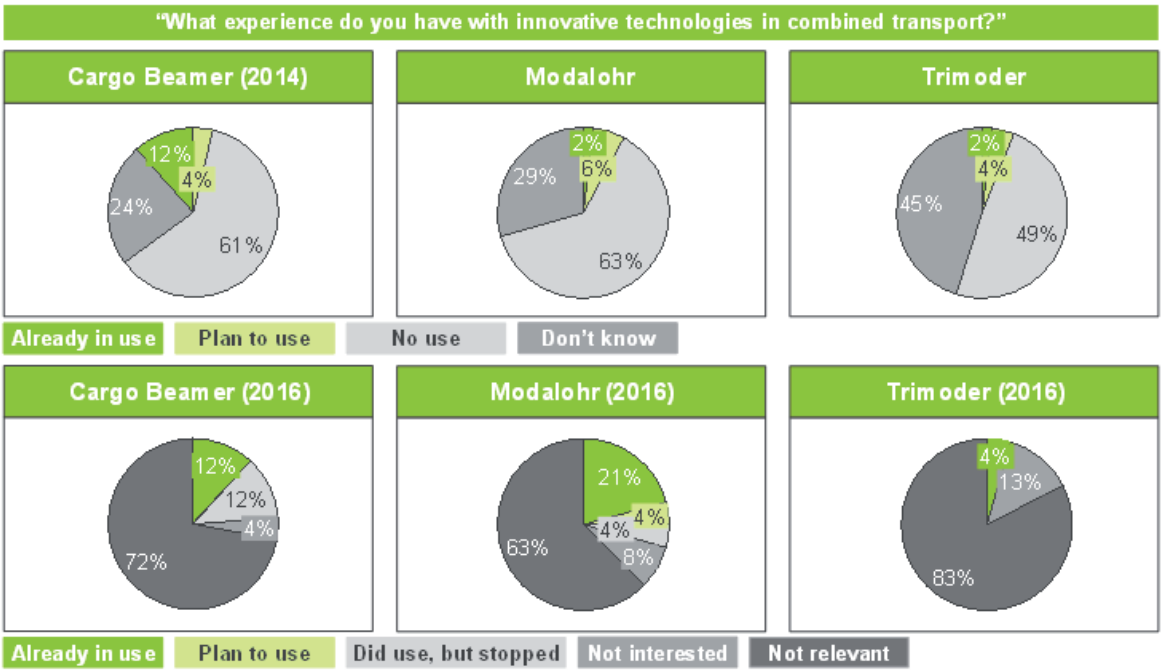
The survey participants were asked to assess the innovative technologies presented regarding their market potential and their use in practice. The results are somewhat sobering.

Only five technologies (ACTS, Cargo Beamer, Mobiler, Modalohr and NiKraSa) are known by more than 50% of the respondents. For most technologies survey participants see no or only small market potential which is mainly due to high unit costs. Only for two technologies (Cargobeamer and Modalohr) a high or very high market potential is attributed by more than 15% of the survey participants. For three technologies (Cargobeamer, Modalohr and Nikrasa) more than 25% of the respondents see a market potential which is at least medium or higher.

Furthermore it becomes obvious that there is little experience with the use of such technologies. A broader experience among the respondents only exists with CargoBeamer (24%), and Modalohr (25%) whereas others like Trimoder (4%) are little known. Comparing this year's survey results with the last survey shows that there is still little experience of innovative systems and technologies and that many remain unknown.

It also becomes that clear that knowledge, own experience with technologies and the assessment of their market potential are closely related.

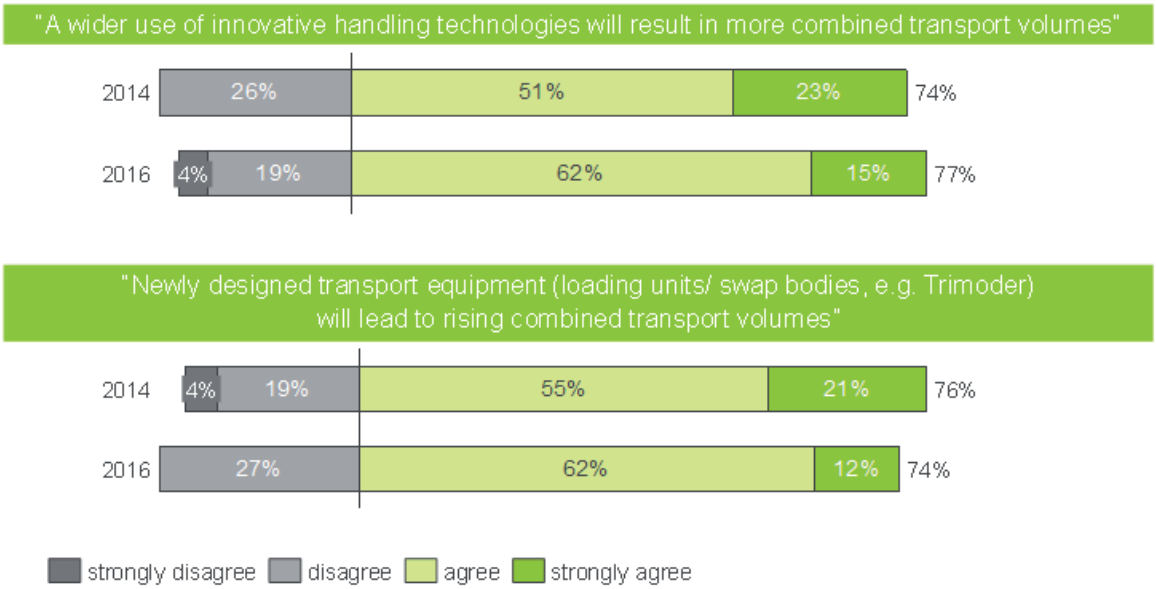
Figure 18: Experience with innovative technologies in CT



Source: BSL Transportation analysis. Note: Rounding differences may occur.

Nevertheless, it is notable, that – similar to the assessment in the last report edition – the survey participants' positive general assessment of innovative technologies differs from their specific evaluation and experience. Contrary to the assessment presented above, the general evaluation of innovative market technology is very positive, being very optimistic about the effects of using these technologies. Additionally at least in the case of Cargo Beamer and Modalohr, there is a significant amount of market participants that did use the technology but stopped again.

Figure 19: General assessment of innovative technologies in CT



Source: BSL Transportation analysis. Note: No consideration of the statement “no comment”. Rounding differences may occur.

Based on the findings above, further use of technology could be one driver and an opportunity for the future development of combined transport.

Besides innovative handling technologies, digitalisation has gained importance in combined transport and generally in the logistic sector in the past years. There is large potential that can be utilised through the progress in the field of digitalisation. Through the recording of potentially every process at any time by various sensors and RFID, it is possible to attain an immense amount of information through the internet of things. With this gathered big data, business processes and work flows are getting more transparent and offer an enormous surface for optimizations and automation. This does not only apply for mechanical devices, but especially in providing assistance to decision making in strategic matters and even to real time problems. The benefits can be very versatile and have an impact throughout the entire logistic value chain.

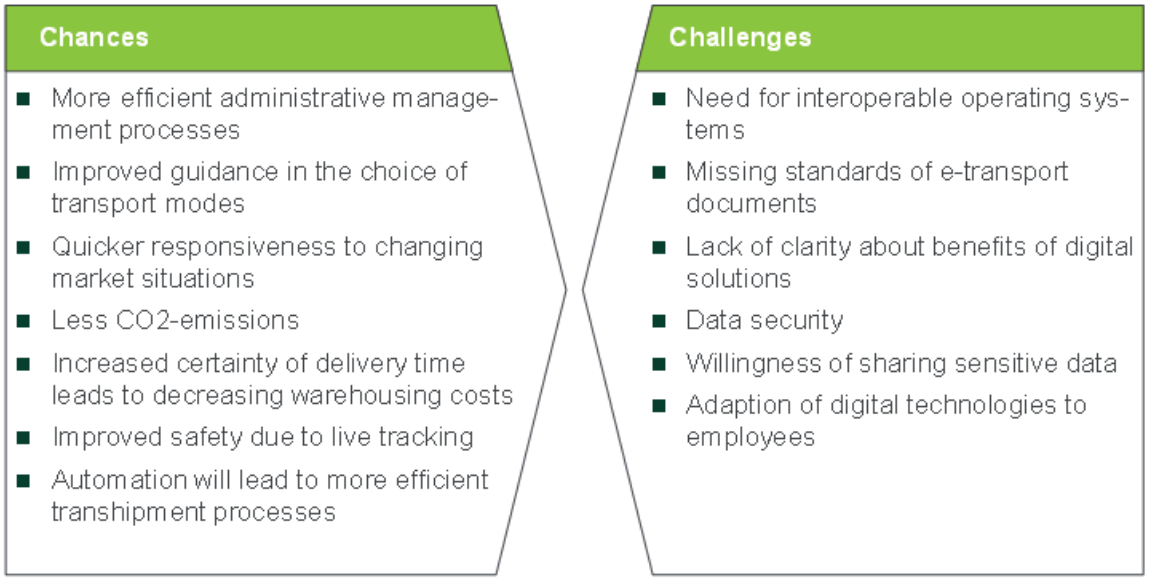
While the manufacturing industry, the main driver of the industrial digitalisation, focuses on creating intelligent and increasingly autonomous facilities, the logistic sector, in particular the combined transport, will still be dependent on human workforce moving the loading units for the next couple of years. Therefore the biggest impact through big data analysis will be in managing challenges. Nevertheless ongoing automation will affect the combined transport as well. Terminals in particular offer big potentials in operating efficiency through automation based on the digitalisation.

To be able to capitalize on the future trends and to stay competitive the key will be the integration of information and communication technologies (ICT) into existing business structures to enable the access to online data. A proper utilization of these opportunities will lead to multiple potential advantages.

Probably the most obvious improvement through online connectivity will be greater efficiency in administrative management processes. Fast communication via internet and the possibility for online exchanges of documents can lead to significant cost and time savings throughout the entire supply chain.

Besides the pure amount of information being accessible also the quality of the data will increase with time, leading to several potentials in transport management. Such as improved guidance in the choice of transport mode and quicker responsiveness to changing market situations. Logistic operations will gain efficiency, which will not only impact the speed and costs of shipments, but although have a positive impact on CO_2 emissions, e.g. through avoidance of switching to less efficient modes of transport saving time which was lost through inefficient planning.

Figure 20: Chances and Challenges of digitalisation in CT



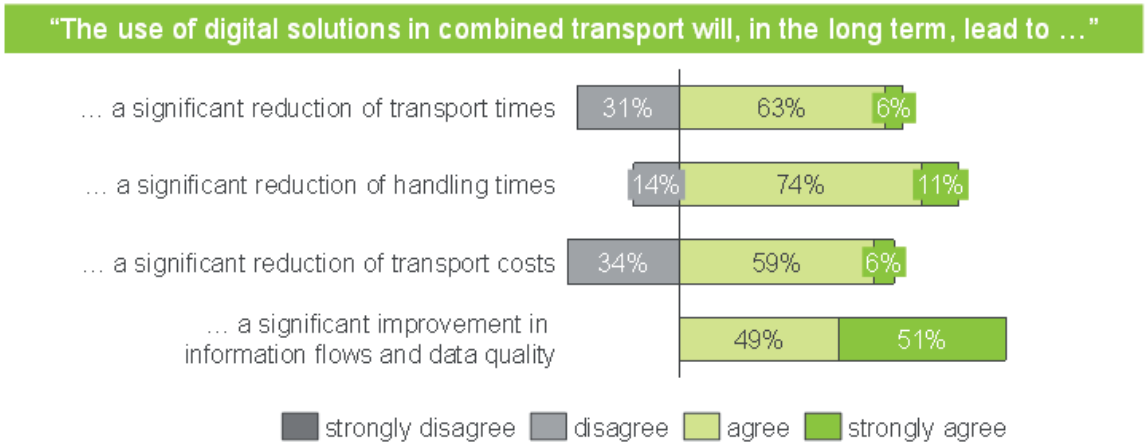
Source: BSL Transportation analysis.

With live tracking information through sensors and cameras the whole shipping process will gain in transparency. The safety on dealing with dangerous goods for example can be enhanced with accessible information on the content and condition of the freight, enabling prevention of incorrect handling and quicker reactions to accidents. Also with current information on vehicle statuses and location, the general safety of transportations can be improved. This applies i.e. at increased safety, against theft or to up-to-date maintenance data of a company's fleet.

Besides operational improvements through online data analysis regarding the coordination and tracking of transportation, the digitalisation can have a major impact on transhipment sites as well. With the availability of digital documents and freight information automated operations on transhipment sites will be possible. Furthermore live status information of the transhipment status will make transitions to following modes seamless. In the more distant future automation may even reach the extend of fully automated vehicles.

The results of the conducted survey underline that according to the market participants digital solutions will contribute more to improvements in information flows, data quality and handling times than to improvements in transport times and transport costs.

Figure 21: Assessment of the use digital solutions in CT



Source: BSL Transportation analysis. Note: No consideration of the statement "no comment". Rounding differences may occur.

Especially regarding the improvement and information flows there are currently numerous programs and projects. The European Commission for instance is currently developing standards for e-transport documents, which could act as catalysts in the progress of digitalisation in combined transport.

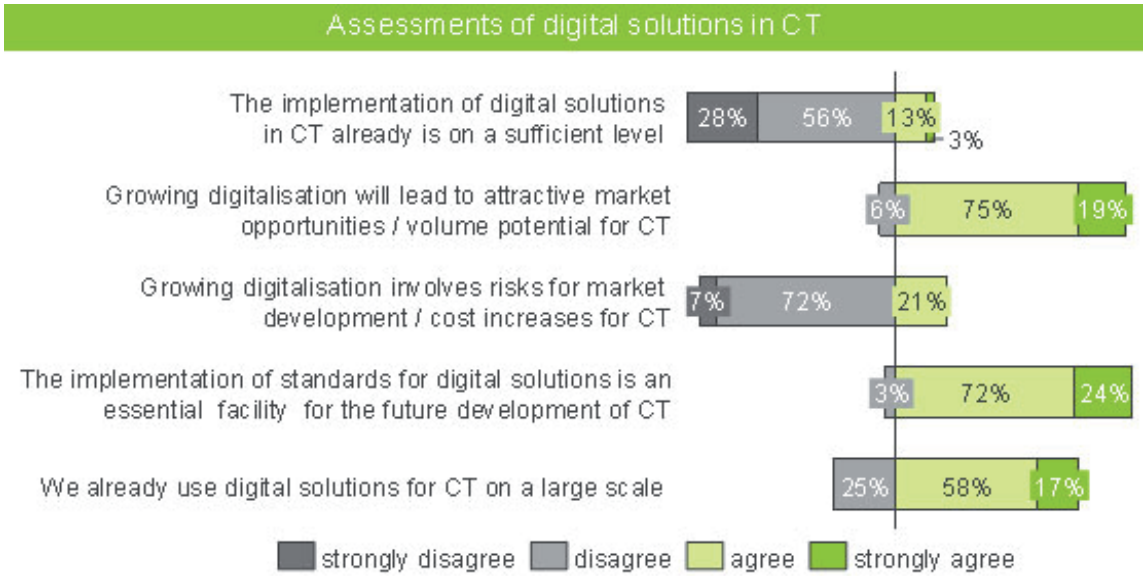
However there are several obstacles to overcome before using the full potential of the digitalisation. One of the main barriers is the need for interoperable operating systems to enable data exchange and communication along the whole supply chain. Currently common standards are mostly missing, which impedes the implementation of consistent systems. And after all coordination is a very important aspect of combined transport with its many actors.

With rising online communication and data transfer, security is gaining importance as well, which forms another major obstacle in the digital evolution. The volume and sensitivity of the transferred data is increasing and has to be protected properly. However to use the benefits of the digitalisation the willingness to share sensitive information with business partners cannot be limited by any security uncertainties. That is why data security goes hand in hand with the digitalisation.

With increasing utilization the adaption of the digital technologies by the employees becomes necessary, too. It is essential to encourage the acceptance of new technologies and train the employees using it and exploiting its full potential.

In general, the market participants assess the chances and opportunities for CT through digital solutions much higher than possible risks or challenges.

Figure 22: General assessment of digital solutions in CT



Source: BSL Transportation analysis. Note: No consideration of the statement "no comment". Rounding differences may occur.

Regarding the market penetration of digital approaches in CT the majority of market participants (84%) consider the implementation of digital solutions as insufficient whereas 75% already admit the usage of digital solutions (e.g. digital handling / tracking techniques, digital transport documents, etc.) on a large scale. The backlog regarding digitalisation is therefore in most cases seen at the other market participants and the CT market in general and not within the own company.

The implementation of standardised digital solution is seen as an essential facility for the future development of CT by 97% of the market participants and could be one driver to increase the CT-competitiveness and an ongoing positive development of the CT market.

4.4. Market development in the (Eastern) Mediterranean and Russia

This year's edition of the report on CT in Europe especially focusses on the market development in the Mediterranean, including Turkey and also Russia, paying special attention to the seaports. For this purpose, this chapter analyses 26 key ports and provides information for all considered ports and countries (see figure below).

Figure 23: Selected seaports in the Mediterranean and Russia under study

Source: BSL Transportation analysis.

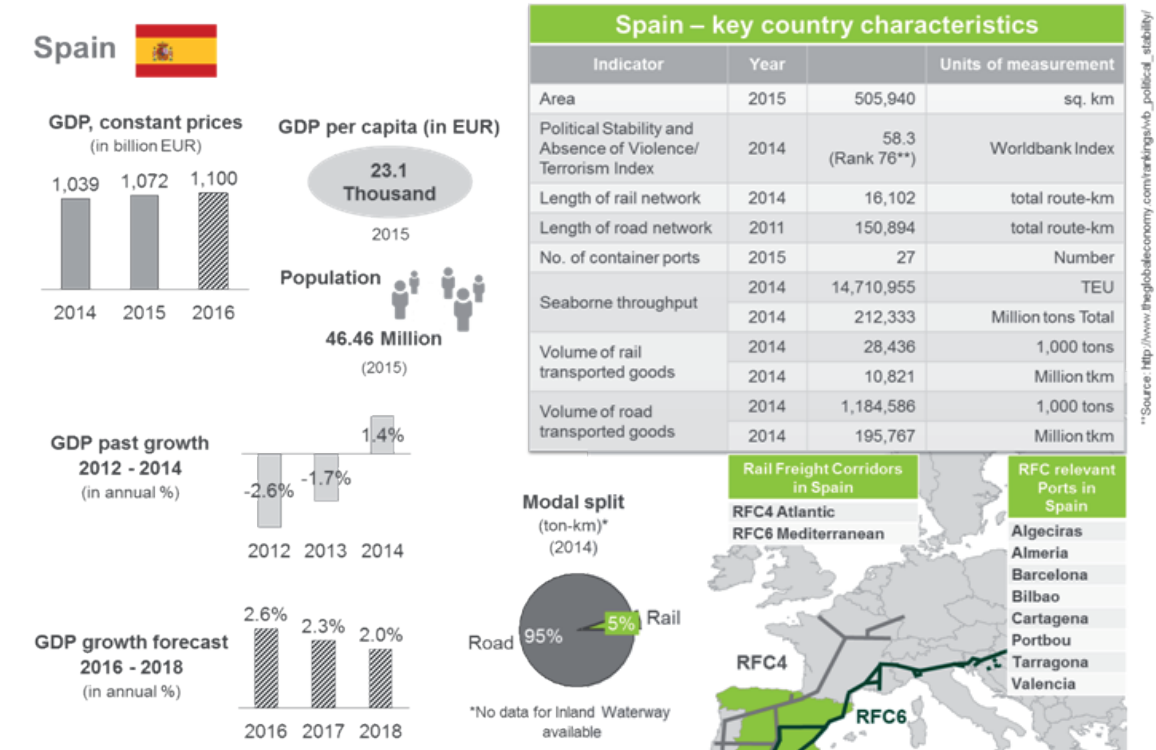
The port sample was chosen based on the following selection criteria:

- Relevance of port in terms of size (container throughput volume in TEU): only ports with an annual throughput of more than 100,000 TEU in 2015 or 2014 are considered
- Seaports which are part of one of the European Rail Freight Corridors are included[9]
- Seaports relevant for rail/CT are included, i.e. ports which are mainly pure transhipment hubs (rail share practically zero or no rail connection at all) are not taken into account[10].

The market (and port) study presented includes a detailed analysis for each port and the eight countries, in which they are located in. For this purpose, for each of the ports and countries, a specific profile with a selection of key characteristics („at a glance") has been created. The country profiles can be found on the following pages, whereas the port profiles are located in the annex. Owing to a lack of data availability, not all criteria may be displayed for each port and country similarly.

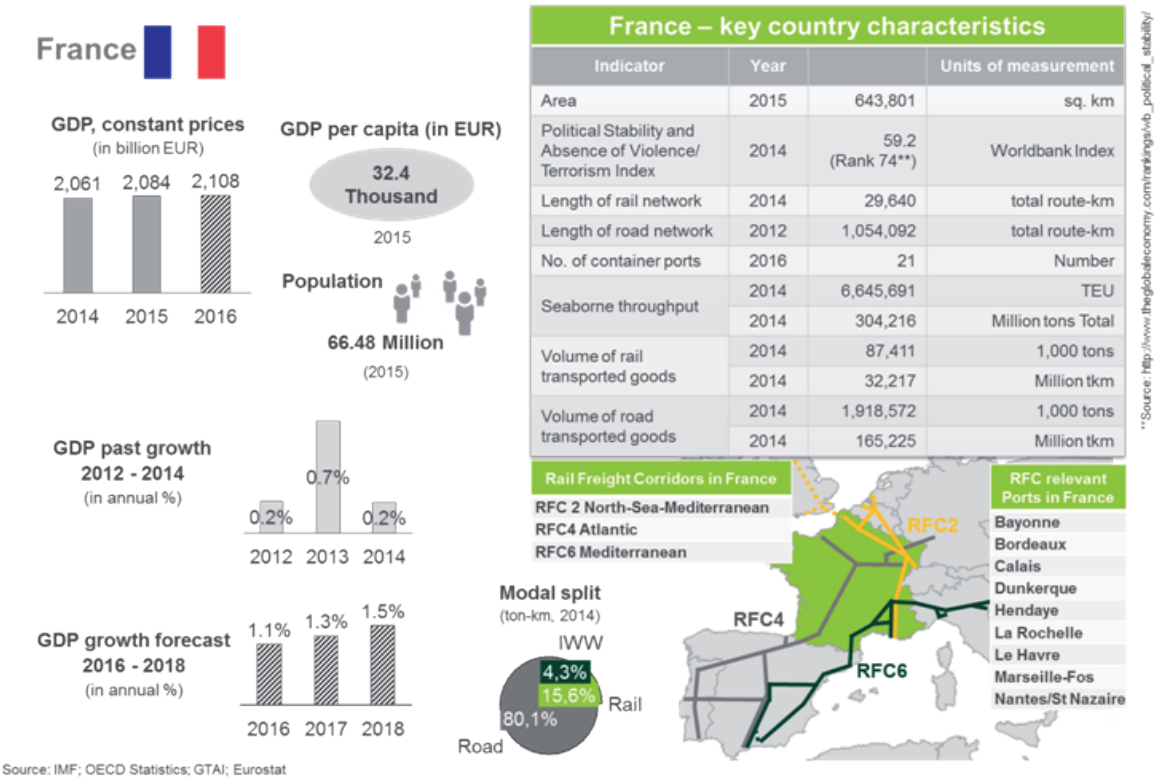
9. Unless smaller than defined in first criteria "Relevance of port in terms of size". Thus, the ports of Cartagena and Palermo, for example. are not taken into account. Civitavecchia (Rome), however, is included due to its relevance for RoRo traffic.
10. E.g. Gioia Tauro. Nevertheless, transhipment hubs with RFC connection (e.g. Algeciras, Piraeus/Athens) are included.

Figure 24: Country profile - Spain



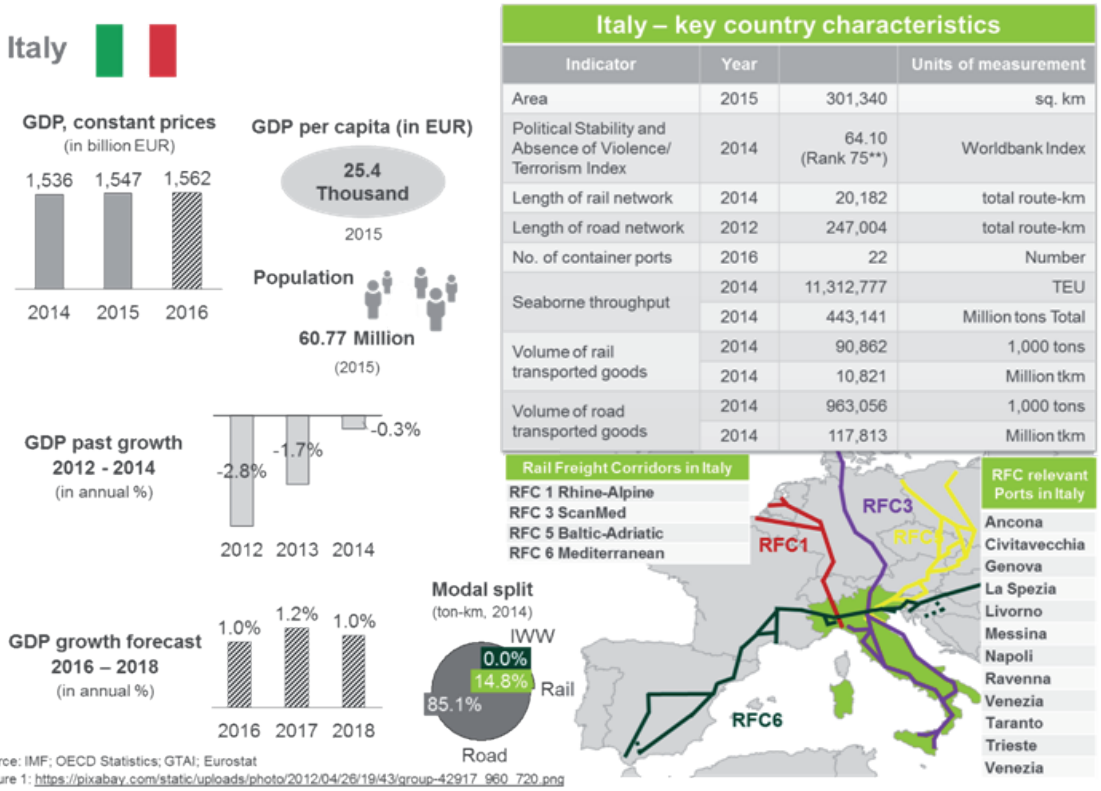
Source: IMF; OECD Statistics; GTAI; Eurostat
Picture 1: https://pixabay.com/static/uploads/photo/2012/04/26/19/43/group-42917_960_720.png
Picture 2: https://upload.wikimedia.org/wikipedia/commons/9/9a/Flag_of_Spain.svg

Figure 25: Country profile - France



Source: IMF; OECD Statistics; GTAI; Eurostat
Picture 1: https://pixabay.com/static/uploads/photo/2012/04/26/19/43/group-42917_960_720.png
Picture 2: https://upload.wikimedia.org/wikipedia/commons/thumb/c/c3/Flag_of_France.svg/1280px-Flag_of_France.svg.png

Figure 26: Country profile - Italy



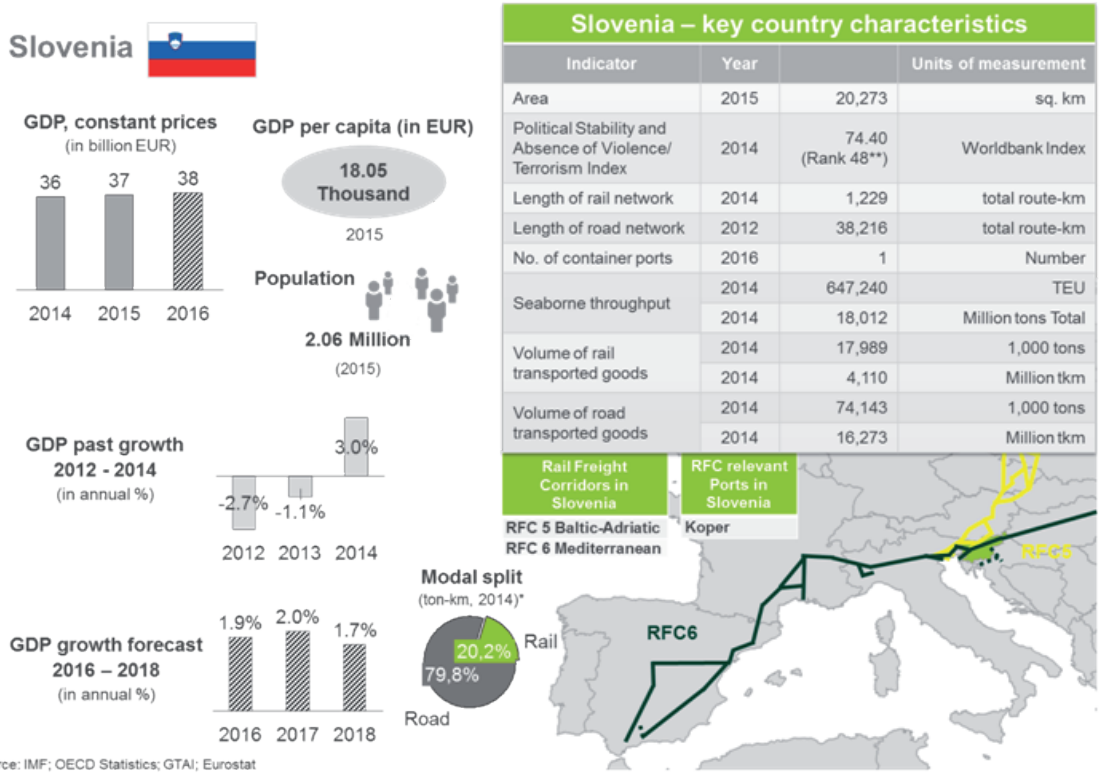
Italy – key country characteristics

Indicator	Year		Units of measurement
Area	2015	301,340	sq. km
Political Stability and Absence of Violence/ Terrorism Index	2014	64.10 (Rank 75**)	Worldbank Index
Length of rail network	2014	20,182	total route-km
Length of road network	2012	247,004	total route-km
No. of container ports	2016	22	Number
Seaborne throughput	2014	11,312,777	TEU
	2014	443,141	Million tons Total
Volume of rail transported goods	2014	90,862	1,000 tons
	2014	10,821	Million tkm
Volume of road transported goods	2014	963,056	1,000 tons
	2014	117,813	Million tkm

**Source: http://www.theglobaleconomy.com/rankings/wb_political_stability/

Source: IMF; OECD Statistics; GTAI; Eurostat
Picture 1: https://pixabay.com/static/uploads/photo/2012/04/26/19/43/group-42917_960_720.png
Picture 2: https://upload.wikimedia.org/wikipedia/commons/thumb/0/03/Flag_of_Italy.svg/1280px-Flag_of_Italy.svg.png

Figure 27: Country profile - Slovenia



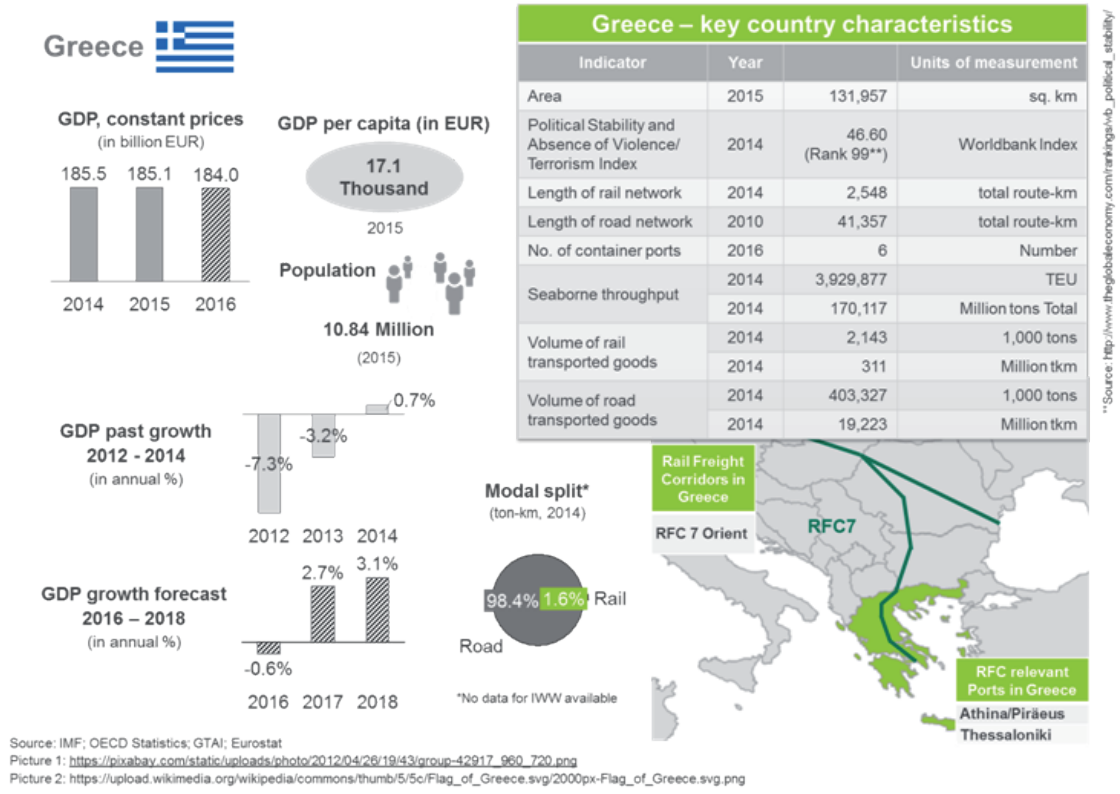
Slovenia – key country characteristics

Indicator	Year		Units of measurement
Area	2015	20,273	sq. km
Political Stability and Absence of Violence/ Terrorism Index	2014	74.40 (Rank 48**)	Worldbank Index
Length of rail network	2014	1,229	total route-km
Length of road network	2012	38,216	total route-km
No. of container ports	2016	1	Number
Seaborne throughput	2014	647,240	TEU
	2014	18,012	Million tons Total
Volume of rail transported goods	2014	17,989	1,000 tons
	2014	4,110	Million tkm
Volume of road transported goods	2014	74,143	1,000 tons
	2014	16,273	Million tkm

**Source: http://www.theglobaleconomy.com/rankings/wb_political_stability/

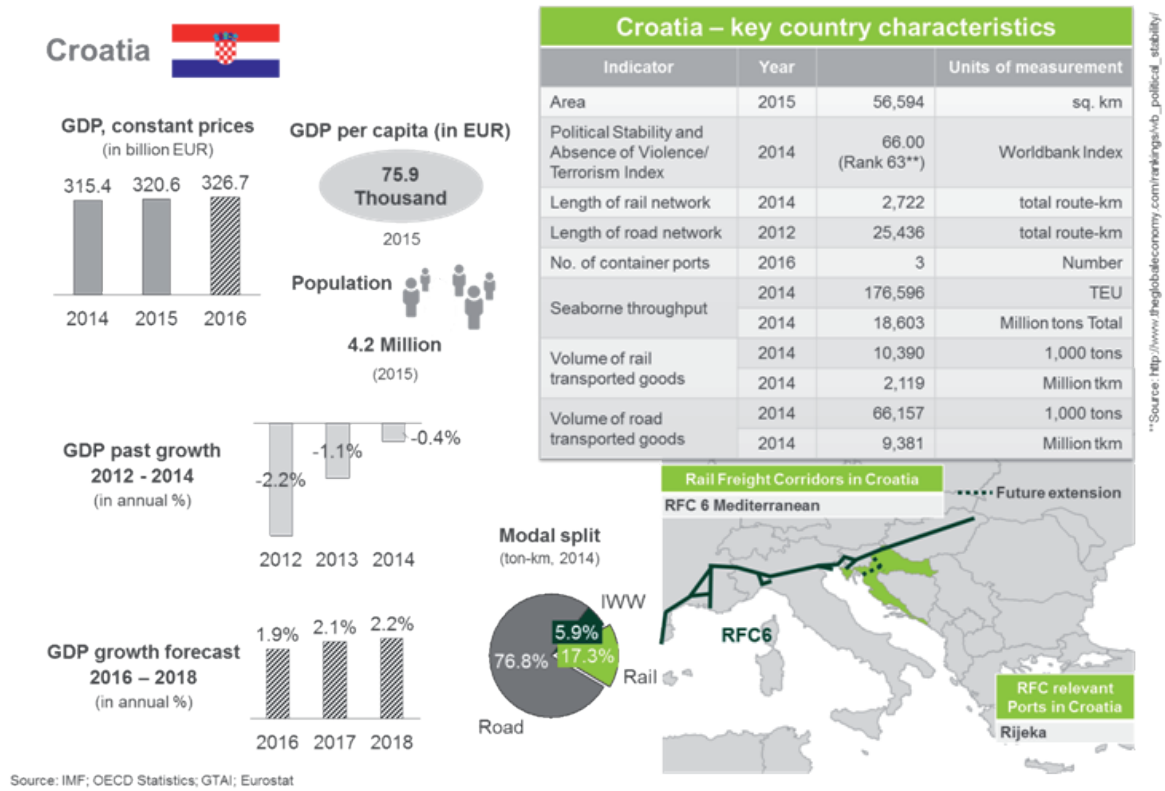
Source: IMF; OECD Statistics; GTAI; Eurostat
Picture 1: https://pixabay.com/static/uploads/photo/2012/04/26/19/43/group-42917_960_720.png
Picture 2: https://upload.wikimedia.org/wikipedia/commons/thumb/0/03/Flag_of_Italy.svg/1280px-Flag_of_Italy.svg.png *No data for IWW available

Figure 28: Country profile - Greece



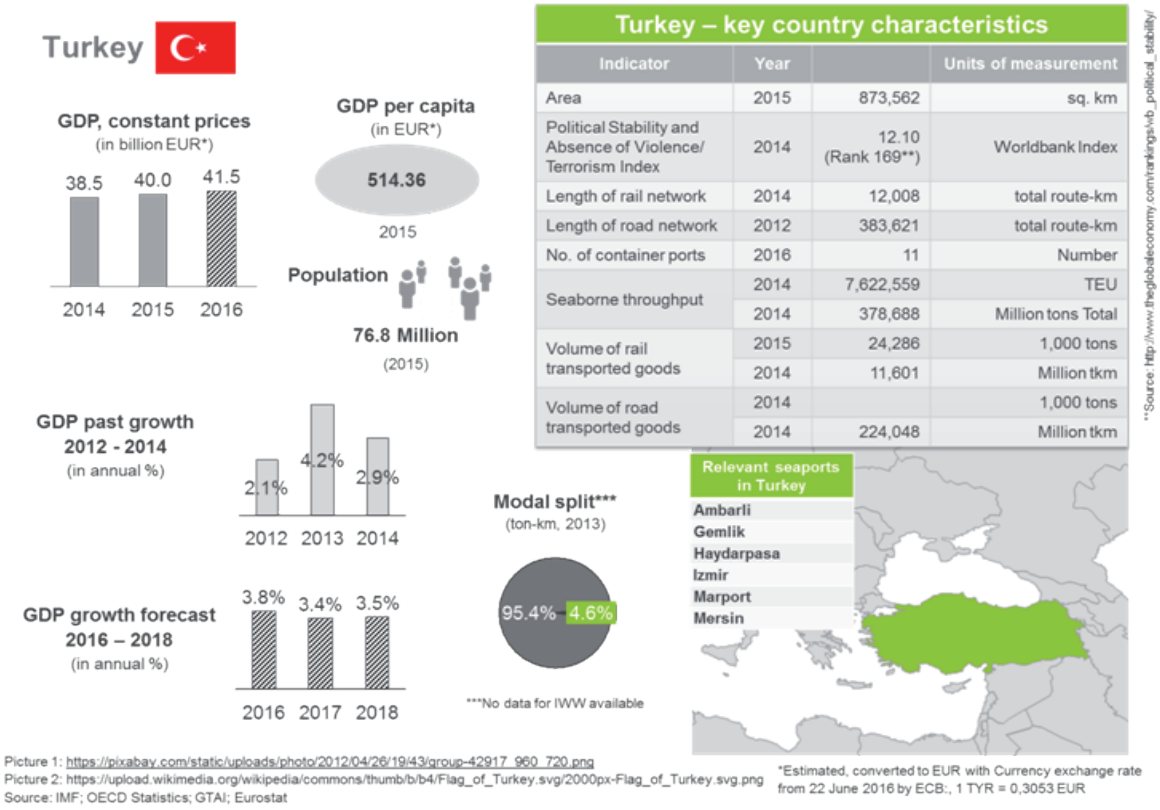
Source: IMF; OECD Statistics; GTAI; Eurostat
Picture 1: https://pixabay.com/static/uploads/photo/2012/04/26/19/43/group-42917_960_720.png
Picture 2: https://upload.wikimedia.org/wikipedia/commons/thumb/5/5c/Flag_of_Greece.svg/2000px-Flag_of_Greece.svg.png

Figure 29: Country profile - Croatia



Source: IMF; OECD Statistics; GTAI; Eurostat
Picture 1: https://pixabay.com/static/uploads/photo/2012/04/26/19/43/group-42917_960_720.png
Picture 2: https://upload.wikimedia.org/wikipedia/commons/thumb/1/1b/Flag_of_Croatia.svg/2000px-Flag_of_Croatia.svg.png

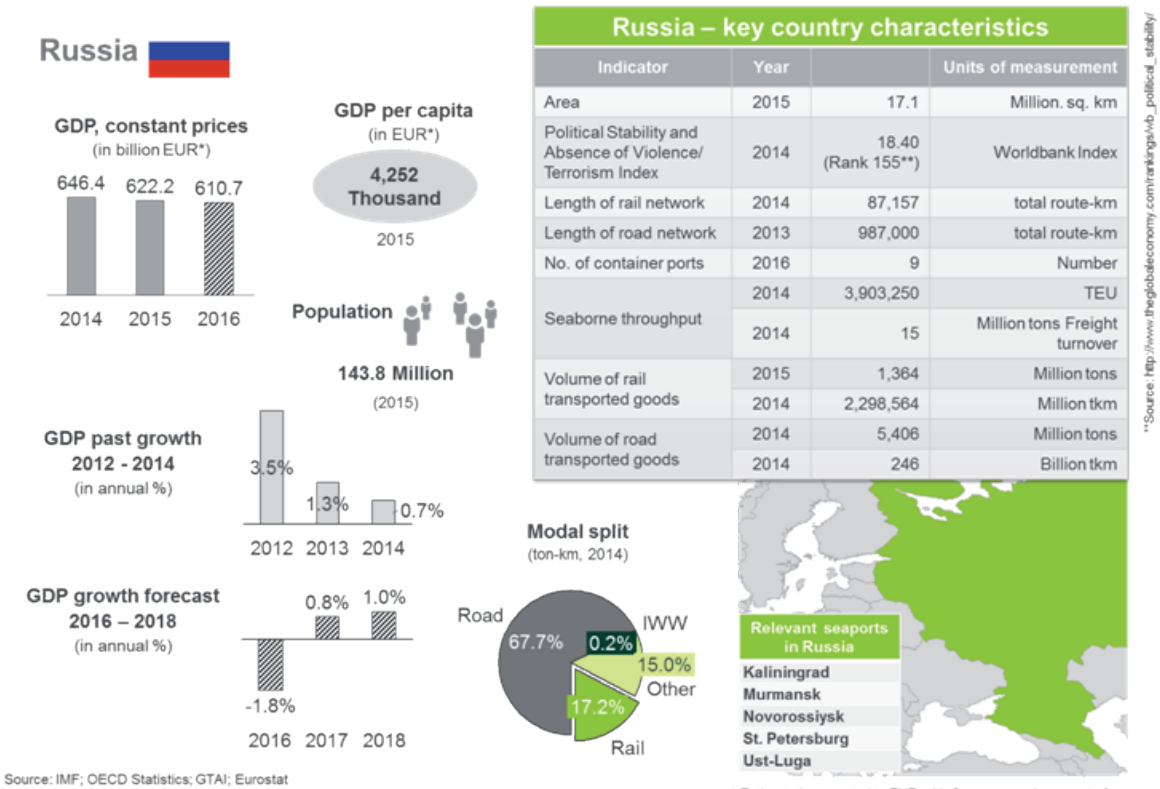
Figure 30: Country profile - Turkey



Picture 1: https://pixabay.com/static/uploads/photo/2012/04/26/19/43/group-42917_960_720.png
Picture 2: https://upload.wikimedia.org/wikipedia/commons/thumb/b/b4/Flag_of_Turkey.svg/2000px-Flag_of_Turkey.svg.png
Source: IMF; OECD Statistics; GTAI; Eurostat

*Estimated, converted to EUR with Currency exchange rate from 22 June 2016 by ECB:, 1 TYR = 0,3053 EUR

Figure 31: Country profile - Russia

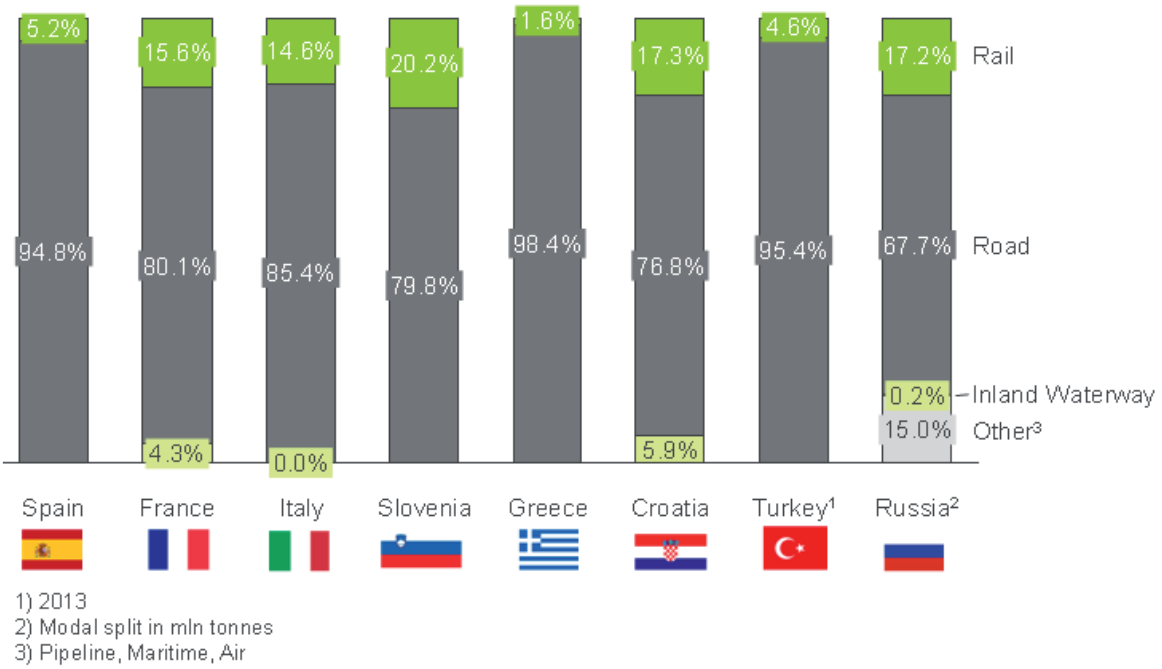


Source: IMF; OECD Statistics; GTAI; Eurostat
Picture 1: https://pixabay.com/static/uploads/photo/2012/04/26/19/43/group-42917_960_720.png
Picture 2: https://upload.wikimedia.org/wikipedia/commons/f/f3/Flag_of_Russia.svg

* Estimated, converted to EUR with Currency exchange rate from 23.06.2016 by ECB:, 1 RUB = 0,01384 EUR

Based on the presented study an overview of key country characteristics, such as the modal split of freight transport and economic development, is provided. Figure 32 shows that the modal split of freight transport (measured in tonne-km) differs significantly among the countries under study, with a rail share ranging from 1.6% up to 20,2%.

Figure 32: Modal split of freight transport (in tonnes) in the countries under study [2014]



Source: BSL Transportation analysis, Eurostat; http://www.gks.ru; Briefing_EU-Transport_Turkey.pdf.
Note: Rounding differences may occur.

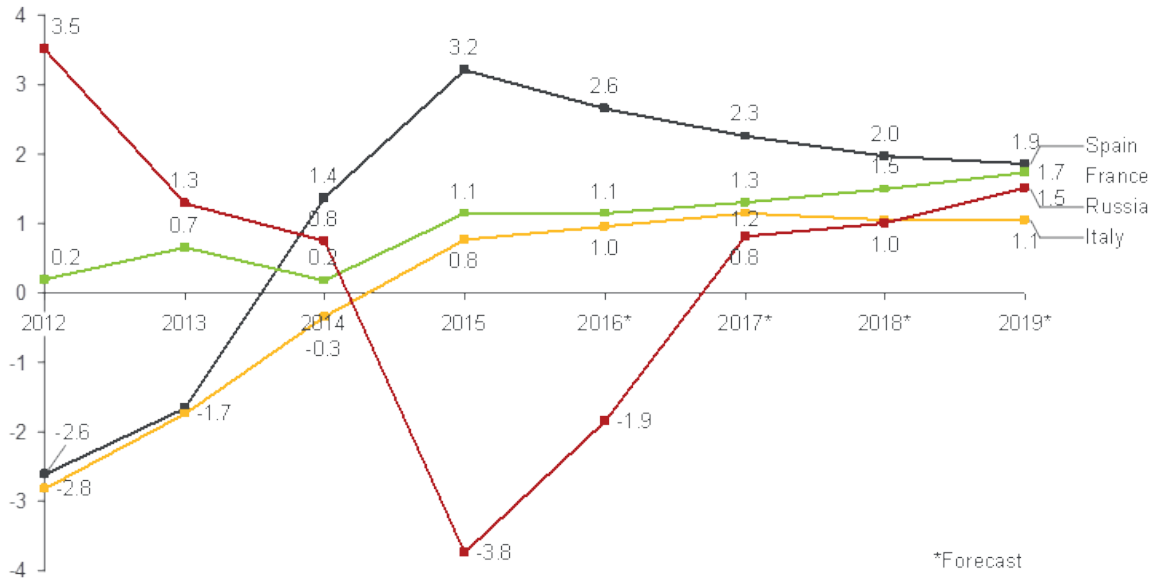
For developing the rail sector and the infrastructure network of the Western and Eastern European countries the implementation of Rail Freight Corridors certainly is a key issue.

In Turkey, a major programme of infrastructure construction and railway renewal was issued in 2010 that aims to modernise and expand the rail network to 26,000 km by 2023. Currently, the quality of railroad infrastructure in Turkey according to the Global Competitiveness Index 2015-16 of the World Economic Forum, is ranked 53 of 140 countries worldwide. In addition the liberalisation of the Turkish railway market has started in order to generate a competitive and transparent market environment by opening market access.

In Russia, the competitiveness of railroad infrastructure is higher (rank 24) than its quality of road infrastructure (only rank 123 of 140 economies). Nevertheless, in particular the existing broad gauge in Russia complicates international combined transport. Apart from further investments in Russian transport infrastructure (a transport strategy 2030 was issued already back in 2008) and the removal of administrative barriers, in particular for customs clearance at borders, the connectivity of transport modes has to be improved in order to foster intermodality.

For transport market development, and thus also for rail freight and CT, GDP development is of particular interest as it reflects the general economic situation of the country and the trade environment. The following figures show the past GDP development and a forecast for 2016-2019, based on IMF data.

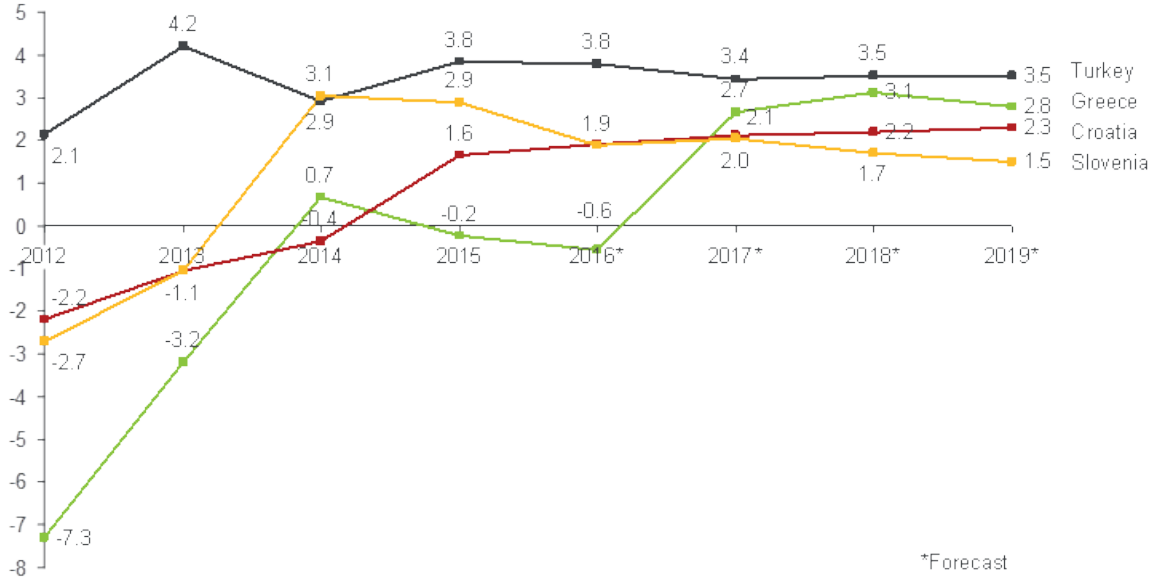
Figure 33: Past and future GDP Development per year (2012 – 2019) in Western Mediterranean countries and Russia



Source: BSL Transportation analysis, IMF World Economic Outlook.

Spain and Italy have recovered from the negative growth they experienced before 2014/2015 and positive economic development is expected for the upcoming years. The Russian economy was negatively affected by the Ukrainian Crisis and the related trade embargo as well as by reduced oil revenues, a devaluated rouble and a high inflation rate. Thus the Russian economy is not expected to return to the growth path before 2017. As the trade sanctions persist, recovery might even take longer than estimated.

Figure 34: Past and future GDP Development per year (2012 – 2019) in Eastern Mediterranean countries



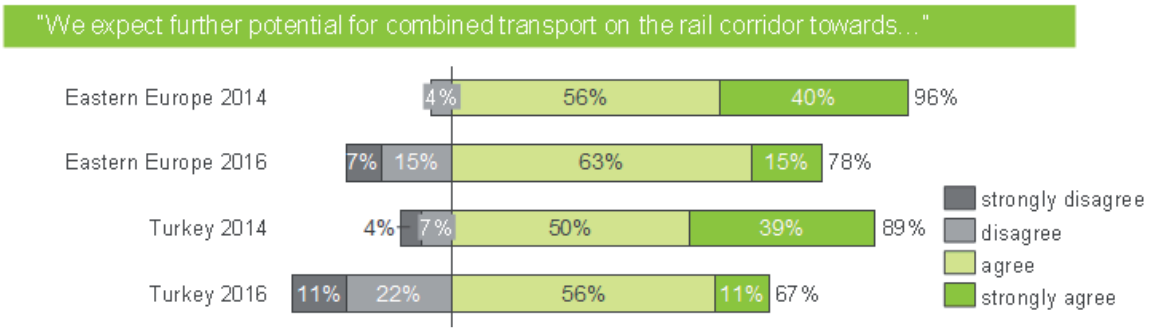
Source: BSL Transportation analysis, IMF World Economic Outlook.

Similar to Spain and Italy, economic recovery is expected for the Eastern Mediterranean countries Croatia and Slovenia with positive growth figures from 2015 on. In Greece the expected economic situation will remain difficult at least until 2017. In view of recent political and economic developments it is questionable, if the recent boom of the Turkish economy may persist and achieve the high growth rates predicted. Due to decreasing exports and private consumer spending GDP development in Turkey was negative in the 3rd quarter 2016 for the first time since many years.

As stated above, particularly Mediterranean seaports connected to one of the Rail Freight Corridors recently could benefit from rising rail volumes. While Turkish ports experienced a rise in container throughput volumes along with the countries' economic boom in the past and in connection with large container port investment projects with several new terminals built, some of the major ports lost cargo in 2015. As the Turkish lira is currently under pressure and there is political uncertainty, this will most probably have a negative effect on future seaport and hinterland traffic – and thus also on CT. Russian ports also witnessed a decline in container handling volumes recently due to the difficult economic situation and the decline in Russian trade and international transport volumes.

Todays market expectations regarding the development of CT towards Eastern Europe and Turley are considerably more restrained than two years ago.

Figure 35: Assessment of market potential for combined transport in Eastern Europe and Turkey 2014 vs. 2016



Source: BSL Transportation analysis.

5. Combined transport market assessment and outlook

The expected average growth rate for 2014 and 2015 was approx. +4% p.a.. These forecasts were based on the statements of CT providers who had participated in the 2014 survey. Based on TEU the prognoses was too optimistic for the entire European CT-market, while the development of tonne-volume widely meets the expectations (see Table 9).

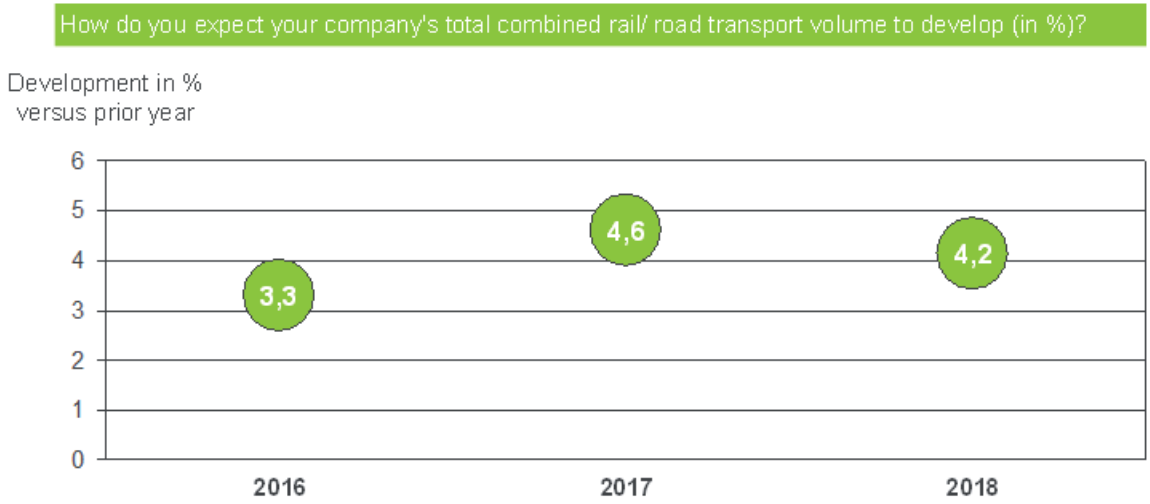
Table 9: Expected and real market development in combined transport 2013 to 2015[11]

Market development	2015 to 2013	
	TEU-based	Tonne-based
Forecast of stakeholders	+ 8.1% p.a.	
Actual figures	+ 1.1%	+ 8.0%

Source: BSL Transportation analysis.

Anyhow, the development differs between CT operators and countries. The outlook for the current and the upcoming years, given by the market participants in 2016 is still very optimistic (see Figure 36). In order to determine the average growth expectations for the market, the company-specific expectations were weighted with the individual CT volumes.

Figure 36: Average expected volume growth of the total combined transport market for the next years



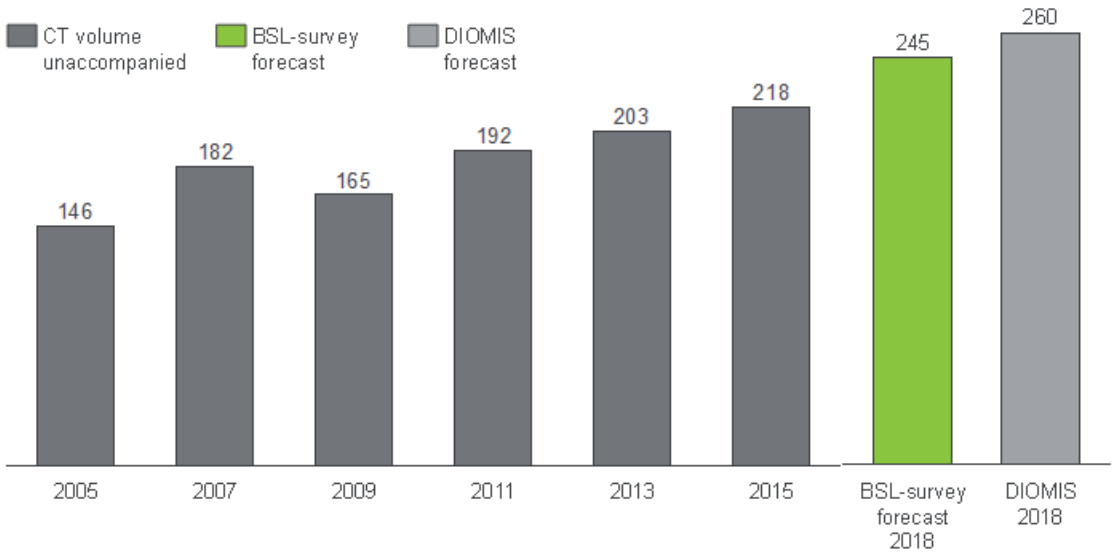
Source: BSL Transportation analysis.

Companies' individual forecasts of expected growth rates are completely different. They range from -20% to more than 100% p.a.

The overall DIOMIS forecast for the years 2018, which focuses on unaccompanied combined transport based on gross tonnes, seems to be a bit too optimistic. Based on the expected growth rates of the survey participants the volume of European CT transport will be about 245 m tonnes in 2018 (see Figure 37).

11. The 2013 volumes relate to the total CT market (incl. accompanied CT with a market share below 5%).

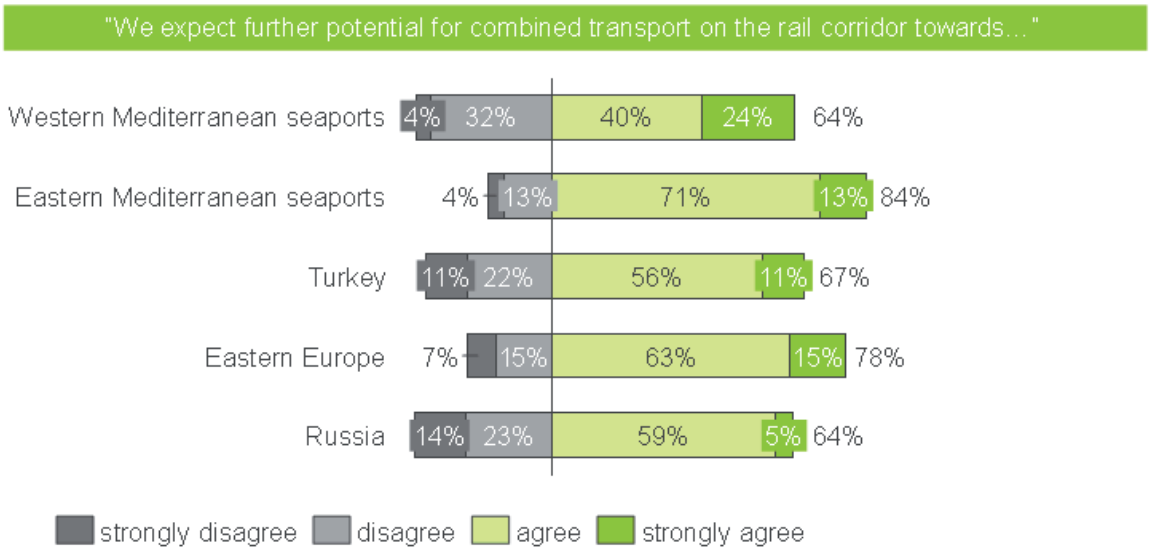
Figure 37: Past development (2005 to 2015) and forecast of total unaccompanied CT volumes [in million tonnes]



Source: DIOMIS, BSL Transportation analysis.

Regarding the geographical focus of future CT growth the survey participants expect further market potential particularly on the rail corridor towards Eastern Mediterranean Seaports and Eastern Europe. For the Western Mediterranean seaports slightly lower growth perspectives are anticipated, which may probably result from a certain market saturation perceived in this geographical region. Although the future potential for CT attributed to Turkey and Russia are still predominantly positive, the assessment of survey participants is more controversial than for the other regions due to the current political situation.

Figure 38: Expected further geographical market potential for combined transport



Source: BSL Transportation analysis.

In spite of several challenges for the future CT-market like:

- use of trucks above 40 tonnes in weight and 18.75 metres in length,
- general cost pressure,
- rail network as well as terminal capacity restrictions, and
- political and/ or economic uncertainty

market stakeholders' outlook is quite positive – for both development towards Eastern Europe/ Eastern Mediterranean seaports and the overall Combined Transport in Europe.

6. Annexes

Table A1: Seaborne container throughput at major European container seaports 2005-2015 [in TEU]

	Port / Country		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1	Aarhus	DK	803.000	856.000	921.000	841.000	683.000	446.328	431.359	404.287	405.837	424.050	444.821
2	Algeciras	ES	3.179.300	3.256.614	3.420.533	3.327.616	3.042.759	2.806.884	3.602.631	4.070.791	4.342.998	4.556.465	4.515.768
3	Alicante	ES	159.237	172.729	179.259	150.827	132.059	147.308	154.257	158.274	148.135	139.273	
4	Ambarli	TR	1.186.051	1.446.269	1.940.000	2.262.000	1.836.000	2.540.000	2.686.000	3.097.000	3.378.000	3.380.000	
5	Amsterdam	NL	65.844	305.995	386.236	436.074	203.084	60.043	48.515	68.933	65.088	57.399	51.634
6	Ancona	IT	64.209	76.458	87.193	119.104	105.503	110.395	120.674	142.213	152.394	164.882	178.476
7	Antwerp	NL	6.482.029	7.018.799	8.176.614	8.663.736	7.309.639	8.468.475	8.664.234	8.635.169	8.578.269	8.977.738	9.653.511
8	Baleares	ES	155.582		194.277	176.186	127.935	78.425	67.210	57.875	61.559	69.772	89.630
9	Barcelona	ES	2.071.480	2.318.239	2.610.099	2.570.000	1.800.213	1.945.733	2.034.693	1.758.647	1.720.383	1.893.836	1.965.240
10	Bilbao	ES	503.817	523.114	554.557	557.345	443.464	531.457	572.784	610.132	606.827	630.888	627.302
11	Bordeaux	FR	50.763	50.112	65.749	55.397	80.018	54.600	60.511	63.285	56.383	56.065	62.718
12	Bremerhaven	DE	3.743.969	4.444.389	4.892.087	5.448.189	4.578.642	4.888.655	5.915.487	6.115.211	5.830.711	5.795.624	5.546.657
13	Cádiz	ES	139.534	157.734	145.229	126.408	106.399	109.187	92.217	96.215	92.332	85.462	67.311
14	Cagliari	IT	639.049	687.657	547.336	307.527	736.984	629.340	613.933	627.609	702.143	717.016	747.693
15	Cartagena	ES	38.089	39.594	47.036	46.755	58.680	64.489	72.320	66.438	80.955	88.784	92.052
16	Castellón	ES	43.773	71.660	101.929	88.208	67.075	103.956	130.963	160.934	193.969	206.551	214.663
17	Civitavecchia	IT		33.538	31.143	25.213	28.338	41.536	38.165	50.965	54.019	64.386	66.731
18	Constantza	RO	768.099	1.037.066	1.411.387	1.380.935	595.303	556.694	662.796	684.059	661.124	668.349	689.012
19	Dublin	IE	590.367	680.680	743.937	676.870	548.123	554.054	525.741	527.984	517.086	565.703	614.226
20	Dunkerque	FR	204.562	204.835	197.811	214.487	212.424	200.858	273.055	260.278	292.000	312.000	316.000
21	Felixstowe	UK	2.760.000	3.080.000	3.300.000	3.132.000	3.020.942	3.415.134	3.400.000	3.700.000	3.700.000	4.072.192	4.042.989
22	Frederica	DK	12.370	19.523	25.174	33.542	36.560	26.181	63.195	70.774	67.869		77.350
23	Gdansk	PL	70.014	78.364	96.873	185.661	240.623	511.876	685.643	928.905	1.177.623	1.212.054	1.091.202
24	Gdynia	PL	400.165	461.170	614.373	610.767	378.340	485.255	616.441	676.349	729.607	849.123	684.796
25	Genova	IT	1.624.964	1.657.113	1.855.026	1.766.605	1.533.627	1.758.858	1.847.102	2.064.806	1.988.013	2.172.944	2.242.902
26	Ghent	BE	3.213	2.743	2.570	61.380	63.657	83.065	80.093	88.159	70.228	36.800	20.195
27	Gijón	ES	5.048	7.740	13.849	26.095	27.465	41.943	35.860	48.607	62.546	53.547	61.006
28	Gioia Tauro	IT	3.208.859	2.938.176	3.445.337	3.467.824	2.857.440	2.851.261	2.338.000	2.721.104	3.087.395	2.969.802	2.546.805
29	Göteborg	SE	787.705	820.394	840.550	863.000	817.615	879.611	886.782	899.628	858.497	836.631	820.000
30	Hamburg	DE	8.087.545	8.861.804	9.889.792	9.737.110	7.007.704	7.895.736	9.014.165	8.863.896	9.257.358	9.728.666	8.821.481
31	Haydarpasa	TR	340.629	400.067	396.637	360.000	187.365	176.468	210.000			127.791	121.641
32	Helsingborg	SE	169.000	200.000	226.733		260.000		350.000			204.476	197.412
33	Helsinki	FI	460.000	417.000	431.000	428.000	357.000	392.000	393.000	405.000	406.246	400.513	430.131
34	Hull	UK	251.684	267.166	303.153	262.000	181.957	202.119	233.009	239.641	254.605	226.869	238.883
35	Izmir	TR	784.377	847.926	892.217	895.000	826.645	726.675	672.486	705.097	697.020	680.975	656.410
36	Kaliningrad	RU										325.189	179.378
37	Klaipeda	LT	214.307	231.548	321.432	373.263	247.977	295.221	382.185	381.278	402.211	450.428	392.674
38	København/Malmö	SE	155.000	175.000	192.000	194.000	151.000	153.000	153.000	148.000	141.000	149.000	164.000
39	Koper	SI	179.745	218.970	305.648	353.880	343.165	476.731	589.314	570.744	600.441	674.033	790.736
40	Kotka/Hamina	FI	542.027	628.857	766.292	627.149	345.939	512.676	609.823	631.042	626.924	574.982	555.377
41	Las Palmas	ES	1.303.356	1.438.409	1.449.928	1.429.457	1.073.033	1.187.109	1.349.968	1.253.216	1.055.752	1.009.284	
42	La Spezia	IT	1.024.455	1.136.664	1.187.040	1.246.139	1.046.063	1.285.155	1.307.274	1.247.218	1.300.432	1.303.000	1.330.000
43	Le Havre	FR	2.118.509	2.137.828	2.638.000	2.488.654	2.240.714	2.358.077	2.215.262	2.303.750	2.485.660	2.550.199	2.559.410
44	Leixões	PT	352.002	378.387	433.437	450.026	454.503	483.319	514.088	632.673	626.193	666.689	624.008
45	Lemesos	CY	320.369	360.010	376.662	413.756	356.681	348.667	344.992	307.396	277.215	307.660	
46	Lisboa	PT	513.061	512.501	554.774	556.062	500.769	512.789	541.906	485.761	549.302	502.186	
47	Liverpool	UK	613.111	613.442	675.678	672.000	588.000	662.000	664.000	635.000	623.000	665.795	680.451
48	Livorno	IT	658.506	657.592	745.557	778.864	592.050	628.489	637.798	549.047	559.180	577.471	780.874
49	London/Tilbury	UK	735.170	742.679	843.808	1.166.814	845.720	496.409	890.755	920.137	929.031		
50	Lübeck	DE	170.000	234.000	205.338		167.459	157.176	140.894	141.356	132.739	147.248	143.788
51	Malaga	ES	247.548	464.838	542.405	428.623	289.871	298.401	476.997	336.265	296.350	87.989	43.281
52	Marport	TR		720.603	798.059	1.252.939	1.159.249	1.663.551	1.548.480	1.583.887	1.705.962	1.757.901	1.585.450
53	Marsaxlokk	MT	1.321.000	1.485.000	1.900.000	2.330.000	2.260.000	2.370.729	2.360.000	2.540.000	2.750.000	2.869.131	3.064.005
54	Marseille-Fos	FR	905.687	941.398	1.002.879	851.000	878.000	953.435	944.047	1.061.000	1.099.000	1.179.910	1.223.071
55	Mersin	TR	596.289	643.749	782.028	844.632	843.917	1.030.391	1.113.850	1.260.000	1.380.000	1.490.000	1.470.000
56	Nantes St-Nazaire	FR	132.054	132.913	147.127	149.281	145.662	166.266	178.185	184.838	183.029	177.811	184.799
57	Napoli	IT	373.706	444.982	460.812	481.521	515.868	532.432	526.768	546.818	477.020	431.682	438.280
58	Novorossiysk	RU	161.800	226.570	261.000	381.300	234.800	471.400	598.000			639.700	476.000
59	Odessa	UA	288.349	396.433	523.610	572.142	255.461	351.600	453.700	463.090	504.083	414.535	372.297
60	Oslo	NO	170.506	172.065	196.252	190.308	178.944	201.892	208.799	202.790	202.497	212.579	195.460
61	Piräus	GR	1.394.512	1.403.408	1.373.138	433.582	664.895	680.000	1.118.000	2.108.000	3.163.000	3.600.000	3.287.000
62	Rauma	FI	120.234	168.952	174.531	172.155	143.269	164.904	223.005	238.953	258.810	277.935	262.567
63	Ravenna	IT	168.588	162.052	206.786	214.324	185.022	183.041	215.336	208.152	226.879	222.548	244.813
64	Riga	LV	168.978	176.826	211.840	207.122	182.980	254.475	302.973	362.297	381.099	387.603	355.241
65	Rijeka	HR	76.258	94.390	145.040	168.761	130.740	137.048	150.677	129.680	131.310	192.004	161.883
66	Rotterdam	NL	9.288.399	9.653.232	10.790.604	10.783.825	9.743.290	11.145.804	11.876.921	11.865.916	11.621.249	12.297.570	12.234.535
67	Rouen	FR	161.387	165.179	158.572	142.036	121.940	129.585	130.598	127.527	102.122	96.985	111.731
68	Salerno	IT	418.205	359.707	385.306	330.373	269.300	234.809	235.209	208.591	263.405	320.044	359.328
69	Santa Cruz de Tenerife	ES	446.314		475.635	397.788	346.254	357.472	348.965	322.100	309.611	325.708	345.457
70	Savona	IT	219.876	227.197	242.720	252.837	196.317	196.434	170.427	75.282	77.859	90.823	98.033

Table A1: Seaborne container throughput at major European container seaports 2005-2015 [in TEU]

	Port / Country		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
71	Setúbal	PT	12.932	15.744	12.425	19.952	25.506	47.551	77.127	49.350	70.564	103.563	121.179
72	Sevilla	ES	115.669	122.611	135.040	130.452	129.736	152.612	164.642	156.193	140.404	161.595	161.671
73	Sines	PT	50.994	121.957	150.038	233.118	253.495	382.089	447.495	553.063	931.037	1.227.694	1.332.200
74	Southampton	UK	1.375.000	1.500.306	1.900.000	1.710.000	1.355.000	1.540.000	1.563.040	1.475.510	1.488.253	1.895.303	1.954.060
75	St. Petersburg	RU	722.427	888.827	959.032	1.072.346	938.931	1.159.989	2.365.174	2.524.680	2.514.440	2.374.876	1.715.139
76	Szczecin/Sw.	PL	36.453	42.424	56.321	62.913	52.809	56.503	55.098	52.163		78.439	87.784
77	Tallinn	EE	127.585	152.399	180.911	180.927	131.059	151.969	197.717	227.809	253.627	260.293	208.784
78	Tanger	MA			600.000	920.708	1.222.000	2.058.430	2.093.408	1.826.313	2.558.423	3.077.750	2.964.324
79	Taranto	IT	716.856	892.303	755.934	786.655	741.428	581.936	604.404	263.461	197.317	148.519	716.856
80	Tarragona	ES	8.980	12.203	47.136	47.419	221.203	255.407	225.747	188.851	147.246	148.636	89.852
81	Teesport	UK				368.829	344.289	394.062	405.806	378.313	374.892	420.000	
82	Thamesport	UK				773.000	422.884	439.766	361.255	350.000			
83	Thessaloniki	GR	365.925	343.727	447.211	238.940	270.181	273.282	295.870	317.900	322.310	349.513	351.407
84	Trieste	IT	198.319	220.310	265.863	335.943	276.957	281.643	393.195	408.023	458.597	506.019	501.276
85	Ust-Luga	RU										103.521	89.820
86	Valencia	ES	2.409.821	2.612.049	3.042.665	3.602.112	3.653.890	4.206.937	4.327.371	4.469.754	4.327.838	4.441.949	4.615.196
87	Varna	BG	84.000	94.046	99.713	155.362	112.611	118.702	122.844	128.390	131.460	132.668	139.203
88	Venezia	IT	289.860	316.641	329.512	379.072	369.474	393.913	458.363	429.893	446.591	456.068	560.301
89	Vigo	PT	205.497	226.927	244.065	247.873	193.921	213.127	212.120	198.517	208.555	204.163	223.699
90	Wilhelmshaven	DE	-	-	-	-	-	-	-	26.045	76.265	67.076	426.751
91	Zeebrugge	BE	1.407.933	1.653.493	2.020.723	2.209.715	2.328.198	2.499.756	2.206.681	1.953.170	2.026.270	2.046.586	1.568.938

Source: BSL Transportation analysis, various port authorities, ESPO, Drewry, Containerisation International, Eurostat.

Table A2: Seaborne container throughput and rail transport volume of selected European ports 2012-2015 (in TEU)

Seaport / Country		Seaborne container throughput (TEU)				Container carried by rail (TEU)			
		2012	2013	2014	2015	2012	2013	2014	2015
Algeciras	ES	4,070,791	4,342,998	4,556,465	4,515,768	6,661	18,309		
Alicante	ES	158,274	148,135	139,273		0	0		
Ancona	IT	142,213	152,394	164,882	178,476	7,111	7,620	350	0
Antwerp	NL	8,635,169	8,578,269	8,977,738	9,653,511	617,000	416,000	383,349	418,962
Barcelona	ES	1,758,647	1,720,383	1,893,836	1,965,240	148,926	154,522	189,553	213,229
Bilbao	ES	610,132	606,827	630,888	627,302	85,901	103,161		
Bordeaux	FR	63,285	56,383	56,065	62,718			0	0
Bremerhaven	DE	6,115,211	5,830,711	5,795,624	5,546,657	1,042,000	1,049,000	1,101,000	1,078,000
Cádiz	ES	96,215	92,332	85,462	67,311	0	0		
Constantza	RO	684,059	661,124	668,349	689,012	n/a	n/a	n/a	n/a
Felixstowe	UK	3,700,000	3,700,000	4,072,192	4,042,989		830,000	890,000	910,000
Gdansk	PL	928,905	1,177,623	1,212,054	1,091,202	116,813	123,101	128,390	371,213
Gdynia	PL	676,349	729,607	849,123	684,796		162,000		
Genova	IT	2,064,806	1,988,013	2,172,944	2,242,902	284,743	296,035	304,955	305,350
Ghent	BE	88,159	70,228	36,800	20,195	7,053			
Gijón	ES	48,607	62,546	53,547	61,006			0	0
Göteborg	SE	899,628	858,497	836,631	820,000	410,949	393,225		
Hamburg	DE	8,863,896	9,257,358	9,728,666	8,821,481	1,975,000	2,110,000	2,249,865	2,300,289
Helsingborg	SE			204,476	197,412			26,517	21,456
Helsinki	FI	405,000	406,246	400,513	430,131	8,400	7,000	5,800	5,000
Izmir	TR	705,097	697,020	680,975	656,410	104,108	105,203	83,298	86,290
Klaipeda	LT	381,278	402,211	450,428	392,674			57,809	42,068
Koper	SI	570,744	600,441	674,033	790,736		360,265	367,011	430,556
La Spezia	IT	1,247,218	1,300,432	1,303,000	1,330,000	277,000	295,000	322,569	310,809
Le Havre	FR	2,303,750	2,485,660	2,550,199	2,559,410	100,049	82,569	87,734	88,265
Leixões	PT	632,673	626,193	666,689	624,008			10,891	5,426
Livorno	IT	549,047	559,180	577,471	780,874	66,885	69,083	66,497	75,972
London/Tilbury	UK	920,137	929,031					no data published	
Lübeck	DE	141,356	132,739	147,248	143,788			55,130	62,807
Marsaxlokk	MT	2,540,000	2,750,000	2,869,131	3,064,005			0	0
Nantes St-Naza	FR	184,838	183,029	177,811	184,799			0	0
Odessa	UA	463,090	504,083	414,535	372,297	80,536	79,172	67,360	66,158
Oslo	NO	202,790	202,497	212,579	195,460				
Ravenna	IT	208,152	226,879	222,548	244,813	23,375	26,248		
Riga	LV	362,297	381,099	387,603	355,241	n/a	95,275	n/a	63,950
Rotterdam	NL	11,865,916	11,621,249	12,297,570	12,234,535	794,000	790,000	869,493	882,791
Sines	PT	553,063	931,037	1,227,694	1,332,200	134,227	137,340	189,683	208,950
Southampton	UK	1,475,510	1,488,253	1,895,303	1,954,060			no data published	
Tallinn	EE	227,809	253,627	260,293	208,784	48,988	62,812	70,796	40,230
Tanger	MA	1,826,313	2,558,423	3,077,750	2,964,324	3,653	5,117		
Trieste	IT	408,023	458,597	506,019	501,276			92,104	111,415
Varna	BG	128,390	131,460	132,668	139,203			0	0
Venezia	IT	429,893	446,591	456,068	560,301	3,150	3,400		
Vigo	PT	198,517	208,555	204,163	223,699	0	0		
Wilhelmshaven	DE	26,045	76,265	67,076	426,751			6,713	42,602
Zeebrugge	BE	1,953,170	2,026,270	2,046,586	1,568,938	535,855	490,363	472,761	387,528

n/a: not available

Source: BSL Transportation analysis, various port authorities, Portopia, RFC1 progress report, partly estimated.

CT-Technologies

Name of technology and Weblink	Key characteristics of technology	Focus		Year	Advantages (selection)	Disadvantages (selection)	Technology field			Use in practice
		Unac com-p anied	Ac com-panied				Wagon	Terminal	Handling	
ACTS http://www.actsag.ch	The roll-off container transport system ACTS allows fast handling between rail and road transport. The roll-off container is a loadiung unit on wheels with standarized subfloor. For road transport a truck is needed, which enables handling by means of a chain or hook device. Through a swiveling frame with guide rails on the wagon, a simple loading process is possible. This will be swung-out by the truck driver and the ACTS Container can now be pushed, by the truck on the rotating frame on the rail wagon. Afterwards the rotating frame is swivelled back	x		1988	No stationary loading aids (stacker, crane) required, easy to use system that allows the rapid handling of roll-off containers between truck and train. Container in serial production, little space needed (only 10 qm), paved area is sufficient, handling by one person possible	Railway carriage with rotating frame required and trucks with towing device/ mounting fixture for waste containers (e.g. trans-lift chain device or hook device), rather low operating costs but possibly high maintenance effort, if necessary fixed rotating frames on wagons required (new: loadable rotating frame for use as needed.	x		x	yes, regular operation (system particularly in use and proven in the waste/ recycling industry)
BOXmover http://www.boxmover.eu/	The BOXmover side loader is a loading device for trucks (or rail wagon) which works without forklift or ramp system. The loading device can directly be mounted on a trailer chassis (or rail wagon) and is possible to lurn-over any nominated loading unit (as well truck-lines). Through the agile hydraulic system a horizontal unloading of cargo at different high levels is possible - this makes the BOXmover uniwue compared to other side-loaders.	x		2005	No terminal infrastructure required (e.g. no cranes, ramps etc.), rapid turn-over, leasing is possible, mobile use, no connecting rail tracks are required, one-person-use, low own weight, transport and turn-over with one vehicle, maximum in flexibility, low downtimes, independent, at groudn level and flexible turn-over	Hydraulic possibly susceptible high-maintenance, arising setup costs for trucks			x	yes, regular operation
Boxtango http://boxtango.com/en/home/	Park -Truck drives onto BoxStation - Stilts are attached to the container - Chassis is lowered - Truck drives out of the BoxStation, container is stored Take up - Truck drives onto BoxStation - Chassis is lifted underneath the container - Stilts are flapped aside - Truck drives out of the BoxStation and is operational	x		2011	Time and cost savings; No decoupling – chassis and truck can be used for further transports; Compatible with ISO containers and swap bodies; Total weight of container and lift truck up to 40 tons Adaptable to different heights of chassis; Anticipator buffering of containers and swap bodies	trucks need to be upgraded, place spaces needed, only containers up to 40 tonnes	x		x	Regular operation planned
CargoBeamer http://www.cargobeamer.com/	Horizontal loading system from CargoBeamer AG for combined rail transport, makes the fully automatic handling process for all wagons of a train parallel possible. Semi-trailer of any type are fixed on one vat, in which the trailer is rail traffic suitable. The horizontal loading can be automatically. The CargoBeamer-System includes special wagons and the JetModule (kind of vat)-, in which each trailer is filed. At the CargoBeamer terminal is on one track the special setup for shunting of the JetModule installed. Target group: non-craneable semi-trailers, especially designed pocket wagons with gatefolds.	x		1998	No crane for loading required, fast turn-over, loading-process with contact-wire possible (no transformation on diesel traction necessary), ideal for changing tracks due to a reduced turn-over time, to and tractor unit donnot have to be there simultaneously at the terminal, compatible to conventional handling terminals (turn-over with cranes/ Reach stackers also possible), area efficiency of the terminal technic (13m width + traffic lane), no hydraulic system or electricity, normal bogies.	only for unaccompanied combined transport, weight of freight wagons (heavier than normal pocket wagon), technical complexity of the wagons and higher investment costs (approx. twice as expensive as conventional pocket wagons), needed (high) infrastructure investments	x	x		yes, regular operation
CargoRoo http://www.uic.org/cdrom/2001/wcrr2001/pdf/poster/5_4/023.pdf	The CargoRoo trailer system consists of a wagon with two associated offloading vehicles (robotic crawlers), which can be raised by an hydraulic system which lift up to 41t. After the train with the CargoRoo-Wagons is positioned in the terminal with raised side platforms, the vehicles extend and positioned under the (not craneable) semi-trailer, which stands by paralle to the wagon. Afterwards the semi-trailer will be lifted and navigated sidewards on the wagon. This process can be performed simultaneously on all Cargo-Roo wagons.	x		2001	Easy and rapid turn-over, no change of existing terminalinfrastructure required (waiver of ramps)	Complex technology (maintenance of vehicles), qualified personnel required			x	no, only theoretical concept

Table A3: CT-Technologies

Name of technology and Weblink	Key characteristics of technology	Focus		Year	Advantages (selection)	Disadvantages (selection)	Technology field			Use in practice
		Unac com-panied	Ac com-panied				Wagon	Terminal	Handling	
CargoSpeed http://www.zukunft-mobilitaet.net/1278/konzepte/cargospeed-symbiose-aus-roro-lolo/	CargoSpeed (cargo Rail Road Intercharge at Speed) BLG Consult GmbH is an loading-system between rail and road transport on the RoRo-principle. With this solution the train stands between two raised platforms. The loading area of the wagons can be raised by an lifting system which is below ground level, after the train retract in the terminal and the wagon took position between the two raised platforms. The loading area of the wagon will be rotated by 36°C by a lifting struts. Thus, in connection with the driveways a kind of bridge results - where the truck can drive on and the semi-trailer on the rotated wagon can get decoupled and parked. The loading area rotates afterwards in its original position and connected with the wagon frame. In this way, 30 loading operations can be performed simultaneaously.	x		2001	Easy and rapid turn-over, possibility to load the trailers as well with conventional lift-on/lift-off systems, low switching costs from previous systems, interoperability is given - electronic as well as -trains can be handeled, semi-trailers are located on rail level during the rail transport so that the loaded train can be used on nearly all roues.	Increased place requirement, high costs for terminal infrastructure/ high investment needs		x		no, only prototype
Flexiwaggon http://www.flexiwaggon.se/	By the Flexiwaggon-System it is possible by a navigated hydraulic wagon, to load busses and cars on railway wagons withoug a terminal. Through built-in retractable ramps (left and right extendible) the wagons can be loaded and afterwards transported by train. By transporting the entire truck, time and emissons can be reduced (as well suitable for accompanied combined transport), horizontal loading.		x	2000	Specialized terminals or devices/loading ramps are not required. Very flexible designed system, as each wagon can be separated loaded and unloaded, fast turn-over - as well possible on electrified lines, no terminal infrastructure investment are necessary, low capital requirements, loading possible from both sides, low wagon height allows the usage on lines with low gauge and electrified lines.	Technology installed wagon side, complexicty of maintenance, complex technology with hydraulic and electrical components with complex repair/maintenance, so far only individual solutions	x			no, only prototype and use in singular cases
Innovatrain Containermover-3000 http://www.innovatrain.ch/de/containermover/	InnovaTrain's intelligent and rapid ContainerMover-3000® transhipment system is suitable for use in all rail freight or private sidings. The ContainerMover-3000® uses compressed air to lift the boxes so they can be laterally and hydraulically displaced from the wagon adaptor to the truck and vice versa. The whole operation is remote-controlled by the truck driver and takes less than 5 minutes to complete. The twistlocks are remotely locked and released. The system operates on the lift and lateral displacement principle. It is modular and can be easily mounted on a road vehicle chassis. In turn, the wagon has to be fitted with a matching adaptor secured in place by means of the container wagon spigots.			2012	Can be used at any free-platforms or connecting tracks,All that is needed is a 4-metre wide stretch of asphalt to be able to transfer standard swap bodies, usage of different containers possible, no costly investment in infrastructure needed, only drive way of 3 m, remote controlled automatic operation by the driver	Hydraulic possibly susceptible high-maintenance, arising setup costs for trucks			x	yes, regular operation
ISU-System (Innovativer Sattelauflieger-Umschlag) http://www.railcargo.com/de/Produkte_und_Innovationen/ISU/index.jsp	A semi-trailer handling -terminal from Rail Cargo Group, developed as part of an EU research project. The innovative semi-trailer transfer system, known as the ISU system, is a new way of loading semi-trailers that cannot be lifted by cranes on railway pocket wagons. In this system the tractor is not carried on the train. The tractor remains at the termini of the transport chain. The user of the system can thus carry out the delivery and collection with his own equipment. The loading can be performed by truck or a special crane system. First, the semi-trailer drives on the loading platform and is positioned and uncoupled there by wheel gripper. After saving the system, the semi-trailer can be lifted into the wagon pocket. The wheel gripper stay on the wagon and serve as centering and securing. Afterwards the wagon is ready for deaparture (developed by Rail Cargo Austria), the system was developed as part of an EU research project that extended over several years and was managed by Rail Cargo Group and taken into regular service in November 2013.	x		2006	Easy loading technology, cost-effective	Low level of automation, high deployment of personnel, relatively long loading process			x	yes, regular operation

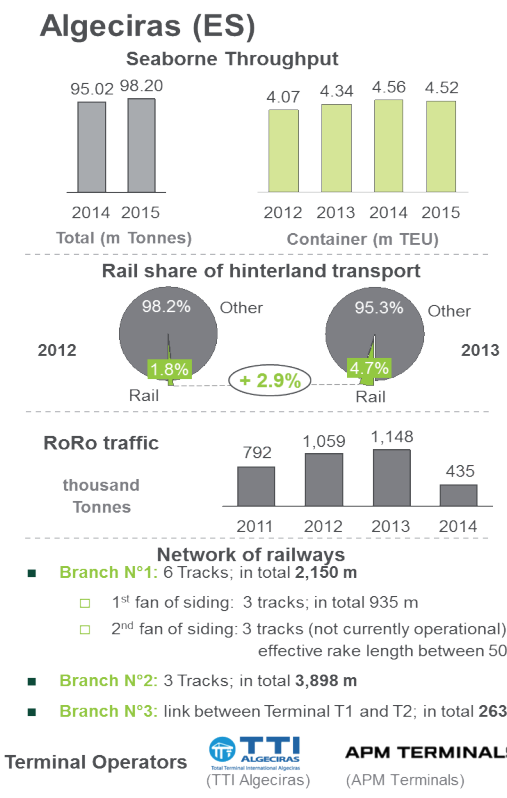
Name of technology and Weblink	Key characteristics of technology	Focus		Year	Advantages (selection)	Disadvantages (selection)	Technology field			Use in practice
		Unac com-panied	Ac com-panied				Wagon	Terminal	Handling	
Megaswing/ Megaswing DUO http://www.kockumsindustrier.se/en-us/our-products/productdetail/?categoryid=3&productid=11	Pocket wagon with swivelling wagon bag (rotatable hydraulic). For loading there is due to the lateral swivelling, no terminal required. The wagon pocket can be swung to both sides and stabilized with hydraulic support, the truck triver then guides the trailer backwards onto the loading area. If the trailer is parked, it will get decoupled and the train can depart (as well as Double-wagon DUO).	x		2010	No terminal required, rapid loading possible, low fix costs and low capital requirements	High acquisition costs (approx. 300.000 EUR, nearly twice as high as conventional pocket wagons), additional operating personnel required, complex hydraulic with complex maintenance.	x			yes, trial operations
Metrocargo http://metrocargoautomazioni.it/index.php/en/	The system allows fully automatic horizontal handling of containers (not suitable for non-craneable semi-trailers), upon entry of the train the containers will be scanned, the loading plattform is functioning automatically, the containers will be lifted on a intermediate platform and then distributed over an arranging platform and from there further distributed. This system requires lifting-columns, shuttles and platforms.	x		2011	Turn-over under contact wire possible, no change at wagons, trucks or containers needed	High costs for terminal equipment		x		no, only prototype
Mobiler (KV-Roller) http://www.railcargo.com/de/Produkte_und_Innovationen/MOBILER/index.jsp	On a truck situated hydraulic loading system. The loading of swao-bodies and ISO-Containers (with adapter) is possible without handling infrastructure and can be performed only by the truck driver (System from Rail Cargo Austria)	x		1995	Bundling the benefits of rail and road transport (mass performance + flexibility) in a system, as well for companies without connecting railways, MOBILER-container-turn-over enables rapid and uncomplicated handling at all times and locations by the truck driver in just a few minutes. Turn-over at all loading tracks with side truck access possible. Particularly suitable for dangerous goods. Container turn-over is independent from a special infrastructure or externally personnel, truck driver alone can un-/upload directly at the loading track. Lower transport journeys by road and the flexible pre- and on-carriage support the formation of round-trips and triangular traffic on railways.	Investment costs, special truck required, lower market penetration			x	
Modalohr http://lohr.fr/lohr-railway-system-2/	Innovative low-floor double carriage wagon (Modalohr concept - wagon "LOHR-UIC") for fast Container turn-over, swap bodies and semi-trailers between road and rail. For special vehicles, which are equipped with a standard bogie, the loading area can be swung out at the track axis. In doing so it is possible for the tractor unit to park the trailer on a low-lying ramp directly on the plateau, afterwards turned back in the longitudinal position. The LOHR-System integrates simple turn-over terminals in varying lengths with ground systems by the possibility of opening wagons from a diagonal angle. Due to technology and the loading of standard semi-trailers, which can only occur horizontal, the LOHR-wagons require special terminals which are equipped with a hydraulic ground system for opening the wagon pockets.	x	x	2003	Easy to use, allows a significant reduction of maintenance costs compared with previous systems in "Rolling Motorway" (RoLa) for low-floor wagons. Usage of standard bogies and semi-trailers are not needed to be specially reinforced for crane lifting, compatibility with vertical loading/ unloading in existing traditional intermodal terminal for combined transport, allows the transportation of standard semi-trailers with a height of 4 m on the main European routes with the minimum clearance gauge UIC GB1 without required infrastructer changes. Investment costs LOHR terminal moderate as civil engineering works are not necessarily required, fast turn-over	Establishment of specific handling terminals is required to fully exploit advantages of the system, depending on timetable (currently low frequency/ number of routes services), large land use at the terminal (huge maneuvering area needed, width: 20m)	x	x		yes, regular operation

Table A3: CT-Technologies

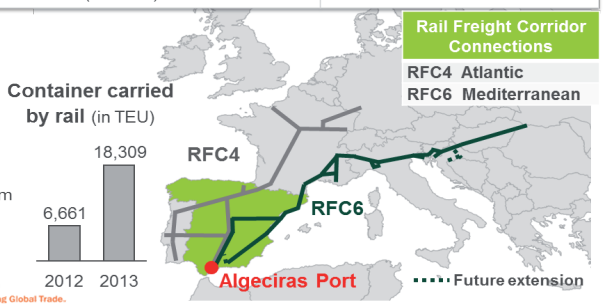
Name of technology and Weblink	Key characteristics of technology	Focus		Year	Advantages (selection)	Disadvantages (selection)	Technology field			Use in practice
		Unac com-panied	Ac com-panied				Wagon	Terminal	Handling	
NiKraSa (Nicht Kranbare Sattelauflieger) http://www.nikrasa.eu/de/startseite.html	The NiKRASA-system makes it possible to transfer non-craneable semi-trailers from road to rail within the existing standards and infrastructure. The system consists of two parts – the terminal platform and the transport platform. The transport platform fits exactly into the terminal platform like a negative into a positive. The terminal tractor positions the trailer in the centre of the transport platform. The portal crane or reach stacker's standard grapplers come into play. They latch onto the lifting pockets of the NiKRASA transport platform and lift the platform. Both trailer and transport platform are loaded as a single unit. The trailer is positioned in the pocket wagon exactly in line with the trestle, and the kingpin is locked into place. The loading process is now complete.	x		2014	No changes at the wagon, the semi-trailer or the business processes required, no additional investments, the already existing transshipment sites in the terminals for combined transport can be used.	Higher weight, each trailer must turned individually, time-consuming			x	yes, regular operation
Rail-Tug http://www.railtug.de/projekt.html	Innovative "Tugmastersystem" for rolling loading of trailers on low-floor wagons, integration of non-craneable trailers in unaccompanied combined transport with standard-port-traction-engine and -wagons, reconstruction of a tugmaster, so that the semi-trailer hook into a draw-bar, and the tugmaster is transportet on the wagon as well whereby the tugmaster drives sidewards the wagon and leads the trailer on the wagon and then decoupled. Therfore a tractor is required, where a driver controll the tugmaster.	x		2010	easy, fast turn-over, no ramps required	Investment- and modification costs, so far only theoretical concept			x	no, only theoretical concept
ResoR@ail	The level of the terminal is adjusted to the height of the wagons, so that trucks can directly drive on the wagons. After the truck on the wagon, the wagon floor will be lowered and and locked (with or without tractor). Thus, the train can run with a lower structure gauge. There is no need for ramps.		x	2010	easy, fast turn-over, no ramps required	Wagons with special lifting technique are required (high invesment costs), as well as a particular terminal, so far only a theoretical concept	x	x		no, only theoretical concept
Trimoder http://www.railtug.de/projekt.html	45- foot container for combined transport, which fulfills ISO and DIN standards and therfore effective use in road and rail traffic. It combines with light chassis, so the additional payload can be up to 29t. Besides ist craneable, stackable, four-sided loadable and pallet-wide. Hence it has a lots of advantages compared to the trailer.	x		2013	Alternative to trailer, in comparison 19-22% additional payload (29 tonnes additional payload possible, only 4,9 tonnes own weight), simultaneous compliance of ISO- and DIN-Norm, efficient loading with pallet possible, cranable and stackable (less area usage), combined benefits of trailer (loading capacity) and containers (craneability/ stacking capacity), good investment proportion, good suitable for RoRo/ShortSeaShipping				x	unknown

Source: BSL Transportation analysis, websites of technology providers, www.zukunft-mobilitaet.de, Ilotech -Scandria Add-on Projekt Innovative Technologien Endbericht (2012); www.sgkv.de

Table A4: Port Profile – Algeciras (ES)

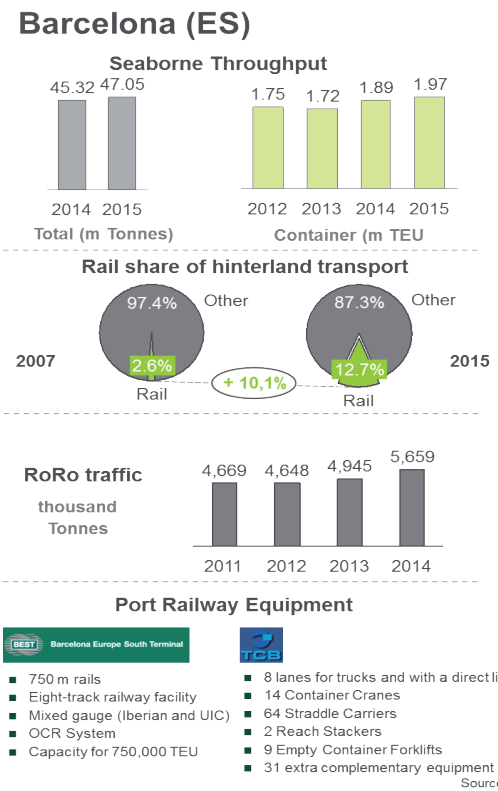


Algeciras – key port characteristics 2015	
No. of container terminals	2
No. of container terminal operators	2
No. of berths	9
Maximum draught (in m)	17 - 18.5
No. of ship calls (2014)	26,748
No. of Container carriers (Vessels)	251
Containerised Cargo 2014 (in 1,000 tonnes)	54,580
Import (40%)	China, Brazil, USA, Costa Rica, Panama
Export (60%)	USA, China, Brazil, Portugal, UAE
Vehicle Traffic – industrials HGVs (2014) (in 1,000 vehicles)	277
RoRo Growth (2013/14)	- 62.1 %
RoRo Growth (2014/15)	- 45.1 %

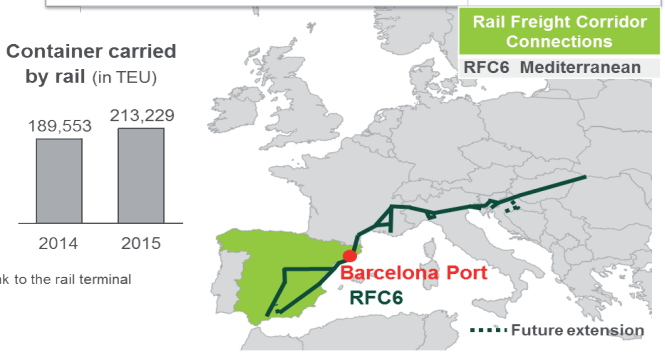


Source: Comport Handbook 2015-16, www.apba.es, ESPO Annual Report 2014_2015

Table A4: Port Profile – Barcelona (ES)

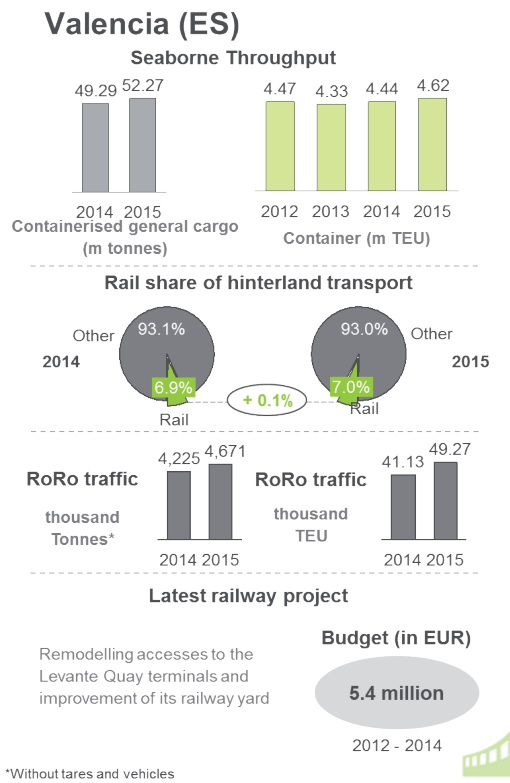


Barcelona – key port characteristics 2015	
No. of container terminals	2
Berthing line (meters)	More than 3,000
Maximum draught (in m)	16
No. of containers handled	18,717,104
No. of Container carriers (Vessels)	8,025
General Cargo throughput (in tonnes)	29,439,846
RoRo Growth (2013/2014)	14.40 %
RoRo Growth (2014/2015)	21.20 %
Container carried by rail in TEU (2014)	189,553
Main areas of destination. (Full TEU non transit)	Far East and Japan
Main areas of origin. (Full TEU non transit)	Far East and Japan
Port terminal investments in m EUR (thereof rail)	40 (9)



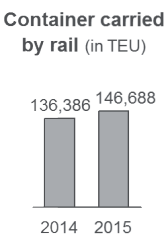
Source: Port of Barcelona Statistical Report 2013, 2014, 2015; Annual Report 2014, ESPO Annual Report 2014_2015

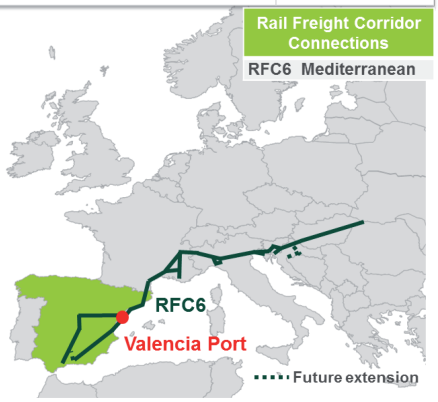
Table A4: Port Profile – Valencia (ES)



*Without tares and vehicles

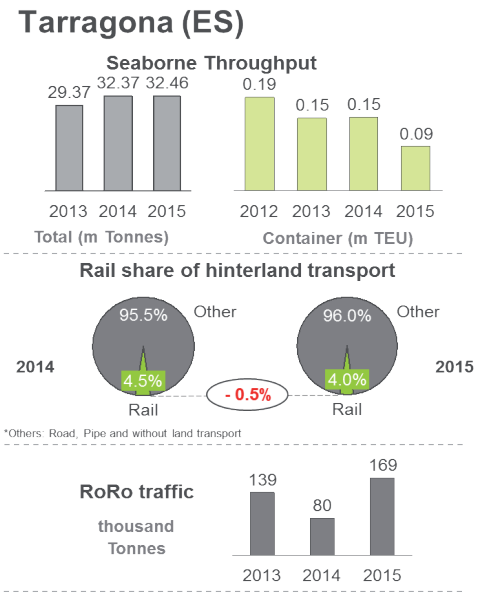
Valencia – key port characteristics 2015	
No. of container terminals	13
No. of container terminal operators	12
No. of berths	22
Maximum draught (in m)	14
No. of Containerships	3,197
No. of containers handled	4,615,196
No. of General Cargo handled (conventional and containerised)	63,102,097
Main area of origin. / destination (on the basis of TEU	China
Annual trend RoRo growth	+ 10.54 %
No. of Rail Companies operating	4



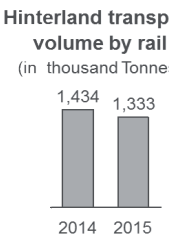


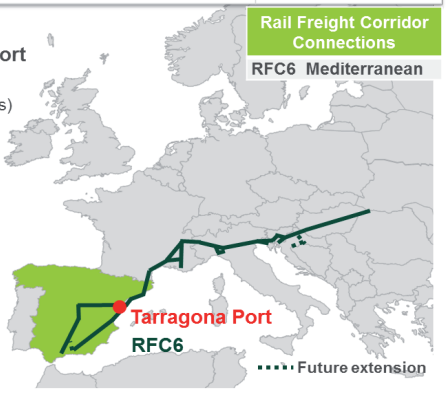
Source: http://www.valenciaport.com, Statistical report December 2015

Table A4: Port Profile – Tarragona (ES)



Tarragona – key port characteristics 2015	
No. of container terminals	4
No. of Berths	113
No. of Terminal operator	8
Maximum draught (in m)	13.25
No. of containers handled (without transit)	59,841
No. of general cargo vessels	802
General Cargo throughput (in tonnes)	2,237,438
Tonnes carried by rail	1,333,254
No. of wagons total	55,810
Main area of destination. (on the basis of tonnes)	Spain
Main area of origin. (on the basis of tonnes)	Algeria



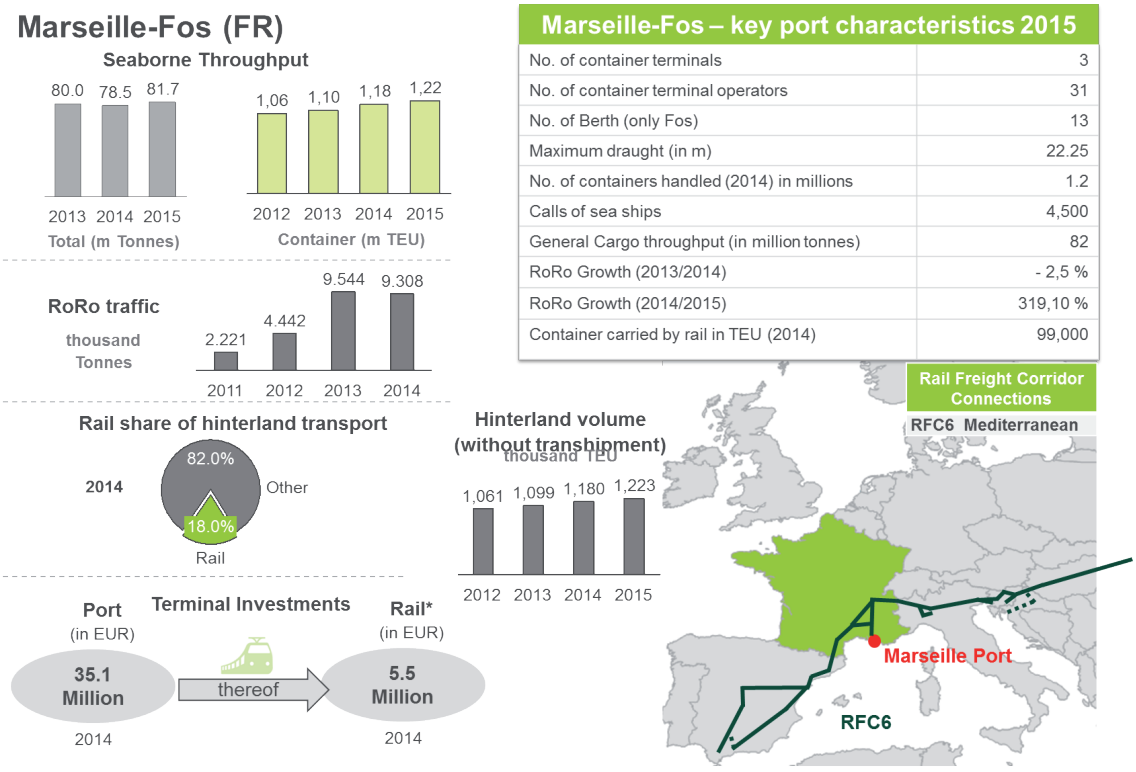


Source: Memoria Anual 2014 and 2015

Railway works in progress or completed during 2015

- Introduction of the UIC-standard gauge and electrification of the new Port of Tarragona intermodal terminal access
- General fire-prevention perimeter water network on the Cantàbria dock and adaptation of intermodal terminal of the Port of Tarragona
- Renovation of railway tracks connecting to dock Reus
- Levelling and drain system project of the centre area near railroad tracks, Cantàbria dock

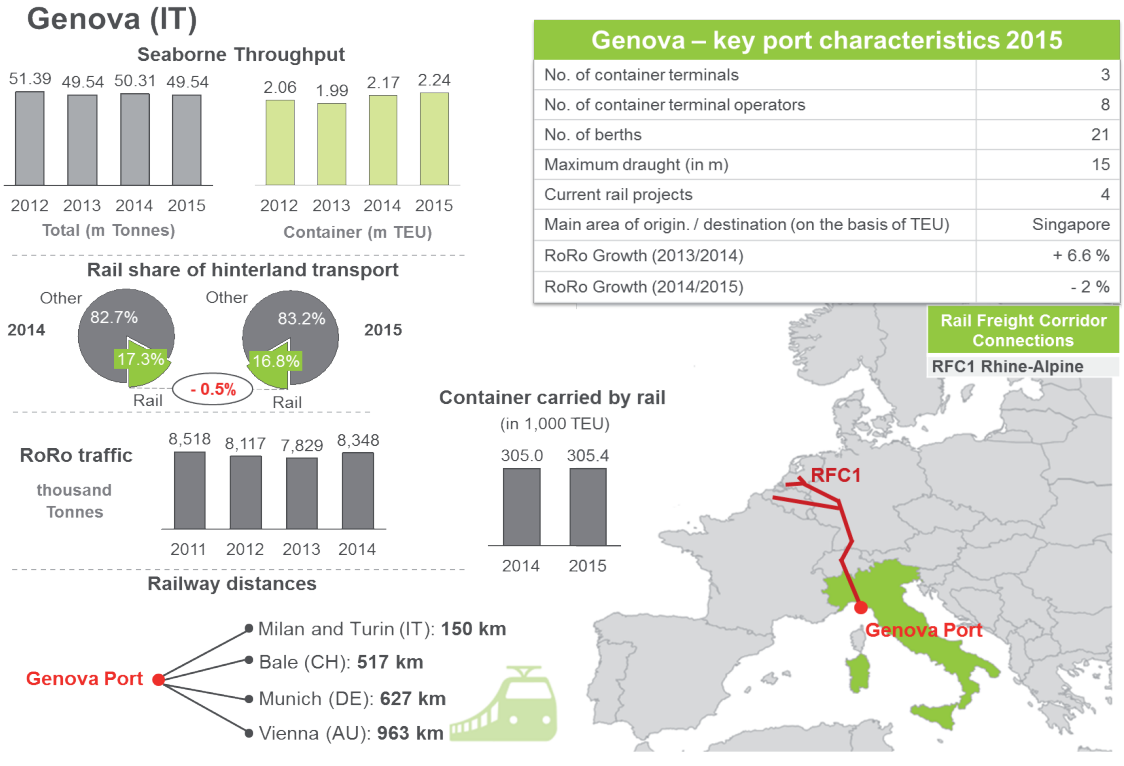
Table A4: Port Profile – Marseille-Fos (FR)



Marseille-Fos – key port characteristics 2015	
No. of container terminals	3
No. of container terminal operators	31
No. of Berth (only Fos)	13
Maximum draught (in m)	22.25
No. of containers handled (2014) in millions	1.2
Calls of sea ships	4,500
General Cargo throughput (in million tonnes)	82
RoRo Growth (2013/2014)	- 2,5 %
RoRo Growth (2014/2015)	319,10 %
Container carried by rail in TEU (2014)	99,000

Source: KPI Report 2014, 2015; Annual Report 2014; Port Information Guide May 2016; ESPO Annual Report 2014_2015

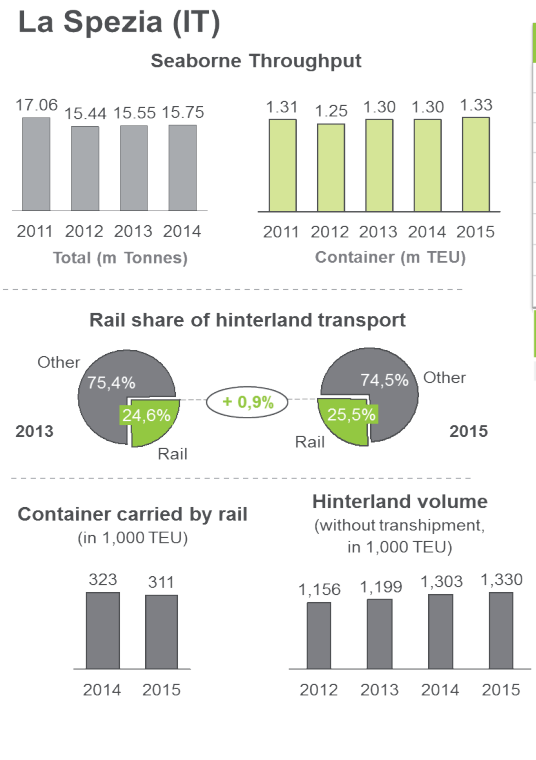
Table A4: Port Profile – Genova (IT)



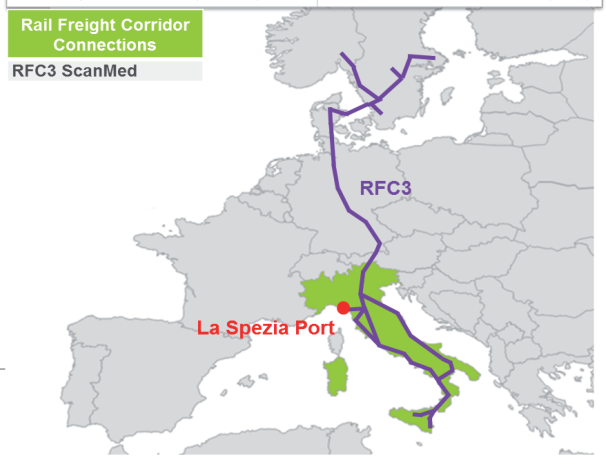
Genova – key port characteristics 2015	
No. of container terminals	3
No. of container terminal operators	8
No. of berths	21
Maximum draught (in m)	15
Current rail projects	4
Main area of origin. / destination (on the basis of TEU)	Singapore
RoRo Growth (2013/2014)	+ 6.6 %
RoRo Growth (2014/2015)	- 2 %

Source: http://www.porto.genova.it/; Genova Handbook 2014-2015, ESPO Annual Report 2014_2015

Table A4: Port Profile – La Spezia (IT)

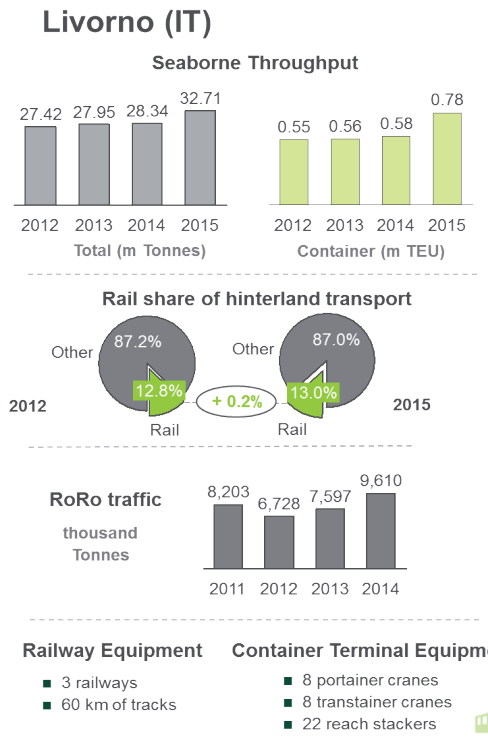


La Spezia – key port characteristics 2015	
No. of terminals	9
No. of container terminal operators	5
No. of berths	9
Maximum draught (in m)	14
Length of internal rail network (in km)	17
Ports of call	1,029
General Cargo in 2008 (in mln. tons)	14.4
Most important market (in 2014)	Asia (44%)

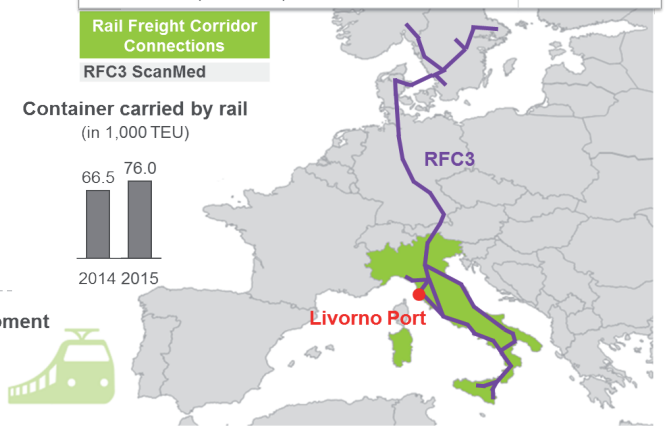


Source: Statistical Data_Year; www.porto.laspezia.it; Traffici La Spezia 2011, 2012, 2013,2014; http://www.worldportsource.com/ports/commerce/ITA_Port_of_La_Spezia_1069.php

Table A4: Port Profile – Livorno (IT)



Livorno – key port characteristics 2015	
No. of container terminals	4
No. of container terminal operators	20
No. of berths	90
Maximum draught (in m)	15
No. of general cargo vessels	3,283
General Cargo throughput (in tonnes)	32,712,473
Main area of origin. / destination (on the basis of TEU)	Algeciras
RoRo Growth (2013/2014)	+ 26.5 %
RoRo Growth (2014/2015)	+ 17.1 %

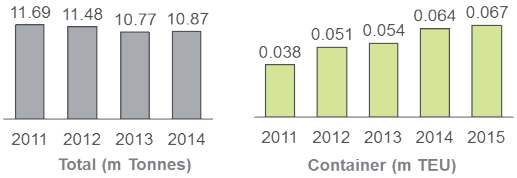


Source: Allegato Statistico 2015; http://www.porto.livorno.it/en-us/homepage.aspx; Livorno Port Presentation

Table A4: Port Profile – Civitavecchia (IT)

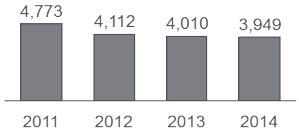
Civitavecchia (IT)

Seaborne Throughput



RoRo traffic

thousand Tonnes



Equipment

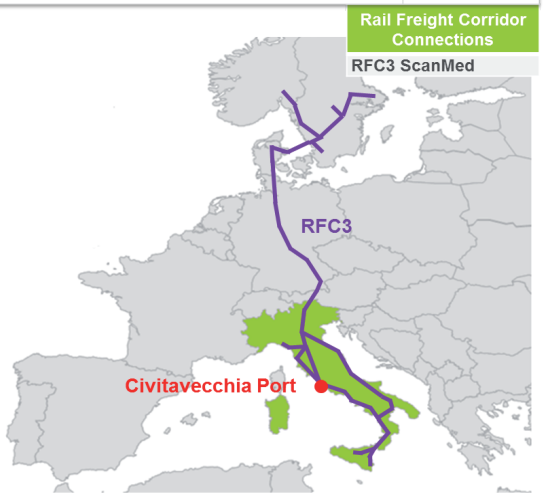
- 2 ship-to-shore cranes
- 3 RTG
- 3 reach stackers
- 4 forklifts

Infrastructure investments

New container terminal planned: investments of 508 million euro

- Sponsored by a private investor (308 million) and the EU Juncker-Plan (200 million)
- Maximum draught: 18 meters
- 0,9 km of wharfs
- 5.000 m² of dry port

Civitavecchia – key port characteristics 2015	
No. of container terminals	1
Maximum draught (in m)	15
Total throughput (in tonnes)	10,870,222
No. of containers handled (in TEU)	66,731
RoRo Growth (2011/2012)	- 13.9 %
RoRo Growth (2013/2014)	- 1.5 %

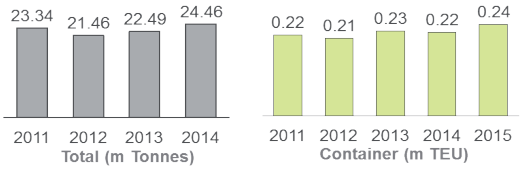


Source: Movimenti portuali 2011-2014, http://www.portidiroma.it/content/il-porto-di-civitavecchia-si-prepara-i-container, http://www.rtcspa.com/chi-siamo.html

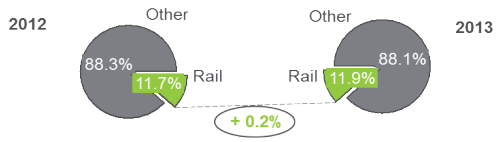
Table A4: Port Profile – Ravenna (IT)

Ravenna (IT)

Seaborne Throughput

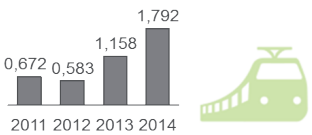


Rail share of hinterland transport



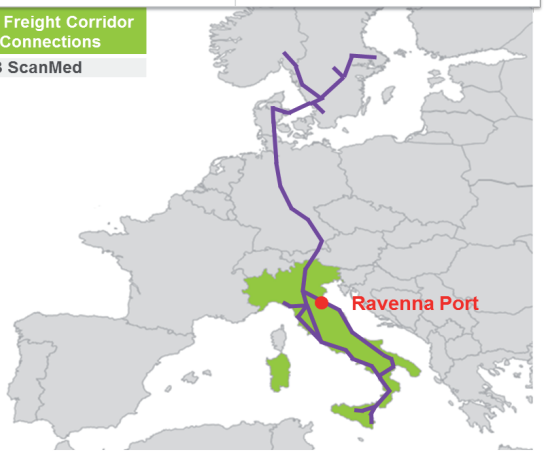
All quays are connected to the nation's rail network with **over 15 thousand meters** of rails

RoRo traffic (in 1,000 tonnes)



Container carried by rail (in 1,000 TEU)

Ravenna – key port characteristics 2015	
No. of container terminals	11
No. of container terminal operators	11
No. of berths	2
Maximum draught (in m)	10.5
No. of vessels (2007)	almost 8,000
Handled cargo (2007) in mln. tons	26.3
Important markets	Middle and Far East
Main trade markets	Eastern Mediterranean; Black Sea

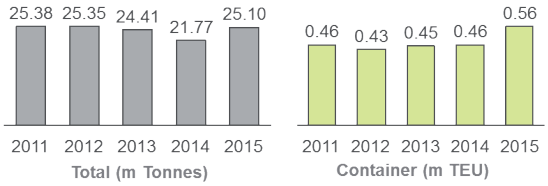


Source: Statistical Data_Year; http://www.tcravenna.it/; http://www.worldportsource.com/

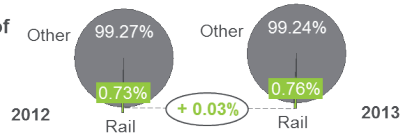
Table A4: Port Profile – Venice (IT)

Venice (IT)

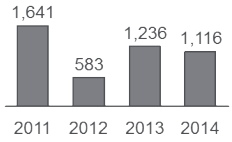
Seaborne Throughput



Rail share of hinterland transport



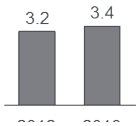
RoRo traffic
thousand Tonnes



Terminals

- Centro Intermodale Adriatico
- Multiservice
- Terminal Intermodale Venezia (TIV)
- Terminal Rinfuse Italia (TRI)
- Transped
- Vecon

Container carried by rail
(in 1,000 TEU)



Venice – key port characteristics 2015	
No. of terminals	24
No. of container terminal operators	6
No. of berths	31
Maximum draught (in m)	12
Length of internal rail network (in km)	205
No. of vessels	3,402
No. of containers handled	353,824
RoRo Growth (2013/2014)	- 9.7 %
RoRo Growth (2014/2015)	- 27.6 %

Rail Freight Corridor Connections
RFC5 Baltic-Adriatic
RFC6 Mediterranean

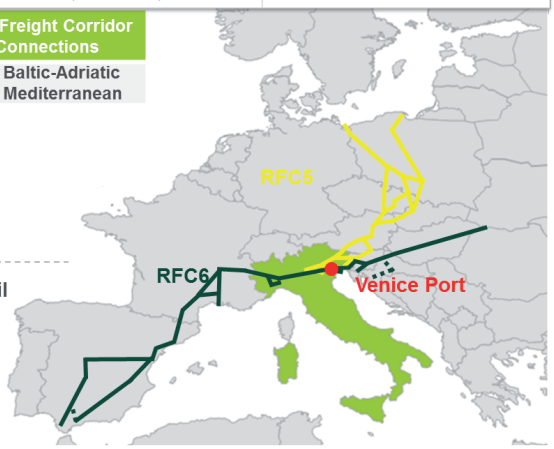
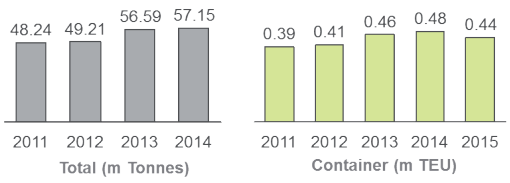


Table A4: Port Profile – Trieste (IT)

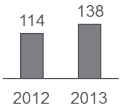
Trieste (IT)

Seaborne Throughput

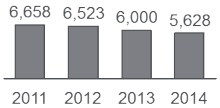


Rail share of hinterland transport

Container carried by rail
(in 1,000 TEU)



RoRo traffic
(in 1,000 tonnes)

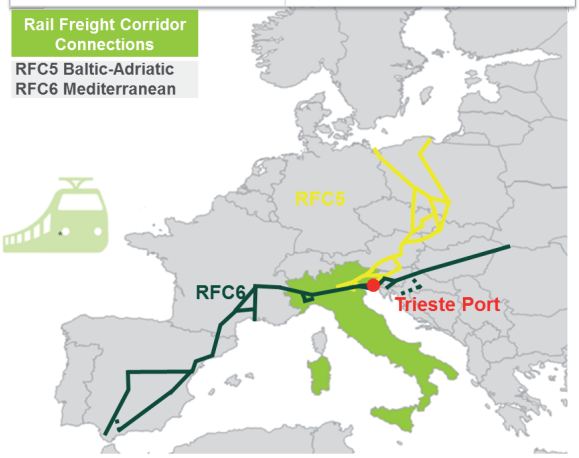


Port Developments (According to North Adriatic Port Association)

- The realization of a modern general cargo terminal (Pier V + Pier VI);
- The enlargement of the container terminal at Pier VII;
- The construction of a new container terminal (Pier VIII);
- The creation of a new RO-RO terminal

Trieste – key port characteristics 2015	
No. of container terminals	16
No. of container terminal operators	33
No. of berths	58
Maximum draught (in m)	18
Length of rail track (in km)	70
No. of trains per month	> 400
RoRo Growth (2013/2014)	- 6.2 %
RoRo Growth (2014/2015)	- 15.5 %

Rail Freight Corridor Connections
RFC5 Baltic-Adriatic
RFC6 Mediterranean

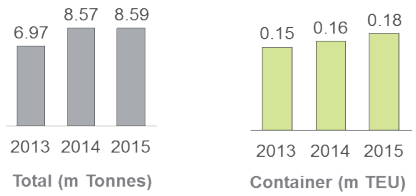


Source: Statistical Data_Year; www.porto.trieste.it, http://www.portsofnapa.com/port-of-trieste/development, ESPO Annual Report 2014_2015

Table A4: Port Profile – Ancona (IT)

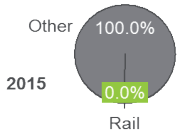
Ancona (IT)

Seaborne Throughput

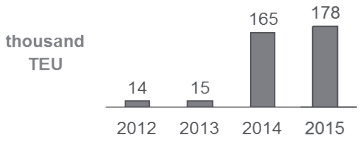


Ancona – key port characteristics 2015	
No. of container terminals	1
No. of berths	25
Maximum draught (in m)	12.2
Total cargo handled in 2005 (in mln. Tons)	9.2
Container handled	106,923
Main trade routes	Adriatic and Mediterranean
Length of rail tracks (in km)	20

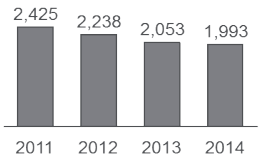
Rail share of hinterland transport



Hinterland volume (without transhipment)



RoRo traffic (in 1,000 tonnes)



Container carried by rail (in 1,000 TEU)

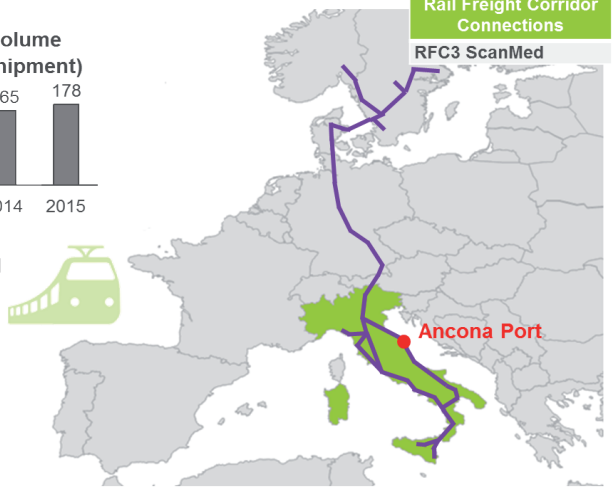
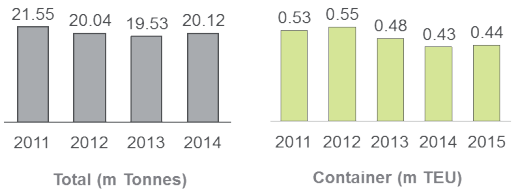


Table A4: Port Profile – Naples (IT)

Naples (IT)

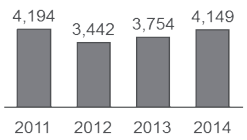
Seaborne Throughput

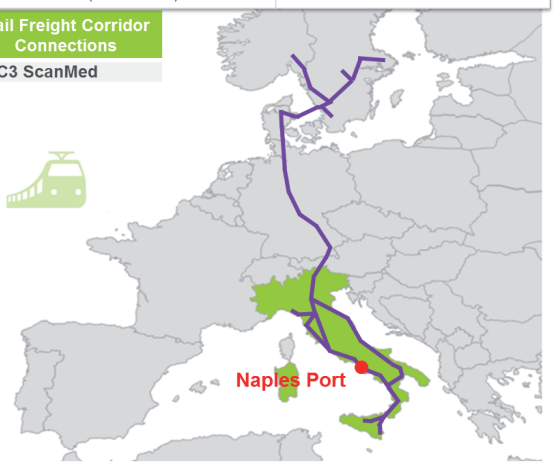


Naples – key port characteristics 2015	
No. of terminals	3
No. of container terminal operators	3
No. of berths	30
Maximum draught (in m)	11
Total length of rail network (in km)	1.8
Container Goods 2014 (in tonnes)	4,615,412
RoRo Growth (2013/2014)	- 3.00 %
RoRo Growth (2014/2015)	- 17.80 %

RoRo traffic

thousand Tonnes





Port Structure

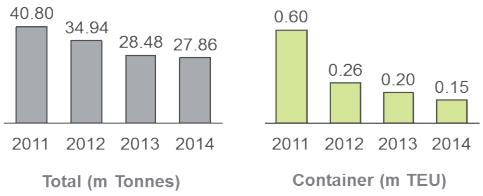
- 7 coastal warehouses for bulk liquid products, mineral oils, vegetable, and chemical products.
- 2 terminals for timber and cellulose with a total surface area of approximately 35,000 qm
- 2 terminals for wheat products
- 3 container terminals, with a total surface area of 200.000 qm
  - 2 specialised in lo-lo traffic at Bausan and Flavio Gioia Docks
  - 1 specialised in ro-ro traffic at Bausan Dock.

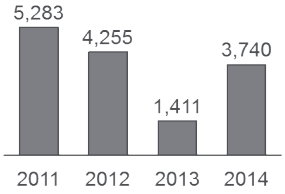
Source: Statistical Data_Year; https://www.port.venice.it, ESPO Annual Report 2014_2015

Table A4: Port Profile – Taranto (IT)

Taranto (IT)

Seaborne Throughput





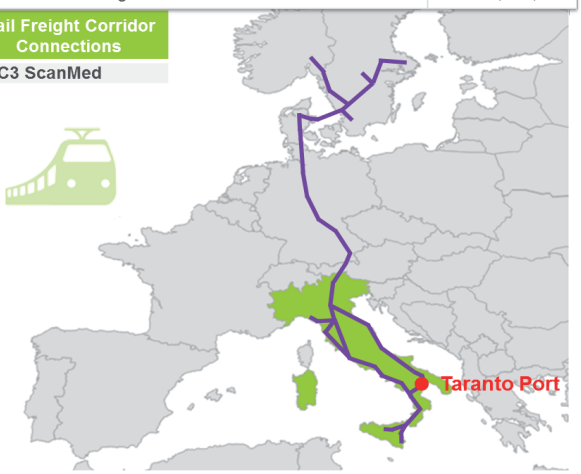
Container Terminal Equipment

- 10 ship-to-shore gantry cranes
- 1 mobile harbour crane
- 22 rail-mounted gantry cranes
- 3 reach stackers
- 5 side loaders
- 62 prime movers

Taranto – key port characteristics 2015	
No. of container terminals	1
No. of container terminal operators	4
No. of berths	5
Maximum draught (in m)	16
No. of vessels	2,198
Length of rail network (in km)	over 1,230
Handling capacity per year (TEU)	2,000,000
Total General Cargo	22,565,243

Rail Freight Corridor Connections

RFC3 ScanMed

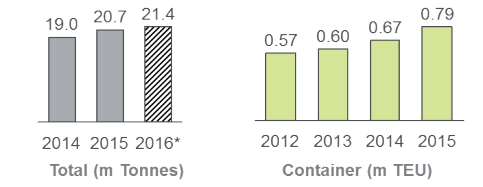


Source: http://harboursreview.com/port-palermo.html, ESPO Annual Report 2014_2015

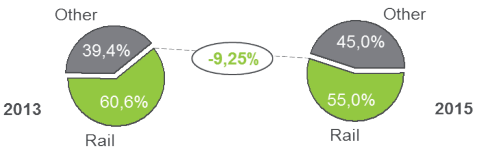
Table A4: Port Profile – Koper (SI)

Koper (SI)

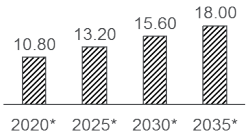
Seaborne Throughput



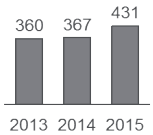
Rail share of hinterland transport (in %)



Forecast of transhipment volumes (million net tonnes)



Container carried by rail (in 1,000 TEU)



LUKA KOPER Port of Koper

Port Railway Equipment

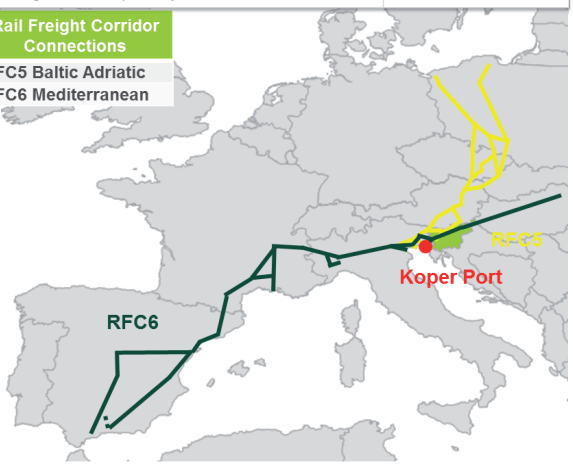
- 4 Ro-Ro ramps
- 6 Railway ramps
- Railway tracks: 5 x 700m, 2 x 270m, 2 x 300m

*Forecast

Koper– key port characteristics 2015	
No. of container terminals	12
No. of container terminal operators	1
No. of Berth	26
No. of vessels	2,032
Maximum draught (in m)	17.2
No. of containers handled (in tonnes)	7,741,976
General Cargo throughput (in million tonnes)	1,475,076
Average of trains per day	52

Rail Freight Corridor Connections

RFC5 Baltic Adriatic
RFC6 Mediterranean



Source: Detailed Statistics 2012, 2013, 2014, 2015; http://www.luka-kp.si/; SETA Port Presentation

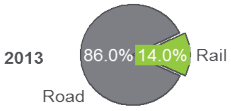
Table A4: Port Profile – Rijeka (HR)

Rijeka (HR)

Seaborne Throughput

*Cargo transport (excluding liquid cargo; including container cargo) (in thousands of tonnes)

Rail share of hinterland transport



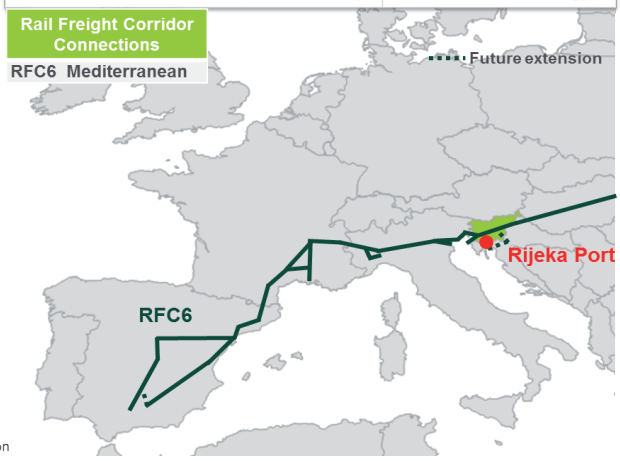
Rijeka Gateway Project**

Rijeka Gateway project known as a Rijeka Traffic Route Redevelopment Project is a complex development program which aimed at rehabilitation and modernisation of the entire port complex and improving the port traffic connection with the international road and railway corridors.

Rijeka– key port characteristics 2015	
No. of container terminals	9
No. of Berth	58
Maximum draught (in m)	28
Total reloading capacity (in tons)	33,000,000
General Cargo throughput 2014 (in tonnes)	1,610,630
Destination / outbound area (Rijeka general)	Turkey; South Africa; Egypt; Lebanon; Algeria; Colombia
Destination / outbound area (Terminal Bršica)	Lebanon; Egypt

Rail Freight Corridor Connections

RFC6 Mediterranean



Rijeka Gateway Project

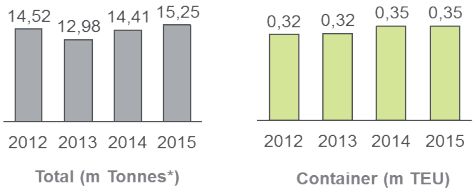
**According to North Adriatic Port Association

Source: KPI Report 2014, 2015; Annual Report 2014; Port Information Guide May 2016; http://www.portsofnapa.com/port-of-rijeka, European Parlament

Table A4: Port Profile – Thessaloniki (GR)

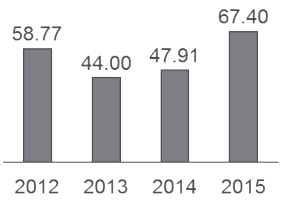
Thessaloniki (GR)

Seaborne Throughput



RoRo traffic

thousand Tonnes



Container Terminal

- 4 cranes (2 post panamax)
- Linkes by a double track railway to the national railway networks

Conventional Cargo Terminal

- General Cargo
- Solid Bulk Cargo
- Liquid Bulk Cargo
- Ro-Ro vehicles

Thessaloniki – key port characteristics 2015	
No. of container terminals	2
No. of Berth	26
Maximum draught (in m)	12
No. of vessels	1,983
Container throughput**	237,564
Seaborne traffic (tare weight not incl.)	14,508,342
Seaborne throughput general cargo (tonnes)	4,003,622
RoRo Growth (2014/2015)	+ 40.68 %
RoRo Growth (2012/2013)	- 25.14 %

Rail Freight Corridor Connections

RFC7 Orient

**Transshipment units are counted once

Source: http://www.thpa.gr; Statistics 2015, 2014, 2013, 2012

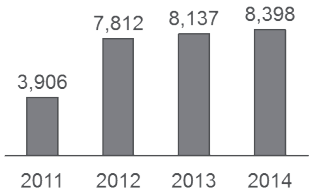
Table A4: Port Profile – Piraeus (GR)

Piraeus (GR)

Seaborne Throughput

RoRo traffic

thousand Tonnes



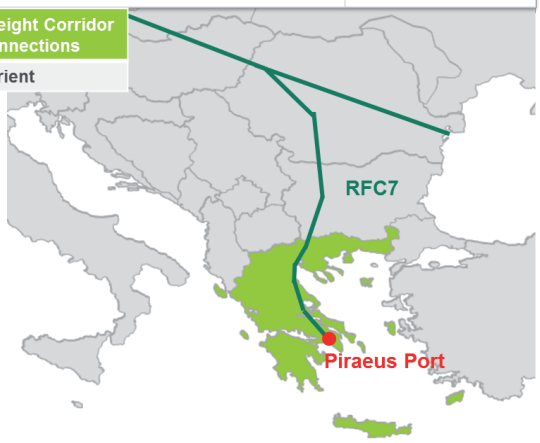
Terminal Equipment

- 7 Ship to shore cranes
- 8 Rail Mounted Gantry Cranes
- 10 Straddle Carriers
- 4 Empty Reach Handlers
- 1 Reach Stackers
- 2 Terminal Tractors
- 1 Topp Lift
- 1 Container Mover

Piraeus– key port characteristics 2015	
No. of container terminals	2
No. of Berth	7
Maximum draught (in m)	18
No. of Cargo ships (2013)	3,596
Annual capacity (TEU)	1,000,000
RoRo Growth (2013/2014)	+ 3.20 %
RoRo Growth (2014/2015)	+ 115.0 %
TEU growth from 2008/2011	+ 287.5 %

Rail Freight Corridor Connections

RFC7 Orient

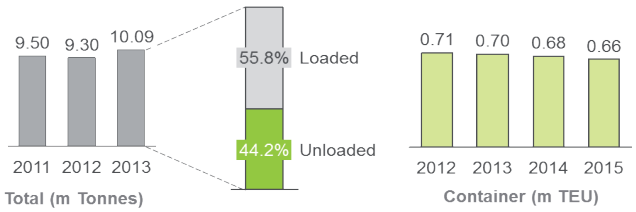


Source: PPA Statistics; http://www.olp.gr/en/stats; ESPO Annual Report 2014/2015

Table A4: Port Profile – Izmir (TR)

Izmir (TR)

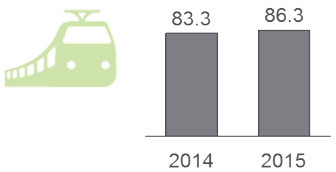
Seaborne Throughput



Rail share of hinterland transport

Container carried by rail

(in 1,000 TEU)



Izmir – key port characteristics	
No. of berths	24
Maximum draught (in m)	12.19
No. of Operators	1
No. of Vessel (2014)	1,305
Container Handling Capacity in TEU (2013)	810

Terminal Berths

- Berths 1+2 in the Port of Izmir serve passengers.
- Berth 3 handles dry bulk and **roll-on/roll-off cargos**
- Berths 4-12 handle general cargo
- Berths 13-19 in the Port of Izmir handle containers and roll-on/roll-off cargoes
- Berths 20, 21, 22, and 23 handle general cargo
- Berth 24 handles dry bulk cargoes

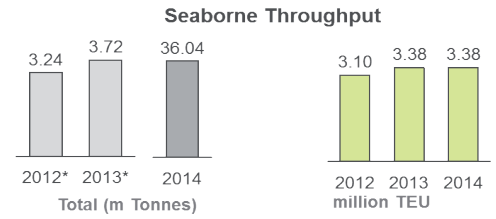
Terminal equipment

- 5 quayside gantry cranes
- 3 MHC (mobile harbor cranes) cranes
- 14 rubber tired transtainers
- 15 reach stackers
- 7 empty container
- 6 mobile cranes
- 12 short mast forklifts (diesel + electric)
- 1 mini loader

Source: Annual Statistic TR 2009-2013, 2008-2012; Annual Report 2014 TR

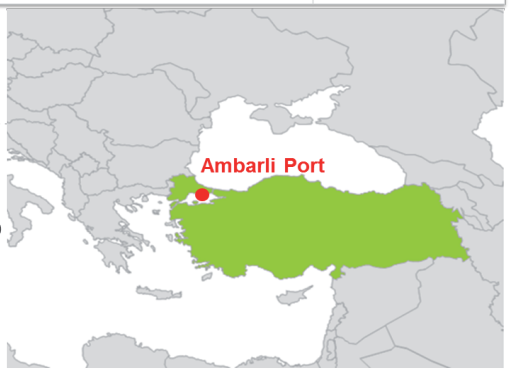
Table A4: Port Profile – Ambarli (TR)

Ambarli (TR)

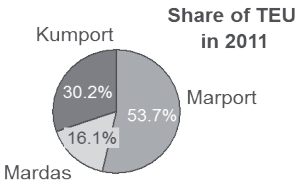


*2012 and 2013 only General Cargo

Ambarli – key port characteristics 2015	
No. of container terminals	3
Maximum draught (in m)	16.5
No. of Terminal Operators	4
No. of vessels arrived to and depart from	~ 4,200



Terminal facilities



MARPORT

- one roll-on/roll-off ramp
- berthing distance of 800 m
- depth of 14.5m (West Terminal 16.5m)
- 6 ship-to-shore gantry cranes
- 1 mobile harbor crane
- 17 rubber-tyred gantry cranes
- 6 top-lifters
- 13 spreaders
- 41 terminal trucks

KUMPORT

- total of 2,080m
- depth range from 13.5 to 15.5m
- three 55-ton 20-row outreach cranes
- two 100-ton 14-row outreach cranes
- two 104-ton 17-row outreach cranes
- three 104-ton 18-row outreach cranes
- one 104-ton 12-row outreach crane
- one 64-ton 8-row outreach crane
- 12 45-ton rubber-tyred gantry cranes
- four 45-ton reach stackers
- one 8-ton empty stacker
- two 9-ton empty stackers
- 21 50-ton terminal tractors

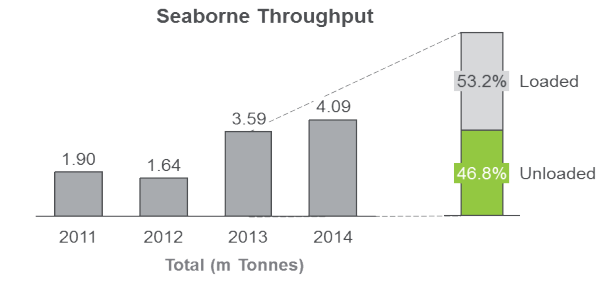
MARDAŞ

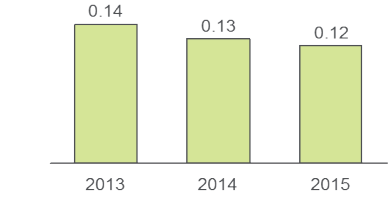
- 2 berths
- berthing distance of 910m
- depth range from 13 to 15m
- 12 mobile cranes
- eight 17-row outreach cranes
- three 16-row outreach cranes
- one 13-row outreach crane
- 8 rubber-tyred gantry cranes
- 14 stackers, and 30 terminal tractors

Source: http://icce2016.com/en/Istanbul-Ambarli-Port-Facilities-in-partnership-with-ALTAS.html; http://www.altasliman.com/en/sirket_profili_istatistikler.php

Table A4: Port Profile – Haydarpasa (TR)

Haydarpasa (TR)





Haydarpasa – key port characteristics	
No. of container terminals	5
No. of berths	**21**
Maximum draught (in m)	11-12.2
No. of Operators	1
No. of Vessel	1,169
No. of Vessel (Ro-Ro Terminal)	**360**
Container Handling Capacity in 2014 (TEU/Year)	654
Container Handling Capacity in 2014 (Tonnes/Year)	1,913

Terminal Equipment

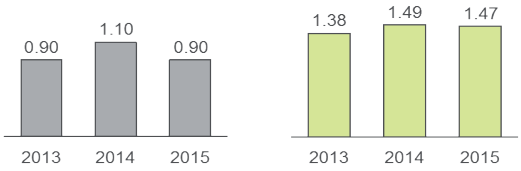
- Operations are carried out by 4 quayside gantry cranes of 40 tons capacity
- 18 rubber tired transtainers
- 9 reach stackers
- 8 empty container forklifts
- 9 shore and yard cranes
- 6 mobile cranes.

Source: Annual Statistic TR 2009-2013, 2008-2012; Annual Report 2014 TR

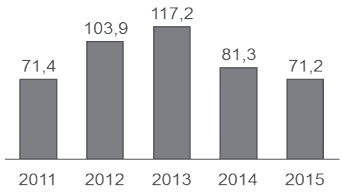
Table A4: Port Profile – Mersin (TR)

Mersin (TR)

Seaborne Throughput



RoRo traffic
in thousand Units



Terminal Equipment

- 7 pieces SSG
- 25 pieces RTG
- 12 pieces ECH
- 18 pieces R. Stacker
- 84 pieces Terminal Tractors
- 67 pieces Forklift
- 6 Pieces Mini Loader
- 19 pieces Conveyor

Berth Equipment

- 7 Gantry Crane
- 7 Mobile Crane (MHC)

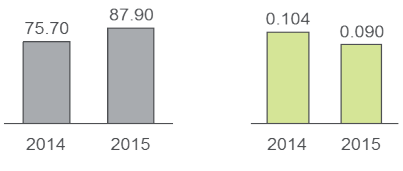
Mersin – key port characteristics	
No. of berths	21
Maximum draught (in m)	10 - 14
No. of Operators	1
No. of Vessel approx. per year	1,500
Container Handling Capacity (TEU/year)	1,800,000
General Cargo Handling Capacity (tons/year)	1,000,000
Ro-Ro Handling Capacity (units-vehicles/year)	150,000
No. of railway lanes	4

Source: http://en.mersinport.com.tr

Table A4: Port Profile – Ust-Luga (RU)

Ust-Luga (RU)

Seaborne Throughput



Port Equipment

- 4 STS
- 11 RTG
- 2 RMG
- 3 Mobile cranes
- 3 reachstackers

Railway Equipment

- St.Petersburg junction:
  - Two-lane railway over the entire length, elongation of the station yards of the way station **up to 1,050m**
- Luzhskaya junction:
  - Seven stations (three of them are already commissioned)
  - In future **65%** of the total cargo volumen is expected to be transshipped **via the railways**

Simultaneous accommodation of **200 wagons**

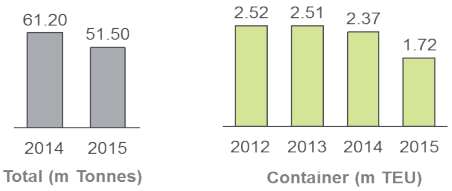
Ust-Luga – key port characteristics			
Indicator	**Year**		**Units of measurement**
No. of container terminal operators	2015	2	Number
No. of container terminals	2015	11	Number
No. of berths	2015	7	Number
Quay length	2016	440	in m
Maximum draught	2015	13,5	in m
Turnover	2012	11,595	TEU
Turnover	2012	101	1,000 tons
Total throughput capacity	2016	440.000	TEU p.a.
Total Length	2013	1,440	in m
Start of operations: 2011, deep sea greenfield container terminal			

Source: http://www.ust-luga.ru

Table A4: Port Profile – St. Petersburg (RU)

St. Petersburg (RU)

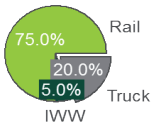
Seaborne Throughput



Main destination of export shipments (in 2014)

Rail share of hinterland transport

2014



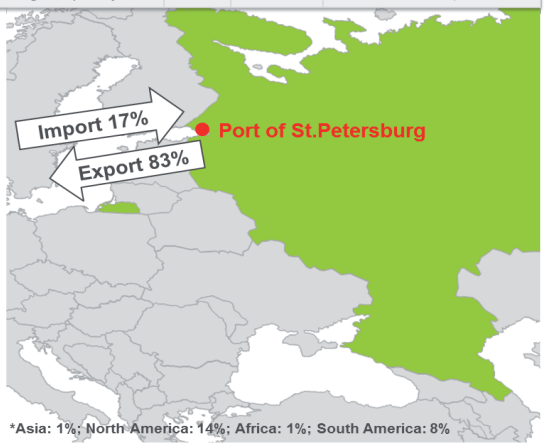
Rail facilities

- Railway transporters of any kind (4-axle – 32-axle, cargo capacity from 64 mt till 500 mt, area type, platform type and linked type
- covered waggons;
- open-top waggons;
- multipurpose platforms;
- fitting platforms;

Average of **650 railcars**/ per day

St.Petersburg – key port characteristics

Indicator	Year		Units of measurement
No. of container terminals	2015	6	Number
No. of berths	2015	200	Number
Maximum draught	2015	11	in m
Total length of railway tracks	2014	3,000	m
RoRo Terminal size	2014	160	th.m^2
RoRo production capacity	2014	1,000	1,000 tons annual
RoRo storage capacity	2014	3	1,000 units



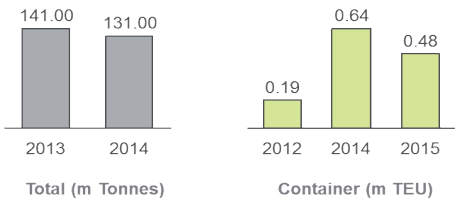
*Asia: 1%; North America: 14%; Africa: 1%; South America: 8%

Source: http://www.en.seaport.spb.ru, http://www.baltictransportmaps.com/port-of-kaliningrad-325,189-teu-handled-in-2014-(0.8-yoy).html; http://www.worldportsource.com/ports/commerce/RUS_Port_of_St_Petersburg_61.php; Brochure of the Port of St.Petersburg; Financial Report 2008

Table A4: Port Profile – Novorossiyk (RU)

Novorossiyk (RU)

Seaborne Throughput



Main destination of export shipments (in 2008*)

Rail facilities

- railway transporters of any kind (4-axle – 32-axle, cargo capacity from 64 mt till 500 mt, area type, platform type and linked type
- covered waggons;
- open-top waggons;
- multipurpose platforms;
- fitting platforms;

The daily flow at the Novorossiysk railway station is **around 800 wagons** (almost 300 thousand wagons a year).

Novorossiyk – key port characteristics

Indicator	Year		Units of measurement
No. of container terminals	2015	2	Number
No. of container terminal operators	2015	8	Number
No. of berths	2015	41	Number
Maximum draught	2015	24.5	in m
No. of containers handled	2014	177,886	Number
Total length of railway lines	2014	22,409	m
No. vessel calls on Container Terminal	2014	177	Number
No. vessel calls on Timber Terminal	2014	233	Number

*Asia: 11.55%; North America: 4.32%; Africa: 3.13%; South America: 1.39%

Source: http://www.nmtp.info/en/; www.nle.ru/en/about/infographics/; http://novpt.ru/info-port-eng.php; http://yankeerussia.com/index.php/home/categories/economy/item/76-novorossiysk-the-largest-sea-port-in-russia; Novorossiysk-Commercial-Sea-Port-AnnualReport-2015.pdf; Financial Report 2008

Table A5: Origin-Destination-Matrix TEU

TO / Total Volume in 1,000 TEU / FROM	Austria	Belarus	Belgium	Bosnia and Herzegowina	Bulgaria	CIS	Croatia	Czech Republic	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Ireland	Italy via AT	Italy via CH	Italy	Latvia	Lithuania	Luxemburg	Macedonia	Netherlands	Norway	Poland	Portugal	Romania	Russia	Serbia	Slovakia	Slovenia	Spain	Sweden	Switzerland	Turkey	Ukraine	United Kingdom	Other Europe	China	Other World	Total
Austria			1.29					5.76				0.42	146.18	9.07	38.05				19.16					3.14	0.61		0.03	7.27				49.55			1.99	16.74		3.45				302.70
Belarus																			0.01																							0.01
Belgium	11.30				1.07	0.14		4.98	0.01		1.08	84.59	42.66	0.06	0.06			131.52	300.12		0.02	23.56		0.23	0.01	13.39	0.01	25.98	0.86			1.00	71.77	52.81	58.82	0.02			0.02		0.29	826.30
Bosnia and Herzegowina																																0.01										0.01
Bulgaria			0.53																								1.63														2.16
CIS																				69.22				0.00		0.03																69.26
Croatia			0.88												1.48							0.01						29.64	0.08		0.86										32.95
Czech Republic	13.91		1.05			0.63					0.97	0.00	420.20		24.49				25.97			0.01		56.77	0.00	205.95					66.20	25.96		0.55							842.66
Denmark	1.85													0.02			26.19																0.08							0.01	28.14
Estonia						1.53																						22.18													23.71
Finland	5.97						0.01							0.09																	0.03							0.02			6.11
France			47.29						0.25		4.08		5.68						116.88			155.66			0.01			31.05				1.52	3.75		15.70		0.83	0.02		0.01	382.73
Germany	122.68	0.92	11.91		0.00	0.21	0.61	239.59	15.72	0.00	4.59	79.69		3.34	138.84		107.01	80.68	840.74		0.02	5.44		549.65	3.21	87.51	0.73	4.01	7.52	0.63	4.58	15.17	82.68	193.88	64.06	9.94			0.01	33.91	2709.49
Greece	7.96		0.25					9.89							5.25								4.12	0.24	0.00						0.10							0.01			27.83
Hungary	42.98		4.44				5.56				0.22	0.37	102.45	5.45		0.06			0.13			0.03		1.08				2.23	0.00	0.03		115.10				41.37	0.01					321.53
Ireland			0.01																																						0.01
Italy via AT						0.02																																			0.02
Italy via CH																								84.50									2.21					4.50			91.21
Italy	11.93		148.54					15.68	28.57		15.75	77.25	459.64	0.04		1.25						15.74		105.15	3.95	1.08		3.20	0.13				6.87	51.31	6.09	0.49		36.00	0.02			988.69
Latvia										1.08																															1.08
Lithuania																			0.05																	59.16				59.21
Luxemburg	0.11		20.35								0.20	23.10	4.54	0.01					15.14						0.01								0.31						0.01	63.73
Macedonia																																									0.00
Netherlands	14.95	0.00	1.27			0.04	0.36	24.10	0.00		1.41	2.99	117.73		8.98		2.36	33.20	63.43		0.01					1.71		1.17	0.38	0.25	4.65	1.86	0.44	37.61	7.87	0.02	0.03		0.04		0.24	327.11
Norway						0.02	0.00								0.47									7.71			0.00	0.04	0.46					50.05							58.75
Poland		0.05						25.09				0.28	72.96		0.00						0.17			43.24					2.23				0.25	0.12							144.40
Portugal											0.10		0.00											0.00									26.83	0.03							26.97
Romania	13.25		19.65		0.24							0.06	1.05									0.14		3.40					9.29								0.12				47.20
Russia								0.31	0.31	17.94			3.70											0.57											0.21							23.03
Serbia							0.30																2.06	0.00							0.21										2.57
Slovakia	46.42	0.30	2.12		0.00	7.58		250.65			0.21		28.81	0.77	30.90	0.00	0.27					0.08		1.63	0.12	0.02			58.98			193.48		0.52		17.95		1.28				642.09
Slovenia	8.09			0.01			0.63	25.52					10.64		64.12				2.84			0.01	0.03		0.02				0.19	65.44										177.58
Spain			32.43						0.06		1.31	20.47	91.70					2.70				0.06		5.78	0.06		35.16						0.00				20.25		0.19		210.18
Sweden	7.09		2.87				0.14							0.01	5.91				9.58									0.04		0.00		1.15	1.92		2.28				0.09		0.01	31.09
Switzerland	18.00					0.19			0.06		1.11	0.02	84.13				4.54							28.13	0.17								0.19	0.11								136.64
Turkey	17.69											0.03							0.40			0.01	2.06															0.00			20.19
Ukraine													0.00																												0.00
United Kingdom								0.12			0.01	0.45	0.00		2.66			28.00										0.02										0.00		0.02	31.27
Other Europe													7.93																													7.93
China																																										0.00
Other World													37.54																					0.11								37.64
Total	344.19	1.27	294.88	0.01	1.32	10.35	7.61	601.70	44.99	19.03	31.04	289.72	1637.54	18.87	321.21	1.32	140.37	276.11	1394.45	69.22	0.22	200.76	8.28	891.21	8.17	309.71	35.93	45.60	162.73	1.18	140.86	404.48	194.69	391.23	141.30	102.24	59.32	66.32	0.20	0.20	34.50	8.704

Table A5: Origin-Destination-Matrix Tonnes

Total Volume in 1,000 Tonnes

FROM \ TO	Austria	Belarus	Belgium	Bosnia and Herzegowina	Bulgaria	CIS	Croatia	Czech Republic	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Ireland	Italy via AT	Italy via CH	Italy	Latvia	Lithuania
Austria			9.71					51.84				4.97	1479.97	0.07	125.77				208.73		
Belarus																			0.06		
Belgium	133.50				13.88	1.72		50.56	0.10		11.57	642.76	448.91	0.60	0.84			1758.03	3802.60		0.10
Bosnia and Herzegowina																					
Bulgaria			1.06																		
CIS																				894.70	
Croatia			8.22												3.71						
Czech Republic	117.90		6.83			5.57					11.38	0.02	3725.94		197.18				355.72		
Denmark	25.88													0.24			314.31				
Estonia						15.86															
Finland	59.66						0.07							1.02							
France			485.47						2.67		43.63		75.84						1536.07		
Germany	1610.10	7.78	111.49		0.04	2.41	7.02	2274.25	152.92	0.06	45.73	636.62		40.30	1502.92		1252.25	1236.25	11655.20		0.06
Greece			2.21					62.10													
Hungary	169.68		49.22				10.01				2.30	4.64	819.97			0.64			1.68		
Ireland			0.00																		
Italy via AT						0.37															
Italy via CH																					
Italy	118.85		1840.87					288.93	364.71		178.41	835.17	5357.34	0.54		15.60					
Latvia										24.23											
Lithuania																			0.71		
Luxemburg	0.83		120.41								2.12	409.35	72.18	0.04					244.31		
Macedonia																					
Netherlands	171.70	0.01	18.72			0.46	4.22	221.60	0.03		15.82	36.19	431.73		97.93		32.82	464.83	864.77		0.08
Norway						0.20	0.03								4.14						
Poland		0.18						196.20				2.72	594.07		0.01						1.73
Portugal											0.90		0.04								
Romania	100.09		186.69		3.54							0.71	11.77								
Russia								5.26	5.26	21.32			38.67								
Serbia							2.09														
Slovakia	332.08	0.94	22.00		0.03	69.98		2331.52			2.63		169.23	4.82	250.10	0.02	3.31				
Slovenia	78.89			0.11			4.72	181.16					44.32		643.28				4.32		
Spain			344.10						0.70		12.78	146.16	1115.14					59.84			
Sweden	77.32		31.20				1.45							0.08	52.39				143.84		
Switzerland	100.76					2.78			0.50		9.78	0.13	1008.26				28.78				
Turkey												0.21							0.98		
Ukraine													0.00								
United Kingdom								1.50			0.07	5.78	0.02		28.13			500.00			
Other Europe													90.80								
China																					
Other World													380.13								
Total	3097.24	8.91	3238.20	0.11	17.49	99.35	29.61	5664.91	526.88	45.61	337.14	2725.43	15864.35	47.72	2906.39	16.27	1631.46	4018.94	18818.99	894.70	1.97

FROM \ TO	Luxemburg	Macedonia	Netherlands	Norway	Poland	Portugal	Romania	Russia	Serbia	Slovakia	Slovenia	Spain	Sweden	Switzerland	Turkey	Ukraine	United Kingdom	Other Europe	China	Other World	Total
Austria			37.97	5.11		0.32					675.84			21.07	0.19		41.07				2662.6
Belarus																					0.1
Belgium	262.67		0.75	0.08	151.73	0.10	306.93	9.03			11.20	1087.99	718.22	545.92	0.10			0.14		2.81	9962.8
Bosnia and Herzegowina											0.01										0.0
Bulgaria							28.37														29.4
CIS			0.01		0.13																894.8
Croatia	0.12							368.41	1.08		5.99										387.5
Czech Republic	0.12		259.93	0.01	1824.02					595.78	228.08		3.05								7331.5
Denmark													0.32							0.06	340.8
Estonia								136.75													152.6
Finland											0.28							0.16			61.2
France	1872.24			0.10				279.89				18.93	40.69		91.26		11.96	0.26		0.09	4459.1
Germany	89.14		5784.08	37.29	680.67	9.93	45.36	80.83	6.53	48.23	258.83	1197.37	2067.54	863.53	106.52				0.09	383.89	32195.2
Greece		51.53	2.47	0.02							0.20						0.16				118.7
Hungary	0.40		10.93				35.71	0.03	0.14		954.16				400.35	0.13					2460.0
Ireland																					0.0
Italy via AT																					0.4
Italy via CH			971.71									36.58					45.00				1053.3
Italy	180.31		1059.90	38.40	15.06		55.59	1.80				89.58	590.91	58.73	6.05		418.44	0.21			11515.4
Latvia																					24.2
Lithuania																709.96					710.7
Luxemburg				0.16									3.39							0.10	852.9
Macedonia																					0.0
Netherlands					13.54		18.13	6.03	3.96	46.61	23.27	6.58	369.15	90.56	0.12	0.37		0.29		2.82	2942.3
Norway			72.20			0.02	0.45	4.94					373.36								455.4
Poland			471.26					24.68				3.18	1.09								1295.1
Portugal			0.01									247.36	0.18								248.5
Romania	1.65		32.11					102.24								1.10					439.9
Russia			8.03											3.50							82.0
Serbia		51.53	0.01								0.36										54.0
Slovakia	0.95		14.64	1.60	0.12			210.54			1440.44		5.72		207.87		12.38				5080.9
Slovenia	0.07	0.09		0.08					1.88	446.93											1405.9
Spain	0.59		66.43	0.66		219.34							0.02				132.02		2.72		2100.5
Sweden							0.35		0.02		11.49	22.33		20.96				0.86		0.14	362.4
Switzerland			262.82	1.45								2.40	1.30								1419.0
Turkey	0.07	25.76																0.00			27.0
Ukraine																					0.0
United Kingdom							0.16											0.01		0.14	535.8
Other Europe																					90.8
China																					0.0
Other World													0.51								380.6
Total	2408.35	128.90	9055.26	84.96	2685.26	229.71	491.06	1225.17	13.61	1137.55	3610.15	2712.29	4175.46	1604.28	812.45	711.57	661.04	1.94	2.81	390.04	92.134

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