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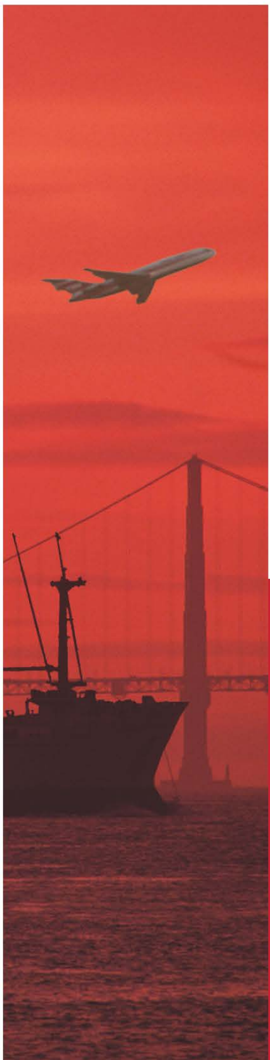

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RESEARCH FOR TRAN COMMITTEE - LOGISTICS IN THE TEN-T CORRIDORS

STUDY

EN

2016

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STUDY

This document was requested by the European Parliament's Committee on Transport and Tourism.

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LINGUISTIC VERSIONS

Original: EN

ABOUT THE PUBLISHER

To contact the Policy Department or to subscribe to its monthly newsletter please write to: poldep-cohesion@europarl.europa.eu

Manuscript completed in March 2016.

Print	ISBN 978-92-823-8825-9	doi:10.2861/020861	QA-02-16-204-EN-C
PDF	ISBN 978-92-823-8826-6	doi:10.2861/341261	QA-02-16-204-EN-N

This document is available on the Internet at:
http://www.europarl.europa.eu/supporting-analyses

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Abstract

This note assesses the status of logistics and the way to achieve a performing multi-modal transport system on the TEN-T core network by making use of/improving existing policy instruments. It shows that interoperability of railways and multi-modal terminals are crucial issues along the nine corridors of the core network.

IP/B/TRAN/IC/2016_030 MARCH 2016

PE 573.429 EN

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LIST OF ABBREVIATIONS

AWP	Annual work programme for TEN-T co-funding
CEF	Connecting Europe Facility
CF	Cohesion Fund
CNC	Core network corridor of TEN-T
CT	Combined transport
ERDF	European Regional Development Fund
GDP	Gross domestic product
EERP	European economic recovery plan
EFSI	European Fund for Strategic Investments
ERA	European Railway Agency
ERTMS	European railway traffic management system
ETCS	European train control system
FTLAP	Freight Transport and Logistics Action Plan
GSM-R	Global system for mobile communications – railways
INEA	Innovation and Networks Executive Agency
ITS	Intelligent transportation systems
IWW	Inland waterways
KPI	Key performance indicator
LGTT	Loan guarantee instrument for TEN-T projects
MAP	Multi-annual programme of TEN-T co-funding
MFF	Multiannual Financial Framework
PPP	Public-private partnership
RFC	Rail freight corridor
RRT	Rail-road terminal
TEN-T	Trans-European transport network
tkm	Tonne-kilometre
VTS	Vessel traffic services
VTMIS	Vessel traffic monitoring and information system

GLOSSARY: THE NINE CORE NETWORK CORRIDORS OF THE TENT-T NETWORK

AT	Atlantic CNC
BA	Baltic Adriatic CNC
MED	Mediterranean CNC
NSB	North Sea-BalticCNC
NSM	North Sea Med. CNC
OEM	Orient-East Med.CNC
RA	Rhine-Alpine CNC
RD	Rhine-Danube CNC
SCM	Scandinavian Med. CNC

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EXECUTIVE SUMMARY

Background and aim

This note provides an overview of logistics in the EU, including its contribution to the objectives of the 2011 White Paper on transport. The note also assesses the way the nine Core Network Corridors (CNCs) of the Trans European Transport Network (TEN-T) foster intelligence of infrastructure, modal integration, interoperability and connectivity, and reviews the interplay between the development of the CNCs and the development of logistics.

Some comments are added on the appropriateness of the CNCs key performance indicators (KPIs), the effectiveness of co-funding through EU funds and the consultation of interested parties.

Findings

Conclusions and recommendations are provided in the final section of the paper. The main points are:

- Achieving the modal-shift objectives of the 2011 White Paper on transport will require more active support from the Member States.
- Successful interoperability requires strategic planning of multi-modal-/rail-road-terminals (RRT). Plans for developing such terminals currently derive from both national master plans and regional initiatives. Consequently, there is a need for streamlining and better coordination within the Member States and between the Member States. In addition, current plans do not consider the structural change of freight transport towards unitised and containerised goods and the synchronisation of milk and main runs.
- The railway sector needs further innovations related to transhipment technology and the coordination/synchronisation of (inter-modal) services to fulfil basic service requirements of industry and trade.
- Parallel activities for CNCs, former "Priority Project" corridors, Rail freight corridors (RFC) and ERTMS development need consolidation.

1 LOGISTICS IN THE EU: DEFINITION, IMPORTANCE AND DEVELOPMENT

As logistics is not an industrial sector defined in national accounts, there are a number of different definitions in existence. In a recent fact-finding study for the Commission, ECORYS et al. (2015, p.23) define the logistics sector as the sector performing services in connection with 'planning, organisation, management, executions and monitoring of company's entire material, goods and information flows (from purchasing, production and warehousing, to added value services, distribution and reverse logistics)'.

On the basis of this definition, the logistics sector would have contributed EUR 878 billion to EU GDP in 2012, i.e. a share of 6.8 % (and 7.6 % in 2010). If the scope of logistics is extended further, for instance by adding postal and courier services, and wholesale and retail businesses (as in Shepherd, 2011, for example), this share increases to 13 %[1]. On the basis of the broadest definition, the logistics sector ranks third in the list of economic sectors.

Freight transport accounts for less than half (44 % in 2012) of the total cost of logistics, while warehousing and order processing show a cost share of 30 %, and capital costs for fixed assets account for 22 %. This is important insofar as public planning activities (including those of the EU) focus mainly on freight transport on publicly provided infrastructure, while the majority of logistics costs are controlled by private actors. Furthermore, the majority of innovations in logistics take place outside pure transportation technologies.

Before the economic crisis of 2008, the hypothesis that freight transport grows significantly faster and passenger transport more slowly than GDP was not challenged. It was initially reasoned that freight transport is highly dependent on trade, which had grown much faster than GDP in the past decades, sometimes by a factor of two or more. The second main argument was that transport intensity (measured in tonne-kilometre[2] per unit of GDP) tended to increase despite more efficient logistics. This was explained by the miniaturisation of transport consignments and higher requirements for synchronised transport with more frequent deliveries (just-in-time, just-in-sequence).

Developments after the crisis have led to this paradigm being rethought. EU GDP recovered slowly and has only recently caught up with 2007 figures (in real terms). The same holds true for passenger transport, which never experienced a dramatic setback. By contrast with these figures, total EU freight transport dropped by 12 % in the first phase after the crisis and has not yet recovered, given that the total tkm transported in 2013 is still 9.4 % lower than in 2007. Over long distances, and in particular in international freight transport, the decrease was even greater. When we look at the averages between 1995 and 2013, GDP increased by 1.6 %, passenger transport by 1.0 % and freight transport by 1.1 % per year[3] (see FIGURE 1[4]).

Although road freight transport was hit heavily by the economic crisis, its modal share remained almost unchanged in the years following the start of the crisis and reached 49.4 %

[1] See the Fraunhofer IIS publication under: http://www.iis.fraunhofer.de/de/pr/2014/20141016_bvl_kongress.html.
[2] A tonne-kilometre (tkm) is a unit of measure equivalent to the movement of one tonne of goods over one kilometre.
[3] EU Statistical Pocketbook, Transport Facts and Figures, 2015.
[4] All figures and tables are in the annex to the note.

in 2013 (up from 45.3 % in 1995)[5]. Meanwhile the share of inland waterway transport remained stable (around 4.4 %) and the railways lost almost 2 % of market share (from 13.6 % in 1995 to 11.7 % in 2013). That negative trend has even accelerated since 2013 as a result of low fossil energy prices, wage cost differentials, strike movements and failure to adjust to market requirements[6].

Against the background of these recent developments, the Commission's 2013 'reference scenario' for 2050[7] assumes that freight transport will grow by 1.6 % p.a. until 2030 and by only 0.7 % p.a. between 2031 and 2050. Road transport is expected to grow by 1.5 % p.a., rail transport by 2.2 % p.a. and inland waterway and short-sea shipping by 1.2 % p.a. While the overall growth of freight transport is much more modest compared with older forecasts, the 'reference scenario' expectations with respect to the future modal split appear very optimistic for rail and inland waterways (IWW) in the light of the fact that the present market trends are negative and no indicators are in sight that would signal a change of trends.

The modal split projections of the reference scenario therefore reflect the politically desired revitalisation of rail and IWW and should be interpreted as political scenario perspectives rather than trends. This is also relevant for the interpretation of the Core Network Corridor study scenarios (briefly discussed in Section 4): all studies assume that the modal share of rail will be at least unchanged in the 'do nothing' scenario; some studies even assume an improvement in rail's share in this case.

[5] Taking account of inland modes only (road, rail, IWW, pipeline), road freight transport's share was 72 % in 2013.

[6] This negative trend is not considered in the Commission's 2015 Fact Finding Studies on Logistics, which use statistics from 2010 and 2012. In the case of the German Freight Rail Company DB Schenker Rail, for example, the year 2012 was its best year ever. Business has been declining since 2012, resulting in businesses carrying out basic restructuring with a view to reducing all loss-making activities and in an effort to reach a recovery in 2018.

[7] http://ec.europa.eu/transport/media/publications/doc/trends-to-2050-update-2013.pdf

2 EU OBJECTIVES FOR FREIGHT TRANSPORT AND LOGISTICS

2.1 White Paper and preparation of mid-term review

Starting from the general goals of increasing competitiveness and reducing the CO_2 footprint of transport, the Commission's 2011 White Paper on transport (COM(2011)0144) lists a number of concrete objectives for optimising the performance of multi-modal logistic chains by making better use of more energy-efficient modes. Those objectives include shifting 30 % of road freight transported over 300 km to rail and IWW by 2030, and 50 % by 2050.

An extensive list of initiatives has been developed in an effort to achieve these goals. It includes creating a workable internal market for rail services and revitalising the railways and their performance for logistics requirements, fostering e-Freight[8], promoting intermodal transport, providing a seamless door-to-door transport service, and establishing a regulatory framework for innovative transport. A basic component is the development of a transport infrastructure that fosters territorial cohesion and removes geographical and national barriers. This implies the accomplishment of the TEN-T core network by 2030 and the TEN-T comprehensive network by 2050 (See Section 3), including the digital infrastructure for an optimal network use by vehicles.

Traditionally, the mid-term reviews of White Papers on transport are less ambitious and more realistic with respect to implementation prospects[9]. The Commission launched a public consultation (2015b) in order to prepare the 2016 Mid-term Review. By and large, the respondents replied that the challenges were well balanced and captured the key issues. However, when it comes to assessing the impact of the White Paper initiatives, the responses are predominantly sceptical. The majority of respondents estimated that they would have a high or even very high impact only on transport safety/security, research and innovation and funding. With respect to the key question of whether the current goals for transport respond to the strategy's overall objective of a more sustainable and competitive sector, only a few respondents agreed. In particular, critical comments were raised with respect to the modal shift sought, which was not regarded as a realistic expectation. One reason given for the lack of success was insufficient support and cooperation from the Member States.

In conclusion, the general goals of EU transport policy are widely accepted, but the feasibility of the implementation of concrete initiatives is also widely questioned. This concerns, above all, policy actions which are intended to correct market failures through direct market interventions, for example by changing the modal split through pricing or regulatory measures. A main goal for developing strategies is therefore to persuade Member States and market players to support the development and implementation of action programmes derived from the White Paper goals, and to enhance cooperation between them.

[8] eFreight supports forwarders through an electronic documentation and information system: no paper document is needed and information on shipping processes is available consistently and permanently in electronic format throughout the whole logistics chain.

[9] See the 2006 Mid-term Review of the 2001 White Paper on transport policy.

2.2 Logistic Action Plan and fact finding studies

In 2007 the Commission worked out a Freight Transport and Logistics Action Plan (FTLAP). The FTLAP includes a list of 34 concrete measures and road maps for improving the EU freight transport system in six areas:

- intelligent transportation systems (ITS) and e-Freight;
- sustainable quality and efficiency;
- simplification of transport chains;
- vehicle dimensions and loading standards;
- green freight transport corridors;
- urban freight transport logistics.

ECORYS et al. (2015) found that the progress made since 2007 in these six areas is remarkable in technical terms. Nevertheless, there are fields in which progress is very slow, starting with the railway sector. Despite all efforts since the first Railway Directive (1991/440/EC), the objective of changing the modal split in favour of the railways is far from having been achieved. On the contrary, the railways have lost market share in freight transport, and medium-term prospects look negative. The relative costs of railway versus road transport are increasing substantially because petrol prices and wages for trucking are going down (the latter because companies are hiring drivers from low-wage countries), while the railway companies are exposed to rising electricity prices and wages and the risk of strikes. Furthermore, shippers require more flexibility and short-run contracting after the economic crisis. This means that the problems besetting EU railways are not only poor infrastructure, fragmented technology and inefficient organisation, but also adverse market trends and, to a certain extent, adverse policy developments.

In 2015 the Commission published four fact-finding studies to analyse the logistics sector further in view of the development of a new strategy. Those studies are:

- Analysis of the EU logistics sector (Lot 1);
- Analysis of EU combined transport (Lot 2);
- Introduction of a standardised carbon footprint methodology (Lot 3);
- Ex-ante analysis of the follow-up of the Marco Polo Programme in the multiannual financial framework (Lot 4).

The available reports for Lots 1, 2 and 3 show that:

- The prospects for logistics development are highly uncertain. The interval of yearly growth rates for optimistic and pessimistic scenarios is between 0.8 % and 2.4 % p.a. until 2030;

- Achievement of the CO_2 reduction target for the transport sector is not impossible, but it requires more consistent avoid, shift and improve strategies[10];
- The strategy of shifting towards rail and water transport is not supported by market trends and would have to be backed by more effective political actions which go beyond improvements in infrastructure, rolling stock and intelligent control technology;
- Innovations in the railway sector have been neglected for a long time. For example, automatic guidance of vehicles can be implemented much more easily on rail than on road and would lead to a leap in efficiency.

The above makes clear that either the assumptions on the future development of freight transport and logistics underlying the TEN-T guidelines from 2013 may have to be reconsidered or that the policies to strengthen the railways' competitive position should be enforced.

[10] **Avoid**: reduce vehicle kilometres by increasing load factors, adjusting vehicle size or changing manufacturing and logistic processes (transport minimising warehousing, on- and nearshoring). **Improve**: use more energy efficient vehicle technology. **Shift**: divert transport from road and air to more energy-efficient and environment-friendly transport modes. The avoid-shift-improve concept has been developed in international research on sustainable transport, see for example International Energy Agency (2013).

3 CORE NETWORK CORRIDORS, RAIL FREIGHT CORRIDORS AND EFFICIENT LOGISTICS

The TEN-T guidelines as defined by Regulation 1315/2013 set a dual structure for transport infrastructure: a 'core network' to be completed by 2030 (50 762 km rail, 34 401 km road and 12 880 km IWW) and a 'comprehensive network' comprising all infrastructure elements of EU relevance to be completed by 2050 (138 072 km rail; 136 706 km road; 23 506 km IWW). Nine 'core network corridors' (CNCs) are the backbone of the core network (CNC features are set out in Table 1). They partially integrate railway corridor concepts such as the 'Rail Freight Corridors' (RFCs, set up by Regulation 913/2010 concerning a European rail network for competitive freight) and the 'ERTMS corridors'[11]. Particular mention of rail is in line with the focus of the CNCs on railway improvements, although all CNCs are multi-modal.

3.1 Intelligent Infrastructure

Increasing the intelligence of transport by combining physical and digital infrastructure and on-board devices will improve capacity, use, safety and reliability of freight transport. The role for the EU to play is not only to support the provision of digital infrastructure, but also to set standards for technology and regulate the market in an effort to preserve competition. Technical and organisational solutions differ according to freight transportation mode. They can lead to innovative ways of using capacity and create feedback between technical progress and advanced logistics technologies.

3.1.1 Road

Advanced digital technology for road transport is subsumed under 'Intelligent Transport Systems' (ITS). This includes:

- traffic management systems, including speed regulation;
- route guidance;
- electronic tolling;
- automatic driving.

In addition to providing standardised ITS, the Commission mentions the objectives of safe and secure parking and availability of alternative fuels. Although non-compliance of national systems with EU targets is relatively high, this seems to have little influence on the efficiency of logistics on roads. Automatic driving will be the next innovative issue, which is promoted by the vehicle manufacturing industry and its electronics suppliers. The role of the EU is to set standards and regulations (for example on guaranteeing transparent rules on insuring automated driving vehicles), as subsidising technological development in this dynamic market will not be necessary.

3.1.2 Inland Waterways and Ports

River information services (RIS) are one of the most important ways of increasing the efficiency of IWW services. They comprise harmonised information services that support traffic and transport management, including interfaces with other modes. The current situation varies considerably from state to state. In some Member States RIS have been implemented on the main waterways (in Belgium and Germany, for example). In other countries, the rate of compliance with EU standards is between 25 % and 50 %

[11] ERTMS: European Rail Traffic Management System.

(Orient/East-Med (OEM) and Atlantic (AT) corridors). For the Rhine-Danube (RD) corridor, the coordinator mentions that RIS services are available but of a different quality. (For further details see: *Project IRIS Europe 3*; Commission 2015d)

Vessel traffic services (VTS) provide safe entry into and exit from ports and manage traffic within straits, coastal and off-shore areas. Vessel traffic monitoring and information systems (VMTIS) extend this service to guiding vessels safely and in the shortest time on routes, and organise the waiting queues at main ports. The coordinator work plans[12] do not mention VTS/VMTIS as the most urgent issues. The reason for this might be that major ports and main carriers already implement VMTIS, so that its further development is driven by private activity, and therefore the role of the EU is predominantly to standardise the technology and communication protocols.

3.1.3 Railways

As the revitalisation of the railways and a change of modal splits are key issues for the EU's sustainable transport strategy, nine rail freight corridors (RFCs) have been defined in the Rail Freight Regulation 913/2010 to foster interoperability, intermodality and cooperation between rail infrastructure managers. The RFCs are integral parts of the nine TEN-T core network corridors. Substantial efficiency gains are expected from common implementation of key performance indicators (KPIs[13]).

EU objectives are strongly constrained by the backwardness and fragmentation of the railway sector with respect to intelligent technology. Therefore, the CNC activities focus notably on the implementation of a common rail operation control system: the ERTMS (European Rail Traffic Management System).

The ERTMS includes the ETCS (European Train Control System) as a signalling and train control system, which combines installations alongside the tracks ('Eurobalise') with on-board units and computer displays inside the locomotives. The ETCS is intended to make train operation more flexible in comparison with traditional train block control. It provides the train driver with a target speed which is optimised by the control centre and transmitted through GSM-R (Global System for Mobile Communications – Railway) signals. The ETCS controls the speed (local max and train max), route, direction, train specification and special operation regulations. It can be developed stepwise into a moving block system (ETCS level 3) which will make the driving cycles much smoother, saving energy and increasing capacity. Increasing capacity depends on the modernisation level of national train control systems. In comparison with modernised block control systems like those on the main corridors in France and Germany, the capacity increase is moderate (less than 10 %). In the case of older block control systems, the capacity increase can reach 40 % (see FhG ISI et al., 2015). Further benefits can arise for the railway undertakings in international transport because as soon as infrastructure and electrical equipment are standardised, train drivers do not have to be changed at borders if locomotives can operate across borders.

ERMTS has been accepted by all the Member States. The development steps of the past included the transition from ETCS Level 0 to Level 2, which is currently the standard and allows for permanent communication between locomotive driver and control ('Radio Block') centre. The next development step is Level 3, which would allow for predominantly automatic and flexible control without fixed blocks. Until now no common standard has been

[12] Coordinators have drawn up a work plan for each corridor to set out the current status of infrastructure, means available and works schedule.
[13] Rail supply-side KPIs: Gauge 1435 mm; 2 Tracks, electrified; Control system with ERTMS; Axle load minimum 22.5 t; Line speed minimum 100 km/h; Train length minimum 740 m.

defined for Level 3, as the Commission, the European Railway Agency (ERA) and the Member States were focused on the implementation of Level 2. Some pilot projects have been started for regional and urban transport (Sweden, Germany). The ETCS Level 2 currently envisaged is defined by the technical specifications of 'Baseline 3', which allow for a relatively cost-efficient upgrade from high-standard control technology, as applied in France, Germany and Switzerland. 'Baseline 3' is downward-compatible in that it allows trains equipped with 'Baseline 1 or 2' to operate on all ETCS-controlled rail tracks.

Because of the importance of this system for the improvement of railway operations, particularly on international routes, the Commission has developed an ERTMS European Deployment Plan (EDP) for the main routes (Commission Decision 2012/88/EU) which now needs to be adapted. For this purpose, the Commission has appointed an ERTMS coordinator (Karel Vinck). In his ERTMS work plan (2015c), the coordinator has mentioned that progress is slower than planned. In some CNCs the compatibility rate is very low, for example, in the Baltic-Adriatic (BA) corridor, where it is only about 7 % (see Table 2). One of the reasons for this is that big countries such as France and Germany – and their rail infrastructure managers – had little interest in investing in ERTMS because they had modernised their national systems. This attitude has changed with the definition of 'Baseline 3' such that several ERTMS projects from these countries appear in the CEF-funded programme[14]. Nevertheless, a number of projects for Germany, the United Kingdom and France have not yet been fully defined and are therefore missing from the ERMTS implementation plans.

As a result, the figures on the total investment needs shown in Table 2 will have to be shifted upwards. They also include a high degree of uncertainty and possible double counting because of overlapping CNCs. However, they make it clear that further substantial acceleration of efforts is needed to achieve the objective of ERTMS completion on the CNCs by 2030, given that the CEF funding decision so far shows less than 10 % of the total ERTMS investments needed, which are listed in a data sheet of December 2014 by the Innovation and Networks Executive Agency (INEA). The ERTMS coordinator proposes a 'breakthrough programme' in his work plan, established on the base of four principles: (1) 'users first' rather than 'designer first'; (2) complete definition of standardised on-board equipment compliant with ETCS Baseline 3[15]; (3) entire priority and focus on deployment; (4) system cost reduction for ERTMS through standardisation of components. Furthermore, the coordinator suggests reviewing the European ERTMS Deployment Plan by the end of 2016 to make sure that the major part of ERTMS implementation is finalised by 2027 and to develop a step-by-step strategy starting with the border-crossing sections. In this context, ERTMS deployment should be facilitated through innovative financial tools, technical assistance and efficient coordination.

Financing ERTMS investments is a major challenge. The Connecting Europe Facility[16] (CEF) expects to co-finance up to EUR 1.1 billion of the 2014-2020 CEF budget at a co-financing rate of 50 %. Only a modest part of this sum was allocated in the first call opened in 2014 (in total EUR 259 million, of which EUR 202 million was earmarked for conventional line equipment), although the first-call spending accounts for more than 50 % of the total sum available for all funding objectives until 2020. It follows from this that the forthcoming calls

[14] The Connecting Europe Facility (CEF) offers funding via a multiannual programme (MAP), which focuses mainly on large projects, and an annual work programme (AWP) via which the budget for the financial period 2014-2020 will be distributed to eligible projects. The first projects for a total amount of EUR 13 billion had been selected by mid-2015 (EC 2015e).

[15] ETCS Baseline 3 is the most recent technical specification set by the European Railway Agency. It allows for downward compatibility, i.e. vehicles equipped with Baseline 3 can also operate on networks equipped according to former specifications (Baseline 1 and 2).

[16] The Connecting Europe Facility is a European fund established for the financial support of the Trans-European Network for Transport, Communication and Energy.

will have to allocate a much higher share to ERMTS investments. The next CEF call, opened in 2015, provides for EUR 200 million in the general call and EUR 200 million in the cohesion call for ERTMS. The ERDF can also contribute, as it will allocate a total of EUR 35-40 billion to transport. At present the extent to which the European Fund for Strategic Investments (EFSI) can support ERTMS is unclear (see section 5). Increasing private contributions through new financial instruments usually requires massive state guarantees, which can be given in part by the Commission and by the European Investment Bank (EIB) (e.g. using project bonds). However, it will not be easy to construct clear business cases for projects including several countries, infrastructure managers and an even larger number of railway undertakings.

3.2 Intermodality and interoperability

3.2.1 Intermodality

While combined transport (CT) in the US increased rapidly after liberalisation through the Staggers Act (1980), development in Europe was very moderate. Railways in the US perform six times as many tkm as in the EU, but GDP and rail network length are rather similar and the rail infrastructure in the US shows poor quality in parts in comparison with the EU KPIs (See Table 6). Factors such as distribution of population, average length of rail transport or the geographical situation allowing for successful competition with maritime transport between the West and East Coasts explain many of the differences, but not all. An important point is the striking efficiency of the US railways en route and at the centres of modal interchange.

Analysis, forecasting and assessment of impact for improvement strategies are most challenging for CT. First of all, there are numerous market segments: (rail/road, IWW/road, short sea/road) X (intra-MS, intra-EU, international) X (accompanied, not accompanied) X (four container types, swap bodies, semi-trailers, complete lorries), which gives 126 supply-side segments that can be used on the demand side for 20 NST[17] commodity groups. Statistics are therefore insufficient and have to be supplemented by field surveys as described in KombiVerkehr et al. (2015), which provide the best available database for the year 2011.

The total EU CT performance for rail and IWW is 125 billion tkm, without road legs, which usually account for 10-15 % of the tkm (see Table 7 and Table 8). These tables show that CT had already recovered from the economic crisis in 2011, but total rail freight transport is still lagging behind. It is also expected for the future that CT will grow faster than average freight transport. KombiVerkehr et al. (2015) forecast average growth rates of 4 % for rail CT and 3.1-4.4 % for IWW CT (see Table 9 and Table 10). In the latter case, the clear dominance of IWW on the Rhine is even extended, i.e. other waterways such as the Danube are not expected to attract much more transport in the future according to trend perspectives. Although CT is expected to grow faster than average, this will not change the general dominance of road transport. Therefore concerted actions in the form of public infrastructure policy, public/private investments in intermodal hubs and private integration of intermodal transport into supply chain management will be needed in order to exploit CT's potential in the EU.

[17] Eurostat classifies commodity groups using the NST system (nomenclature uniforme des marchandises pour les statistiques de transport: standard goods classification for transport statistics). The first order of classification includes 20 groups.

The CNC studies mention a large number of rail/road terminals (RRT) and rail/IWW terminals that are of poor quality, for example 10 RRTs in the case of Spain and 5 RRTs in that of France in the MED corridor with track lengths between 320 and 400 m only.

Table 3 shows that the CEF allocations in the recent first call for intermodal terminals are comparatively modest, comprising EUR 47 million to subsidise project costs of EUR 122 million, while a lower band of cost estimates for terminals along the CNCs amounts to EUR 3 400 million. The budget provided in the next CEF call is only EUR 40 million.

The information given in the CNC studies and INEA documents on multi-modal and RRT projects is very varied (column 5 of Table 3). The RRT plans mentioned in the studies have been taken from national plans without further investigation. Their number is consequently very large (about 200) and it is highly probable that only a subset of them need major upgrading for integrated and synchronised logistic chains with high transport volumes. The extent to which the planned investments in multi-modal terminals and RRT will reduce the cost of transhipments of containers and unitised cargo is not analysed in the CNC studies or other related documents.

In the course of work plan preparation for the CNCs, working groups for RRT development have been established, and they are trying to coordinate the RRT investment plans. This task has, in our view, three dimensions: RRT locations and design, train operations and future technological development.

The first dimension calls for the construction of a hierarchy of RRTs. Only RRTs with high volumes of transhipment need massive EU support for the purpose of improving (for example, automated) handling technologies. Partly existing marshalling yards can be changed into railports, i.e. into transhipment centres which can also be used for multiple units of cargo. The second dimension calls for efficient operation of freight trains between large freight centres or railports on the basis of fixed timetables, in an effort to improve reliability and synchronisation and to save costs. This can be paired with auctioning of free train space and presupposes flexible market strategies for regular and casual customers. It includes the operation of half or part-block trains in EU corridors for which a recomposition at particular freight centres in the EU does not require costly marshalling operations. The third dimension makes evident that the present technologies are not sufficient to meet the market requirements. Large automated container transhipment hubs are a backbone of this strategy, but they need to be paired with new technologies for small- and medium-sized freight centres. Currently only France (Modal-Ohr system) and Germany (Cargo Beamer system) have started pilot projects for testing new technologies which do not require very expensive and area-wide unified equipment.

Certainly progress towards the above three dimensions requires further competition policy decisions, for example, whether large and efficient freight hubs are defined essential facilities or not. These problems will have to be discussed in the next round of work plan development and are most important for the prospects of combined transport, which needs to be pushed to achieve much higher growth than the current trend development; otherwise the objective of substantially improving the modal shares of rail and IWW cannot be achieved.

3.2.2 Interoperability

The fragmentation of the European railway systems has been a predominant issue for EU transport policy in the 25 years since Directive 1991/440 EC was published. Six different standards for electrical power supply, four standards for pantograph profile, three gauge standards, 20 regulations for train lengths and 16 train control systems, along with a variety of standards for container fixing, loading gauges, speeds, axle loads, noise protection equipment and driver education have caused massive problems in international rail transport. Efforts to develop a common standard for train control (ETCS) have been mentioned in section 3.1.3. The fourth Railway Package includes a number of measures to further harmonise vehicle technology and organisation under coordination of the ERA. In the past, harmonisation progress was very slow, not only because of the rather complex problems to be solved, but also because of missing national governments and incumbent railway company incentives.

As a result, it would be necessary to agree on a framework on *innovative railway operation and regulation* which is consistent with the infrastructure investment plans to make use of the better infrastructure.

3.3 Connectivity with adjacent networks

The core network and its nine corridors represent the backbone of EU high-standard transport infrastructure. The core network is linked to the comprehensive network, which features minimum infrastructure standards and should allow for smooth access to CNC network nodes. In the case of freight transport, this includes access to ports, RRTs and urban networks. In the case of railway freight, a long discussion has been going on about the need for sidings to link industrial production directly to the railway network. But this strategy is only financially viable for large companies with a high volume of cargo, such as energy power plants, the chemical industry and very large manufacturers (such as the automobile industry).

For the numerous small- and medium-sized companies, this is not a viable option. Modern logistics involve collection and distribution by milk runs and consolidation at freight centres from which main runs with high-capacity vehicles (e.g. heavy goods vehicles (HGVs), trains and barges) to the freight centres close to the destinations are organised. This means that for the last mile of collection/distribution services, there may be problems with road quality and parking space, but these local problems can be solved by agreements between local authorities and the companies concerned. Optimisation of milk runs and logistic processing technology is for private initiatives, which can be channelled by providing local infrastructure for freight villages and cross-docking stations. It does not require concerted EU actions beyond general support for traffic management systems and standardised electronic road pricing. Furthermore, financial support through new instruments such as project bond finance can be considered.

The rail connection of airports (in passenger transport) or ports (in freight transport) is one of the key issues of the guidelines. While the latter is a reasonable strategy for large ports, it needs to be checked in detail for medium-sized ports. For example, on the Atlantic corridor, the ports of Nantes and La Rochelle are being considered for a rail connection. A careful economic and environmental assessment is necessary because rail transport is only financially and environmentally viable for busy nodes which allow for frequent full trains. The operation of short feeder service trains to marshalling yards is neither economically nor ecologically advantageous if the present railway operation technology continues to be used in the future. The connection of nodes with lower transport volumes may only become advantageous if feeder services can be at least partially automated.

4 CORRIDOR AND LOGISTICS DEVELOPMENT, APPROPRIATENESS OF TEN-T GUIDELINES

All core network corridor (CNC) studies include a multi-modal transport market study which describes the current market situation for the different transport modes and their development in the future. As no standards and no common template have been defined, the information given in the market studies varies widely. These studies can be categorised into three types (see Table 4).

(1) The study applies a comprehensive integrated transport analysis/forecast or summarises previous studies such as to give consistent aggregate results on freight transport performance (tkm) for a base year, a scenario without major changes (a 'do nothing' baseline), a scenario with planned projects up to 2030 (work plan) and a scenario with the work plan plus additional policy measures to support the market position of railways. Only three out of the nine CNC studies fall into this category and provide sufficiently comparable results.

(2) The study is based on previous studies for the priority projects under the 2004 TEN-T guidelines or for the rail freight corridors and gives partially comparable results on freight transport development and the modal split. Nevertheless, the study presents a good baseline for integrated transport forecasting and assessment. This holds true for three CNC studies.

(3) The study is compiled from the consortium partners' knowledge base and unconsolidated data from corridor countries which are not based on comprehensive analysis and forecasting. In particular, the most expensive corridor, the Scandinavian-Mediterranean (SCM), is in this category, as are the Rhine-Danube (RD) and North Sea-Baltic (NSB) corridors. The authors stress the risk of generating results which deviate from national forecasts and could contradict national investment plans[18]. While the SCM and RD studies can be regarded as good baselines for integrated forecasting and assessment, the NSB study is of poorer quality and requires basic revision.

Most of the studies that apply integrated transport forecasting show moderate total freight traffic growth in the countries concerned, following the Commission's trend scenario (1.6 % growth on average up to 2030; see section 1). For the corridors, cross-border and long-distance freight transport, the projected growth rates are much higher and may be about twice the average. In most CNCs, road transport is currently by far the dominant transportation mode, accounting for up to 85 % of the freight transport market. However, there are also strong rail corridors, such as the NSB (45 % modal share). The forecast for the NSB indicates that it will be difficult to preserve this high railway share in the future, as in countries such as the Baltic States and Poland, the full potential of the road mode has not yet been exploited because of backlogs in road infrastructure. The Rhine-Alpine (RA) corridor is dominated by inland waterways (IWW) because more than 70 % of EU IWW transport is carried on the Rhine. Railways will be able to improve on their market position because of the New Railway Link through the Swiss Alps (NEAT). No aggregate forecasting figures are given for the SCM, NSB and RD corridors. Link loads have been partly projected on the basis of national projections. The RD corridor study refers to a study on the former 'Priority Project 22' which forecast extremely high volume growth in the corridor (up to 5.27 % per annum

[18] 'Finally, the mandatory usage of national forecasts and infrastructure investment plans determined the content related frame of the MTMS (multi-modal transport market study) and the approach.' (SCM Study, p. 240). Other CNC studies, such as the Baltic-Adriatic (BA) CNC, do not mention a 'mandatory usage of national forecasts' and present a comprehensive forecasting approach.

(p.a.)). However, despite these very optimistic prospects, the study expresses some reservations with respect to railway investments between Sofia and the border with Greece because freight transport is very low in that area and there is little hope of a substantial increase.

In our view, four challenges remain for the further work on CNCs : (1) A comprehensive transport analysis and forecast is necessary for all CNCs, applying harmonised assumptions and methods, as well as common templates for the results. It has to be questioned whether an investment programme of more than EUR 600 billion, with probably more than EUR 200 billion of EU co-financing, should be based on disparate national forecasts and project lists. An integrated approach for all CNCs is also needed because of the many overlaps between corridors and the considerable variation in national forecasts. (2) The size of the projects planned by Member States has to be re-assessed. Several CNCs include branches with very low freight transport, which implies that it might not be necessary to introduce the full level of infrastructure key performance indicators (KPIs) until 2030. (3) A priority list of actions is necessary with a view to bringing together the expected demand development, infrastructure projects, changes in control and management technology and logistics potential. The European Rail Traffic Management System (ERTMS) and efficient rail-road terminals (RRTs) are undoubtedly the most urgent issues and should be treated accordingly in the forthcoming Connecting Europe Facility (CEF) allocations. However, as regards the development of RRT or trimodal terminals, the coordination of investment is recommended. (4) The demand and supply side statistics should be unified so that progress can be observed and hot spots identified more easily. It was already suggested in other studies for Parliament (Schade et al., 2014, 2015) that dossiers for corridors and projects should document the progress in a harmonised way. The variation in the figures shown in Tables 1 to 4 makes it clear that this is an urgent issue.

5 ROLE OF EU FUNDS: CEF, ERDF AND EFSI

The investment needed to complete CNCs amounts to about EUR 623 billion, of which at least EUR 467 billion still needs to be invested. The most 'expensive' corridor is SCM, at about EUR 130 billion, while the Orient / East Med (OEM) corridor 'only' requires about EUR 43 billion. The total number of projects exceeds 2 700 (Table 5 and Figure 2).

With the allocation of EUR 13 billion under the first CEF call, the main CNC works can progress into 2016 and beyond. This fits with the analysis that the biggest financial challenges to the implementation of the core network are expected in the first five years, starting with about EUR 30 billion in 2015 and reaching a peak in 2020 of about EUR 45 billion p.a. This implies huge financial efforts by Member States and the EU; indeed a high-level group is proposing to develop new financial instruments to enlarge the funding base for transport infrastructure (Christophersen et al., 2015). This indicates that there could be reasonable doubts that EU and national government funding will be sufficient to implement the core network by 2030.

The funds for motorised transport under the MFF (Multiannual Financial Framework) for 2014-2020 provided by the ERDF (European Regional Development Fund) amount to EUR 68 billion (Schade et al., 2015). Presuming that the CEF and the ERDF will continue to provide financial support at a similar level and that the ERDF will focus funds on the CNCs, average EU co-financing of about 30 % could be reached (50 % co-financing for ERTMS), excluding the additional 'new' financing instruments, which include the Loan Guarantee Instrument for Trans-European Transport Network Projects (LGTT) and the Euro Bonds Initiative. As the investment programme focuses in particular on cross-border and railway-oriented projects with high European value, the revenues from project investment will be too low to justify public–private partnerships (PPPs) with considerable private finance. Therefore a blend of different instruments may offer a promising solution, as has been suggested by the Christophersen Group (2015). A major improvement in the funding situation is possible through 'concession-like' and 'investment fund'-based financial schemes. Concession-like schemes work like private concession finance but integrate major public contributions to pay back interest and amortisation for the capital used: for example, PPP models based on availability criteria instead of project revenues. The disadvantages might be that such schemes conflict with the consolidation issue for public budgets in accordance with the Stability and Growth Pact. Switzerland is applying the most radical investment fund scheme, which begins with a long-term investment plan and constructs a financial plan with mixed public and private sources stemming from earmarked shares of fuel taxes and road tolls for passenger cars (vignette) and HGVs (distance-based user charges). While it is unlikely that such a scheme can be applied throughout Europe, consideration could be given to adding environmental charges to user charges for the transport infrastructure and assigning the revenues to CNC projects which support environmentally-friendly transport modes.

The establishment of the CEF has substantially streamlined the funding of TEN-T programmes, as the budget has increased from EUR 8 billion (plus EUR 1.6 billion from the European Economic Recovery Plan) in the 2007-2013 MFF to EUR 24.05 billion in the 2014-2020 MFF, including the Cohesion Fund (CF) share of EUR 11.2 billion. The main funding objectives are the accelerated improvement of railways (co-funding 30 %, ERTMS 50 %, innovative technologies 50 %) and inland waterways and, above all, removing bottlenecks at border crossings (co-funding: 40 %) and improving intermodality by RRT and interoperability by ERTMS. Countries eligible for CF funding can receive up to 85 % co-financing from the CEF and 75 % from the ERDF.

The European Fund for Strategic Investments (EFSI), established in November 2014 by the Commission and the EIB, is designed to overcome investment weaknesses in the EU. It is equipped with EUR 21 billion and is intended to have a 15-fold leverage effect in an effort to generate investments to the tune of EUR 315 billion. EUR 2.2 billion has been transferred from the CEF, EUR 5 billion has been provided by the EIB and EUR 16 billion has been taken from the MFF. The extent to which EFSI can accelerate the CNC implementation plans remains to be seen. This would presuppose that more than EUR 2.2 billion is re-allocated from EFSI to transport investments. But it is doubtful that a leverage factor of 15 will be achieved with CNC projects which form part of the core CEF funding and will not generate high financial revenues in the short and medium terms. Therefore, the aim of mobilising private finance for infrastructure projects can only be achieved with mixed finance schemes which include massive state contributions and/or cross transfers from road to rail/IWW. Successful mixed financial schemes such as the Oeresund fixed link between Sweden and Denmark or, more recently, the PPP for the high-speed rail (HSR) link between Tours and Bordeaux are individual cases against a background of several hundred projects which will have to be financed over the next 15 years.

6 CONSULTATION PROCESSES

Corridor forums have been established to take up suggestions from major stakeholders such as associations, non-governmental organisations, railway companies, consultants and representatives of the Ministries of Transport in the Member States. These forums are an appropriate place to discuss multilateral implementation problems which are then worked on further by the CNC coordinators. Against the background of the adverse market trends for transport modes, the discussions should also extend to national policy measures to support rail and waterways. Several countries (such as Bulgaria) are experiencing a rapid decline in their railways because they have neglected rail in the past decade in favour of road investments supported financially by the ERDF and the EIB. To shift the trend towards the desired direction, there is a need for a concerted policy by the EU and the Member States. Otherwise, the huge CNC investments of more than EUR 620 billion will only provide some positive multiplier effects through construction work, but no long-term increases in terms of productivity and the environmental quality of freight transport.

7 CONCLUSIONS

With reference to the title of the 2001 White Paper on transport, one can conclude that it is time to decide whether the ambitious goals of the 2011 White Paper and the targets set in it should be revised, or whether a new action plan should be developed to include more stringent policy measures in favour of rail and inland waterways transport, flanked by **more active support from Member States and intensified cooperation between them**. For the revision of the work plans for CNCs (planned for 2016 and 2017), the following recommendations are given:

(1) The **prospects for freight development will have to be revised**. The forecasts for the growth of freight transport in the CNCs are too optimistic in some cases (Orient/East-Med, Mediterranean). In other cases, no comprehensive forecasts exist (SCM, North Sea-Mediterranean), or they are taken from previous PP or RFC studies with contradictory results (RD, NSB).

(2) The **design of investment will have to be adjusted to the forecast traffic loads**. In several cases there is a risk of over-dimensioning capacity (OEM, RD, AT). Adjustment to all KPIs (e.g. speed, two tracks, train length, etc.) is not required for sections with low traffic volumes. The regulation allows for exceptions from the standard KPIs in 'duly justified cases'. A lifecycle assessment of projects with regard to their long-term economic and environmental performance is recommended in the interest of avoiding investment failures.

(3) **Interoperability is a very urgent issue**. Implementation of ERTMS is lagging way behind. This holds true above all in countries like Germany, France and Italy that have strong incumbent rail companies, but the UK is also far behind plan. A priority plan should be developed by the ERTMS coordinator and co-financing should be extended in the next calls for CEF funding.

(4) Intermodality presupposes the proper design of transhipment nodes and freight centres. The current work plans for RRT in CNCs are derived from both national master plans and single project promoters and need streamlining and better coordination. They do not consider the structural change of freight transport in favour of unitised and containerised goods and the synchronisation of milk and main runs. **RRT needs to be prioritised, but the plans also need streamlining**. An informed decision should be taken **as to whether major hubs should become essential facilities,** and therefore publicly financed, or should remain under the control of large railway or forwarding companies, thereby strengthening an oligopolistic market with fewer opportunities for SMEs.

(5) The **railway sector**, which is at the centre of core network investment activity, **needs further innovations beyond supply-side and vehicle-related changes**. This includes transhipment technology and the coordination/ synchronisation of services to fulfil the basic service requirements of industry and trade.

(6) The organisation of regular consultation with major stakeholders (corridor forums) and the establishment of corridor coordinators are successful steps towards moving all national participants towards a European horizon of integrated and environmentally sustainable freight transport. However, the coordinators seem to see their role primarily as one of promoting their own CNC projects in terms of CNC implementation, and not of providing a realistic assessment. **Streamlining of over-designed projects and the modification of overly ambitious KPIs in sections of low demand** are challenges that are being neglected in current work plan preparations.

(7) Communications would benefit if the documents were more transparent on corridor facts and findings, and on forecasts and project analyses. There are currently considerable discrepancies in data and these should be harmonised in the course of updating the work plans. **Parallel activities for CNCs, former PP corridors, RFC and ERTMS development also need to be consolidated**.

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ANNEX: FIGURES AND TABLES

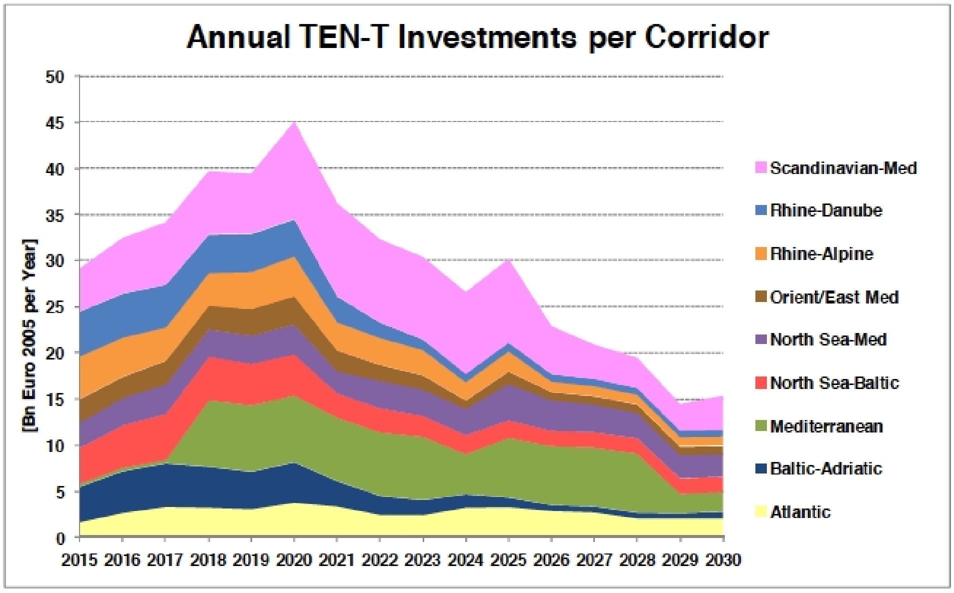
FIGURE 1: Annual growth Rates EU Passenger and Freight Transport, 1995-2013

ANNUAL GROWTH RATES EU-28

	1995–2013 p.a.	2000–2013 p.a.	2012–2013
GDP at year 2000 prices and exchange rates	1.6 %	1.2 %	0.0 %
Passenger transport (pkm)	1.0 %	0.6 %	1.1 %
Freight transport (tkm)	1.1 %	0.5 %	0.1 %

Source: EU Commission: Facts and Figures, 2015c

FIGURE 2: Annual TEN-T Investments per Corridor, in Billion Euro



Source: EC/Fraunhofer-ISI

Source: FhG ISI et al., 2015

Table 1: Main Characteristics of the Core Network Corridors

Core Network Corridor	Alignment from-to	Length	Countries Involved	Characteristics
Baltic Adriatic (BA) RFC 5	Gdynia/Gdank – Koper/Trieste	2,400	AT, CZ, IT, PL, SI, SK	Connects Baltic ports in PL with ports to the Adriatic Sea. Core urban nodes: 14; Maritime ports: 8; IWW ports: 5; RRT: 20
North Sea-Baltic (NSB) RFC 8 ERTMS F	Helsinki/Talinn-Hamburg/ Antwerp	3,200	BE, DE, EE, FI, LV, LT, NL, PL	Connects Baltic ports in FI/EE with North Sea ports. Core urban nodes: 17; Maritime ports: 12; IWW ports: 13; RRT: 15
Mediterran-ean (MED) RFC 6 ERTMS D	Algericas-Budapest	3,000	ES, FR, IT, HR, HU, SI	Links ports in the south western Mediterranean region to the Ukrainian border. Core urban nodes: 14; Maritime ports: 4; IWW ports: 9; RRT: 19
Orient-East Med (OEM) RFC 7 ERTMS E	Hamburg/Rostock - Burgas/Patra/Igoumenitsa	5,900 rail 5,600 road	AT, BG, CZ, DE, EL, CY, RO, SK	Connects central Europe with maritime interfaces of North, Baltic, Black and Mediterranean seas. Core urban nodes: 15; Maritime ports: 12; IWW ports: 10; RRT: 25
Scandinavian Mediterran-ean (SM) RFC 3 ERTMS B	RU border/ Helsinki-Berl-in-Palermo/ Valetta	9,300 rail 6,300 road	AT, DK, DE, IT, MT, FI, SE	Links urban centres in Germany and Italy to Scandinavia and the Mediterranean; Core urban nodes: 18; Maritime ports: 25; IWW ports: 6; RRT: 44
Rhine-Alpine (RA) RFC 1 ERTMS A	Genova-Amsterdam/ Zeebrugge	2,450	BE, DE, FR, IT, LU, NL CH	Connects North Sea ports to the Mediterranean basin. Core urban nodes: 13; Maritime ports: 8; IWW ports: 22; RRT: 20
Atlantic (AT) RFC 4	Algeciras/ Sines/Lisbon - Bilbao-Paris-Mannheim/-Strasbourg	4,500	DE, ES, FR, PT	Links Iberian Peninsula to Mannheim/Strasbourg via Paris. Core urban nodes: 8; Maritime ports: 8; IWW ports: 5; RRT: 21
North-Sea-Mediterran-ean (NSM) RFC 2, 6 ERTMS C	Belfast/Glasgow Rotterdam-Basel Antwerp-Paris	n.r. Longest CNC	BE, IE, FR, LU, NL, UK	Connects British Isles with continental EU via North Sea ports. Core urban nodes :17; Maritime ports: 17; IWW ports: 6; RRT: 11
Rhine-Danube (RD) RFC 9	Strasbourg-Stuttgart/Regensburg-Vienna-Budapest/Costanta	2,700 Black Sea br. 1,150 CS br.	AT, BG, CZ, DE, FR, HR, HU, RO, SK	Links regions alongside the Main and Danube rivers to the Black Sea. Core urban nodes: 12; Maritime ports: 1; IWW ports: 19; RRT: 17

RFC: Rail Freight Corridor
RRT: Rail-Road Terminal
ERTMS: European Rail Traffic Management System Corridor
Sources: Work plans of CNC Coordinators (EC 2015a), CNC Studies (2014), Corridor Descriptions (2013)[19].

Note: Most recent published data have been selected. Length data can relate to corridor length or to network length, or are absent. Further characteristics can be found in Schade et al. (2016).

[19] ec.europe.eu/transport/facts-funding/tenders/specifications/2013-appendix 1- corridor descriptions

Table 2: Status of ERTMS in CNCs: planned projects and funds allocated

CNC	Deployment of ERTMS	Cost Projects 2014-2020	CEF Allocation 2014-2020*	Total Inv. Cost -2030 mill. EUR
BA	Not deployed apart from one section in Austria. PL: until 2030 CZ: until 2024 SK: until 2019 AU: until 2024 SI: 2015 IT: no date			854
NSB	In operation on 8% of total length of rail tracks of NSB. NL: 75%, whole corridor until 2030 BE: 32%, whole corridor until 2030 DE, PL: whole corridor until 2030 Rail Baltic: mid-2020s Impl. - 30			1,501
MED	Deployed on HSR in Spain and Italy Average compl. : 13%. ES: 25% FR: 2% IT: 13% SK, CR, HU: 0% Impl. - 30	64	5	3,338
OEM	Deployment on corridor: 14%. Use for operation: 10% 5074 km not compliant. Impl. - 30			499
SCM	Low rate of ERTMS implementation ("Patchwork") except for AU and DK. Impl. - 30	309	19	1,375
RA	ERTMS deployment: NL: 49.8%; BE: 18-4%; DE: 0%; FR: n.r.; CH: 15.5%; IT: 0% Total corridor: 12.3%. Impl. -30	197	54	1,724
AT	ERTMS operational: DE: 0%; FR: 6%; ES: 11%; PT: 0%; Total corridor: 7%. Impl. - 30	190	22	580-2820**
NSM	LU completed; BE up to 2022; UK and FR: no compliance. For UK rolled out for 50% until 2030; NL has started a programme for deployment. Impl. - 20	154	56	318
RD	Some line sections in AU and HU; Further sections in RO and CZ in testing operation. Impl. - 19	54	46	504
Various	Country related, incl. several CNC, Locomotive equipment, small Projects. Estimates.	150	n.r.	150
Total		1,118	202***	10,843-13,083

* First call allocation; total allocation foreseen to ERTMS: 1.1 billion EUR until 2020.
** For 4 Portuguese projects an interval of 50-500 EUR is given
*** Without studies and HSR investments. Total ERTMS MAP CEF allocated: 258.6 mill. EUR (EC 2015e)

- 2nd column: info from ERTMS coordinator's report, 2015
- 3rd column: info from CEF brochure, (EC 2015e)
- 4th column: info from INEA data sheet on CNC innovations and terminals, 12/2014

Table 3: Multi-modal logistic platforms (investment in million EUR)

CNC	Countries with multi-modal projects in CNC project list	Cost projects in project list	CEF allocation 2014	RRT projects Numbers and/or cost
BA	AT, IT, SK, SL	>520		22% of projects multi-modal; SK: 33.1; AT: 375.5; SL: 45.0 mill. EUR
NSB	FI, NL, PL	>105		RRT Terminals mentioned in CNC studies: 37
MED	ES, FR, IT	>390	26.1	RRT Terminals mentioned in CNC studies: ES: 10; FR: 5
OEM	AT, BG, CZ, DE, EL, SK	>640	2.1	3 out of 77 RRT under design in EL and SL
SCM	AT, DE, FI, IT	>350	3.4	16 RRT; DE: 10; IT: 3; SE: 1; DK: 1
RA	BE, DE, IT, NL	>370	2.0	13 multi-modal projects. 7 for RRT (out of 59 RRT); cost m-m. projects: 9.92; RRT: 0.37 bill. EUR
AT	ES, FR	>650	13.6	DE: 1; FR: 27; ES: 27; PT: 7
NSM	n.a.			10 multi-modal; FR: 9 (166 mill. EUR); NL: 1 (76 mill. EUR)
RD	AT, BG, DE, RO, SK	>440		Projects: DE: 4; AT: 4; BG: 1; SL: 1
Total		>3 455	47.2	

Sources: own compilation based on EC (2015e); CNC Studies (2014)

Table 4: Aggregate results of CNC freight market studies (2010-2030)

CNC (Type of Market Study)	Growth of Corr. Freight Transport 2010-30 (%)	Road Modal Split Do nothing/ All CNC compl. (%)	Rail Modal Split Do nothing/ All CNC compl. (%)	IWW Modal Split Do nothing/All CNC compl. (%)
BA (1)	33 total (tkm)	81/76	19/24 total 39/43 long distance	n.r.
NSB (3)	34 corr. (tkm)	30.5/32.0	45.2/46.0	24.3/22.0
MED (2)	75.7 corr. (tons)	85.4/72.9 w.o. sea (tons)	14.6/27.1-29.4 (tons)	n.r.
OEM (1)	97 corr. (tkm)	70.2/66.8	27.1/31.3	2.7/1.9 (trend)
SCM (3)	tons 2010 corr.	16.8/	39.3/	59.7 sea transport
RA	98.5 corr. (tons)	28.8/27.4	20.5/22.3	50.7/50.3
AT (1)	39 total tkm 68 cross-b.	73.5/71.2 national level	19.4/21.7 n.l. (4.9/6.0 cross b.)	7.0/7.1 n.l.
NSM (2)	Doubling in FR, NL, +10% in UK	79.3/ (without sea)	10.5/	10.2/
RD (3)	From PP22: 100.7-180%%	58/country gr. rates 1-4.5%	28/country gr. rates 1-4.6%. much lower in RFC 7, 9 studies	14/av. 3.3% p.a. f. Danube river

Source: own compilation based on CNC Studies (2014); Work plans of Coordinators (EC 2015a; taken in case of biases)

Table 5: Investment for Core Network Corridors

CNC	Total Investment	Investment 2015-2030
Atlantic	56,136	45,003
Baltic-Adriatic	52,784	37,366
Mediterranean	91,101	76,951
North Sea-Baltic	60,001	46,777
North Sea-Med	73,993	47,923
Orient/East Med	42,739	27,673
Rhine-Alpine**	61,203	42,869
Rhine-Danube	55,051	37,524
Scandinavian-Med	130,400	105,503
Total	***623,409***	***467,589***

*** includes investments made by Switzerland* *Source: EC/Fraunhofer-ISI*

Source: FhG ISI et al., 2015

Table 6: Rail Freight Transport in the EU and the US, in 2011

Indicator	Unit	North America	EU
Area	million km^2	22	4.3
Population	million	467	504
Population density	people per km^2	21	117
Gross Domestic Product	$ trillion	18.1	16.5
Rail network size	thousand km	223	239
Rail freight traffic	**bn tonne-km pa**	**2,501**	**419**
Road freight traffic	bn tonne-km pa	3,626	1,519
Rail mode share (of total road/rail)	% total tonne-km	41%	22%
Rail freight average length of haul	km	1,475	375
Rail freight average train payload[26]	tonnes	3,209	510
Intermodal units moved by rail[27]	**million TEU**	**28.7**	**17.2**

Source: KombiVerkehr et al. (2015)

Table 7: Volume of Rail Container Transport in the EU, 2007-2011

		CT market segment			
		Intra-MS	Intra-EU	International	Total
Transport volume (TEU)	2007	3.186.600	4.764.400	9.117.900	**17.068.900**
	2009	2.814.300	4.327.300	7.427.400	**14.569.000**
	2011	3.218.100	4.856.200	9.133.500	**17.207.800**
Tonnes lifted (gross tonnes)	2007	31.050.000	59.262.000	91.871.000	**182.183.000**
	2009	26.824.000	53.777.000	75.556.000	**156.157.000**
	2011	33.261.000	60.356.000	92.142.000	**185.759.000**
Tonnes moved [a] (bn tonne-km)	2007	16	50	46	**112**
	2009	14	45	39	**98**
	2011	17	51	47	**115**

a Estimates, distance only relates to rail journey

Source: KombiConsult analysis

Table 8: Volume of IWW/Road Transport in the EU, 2007-2011

CT market segment	Transport volume (TEU)	Units	Tonnes lifted (gross tonnes)	Tonnes moved [a)] (m tonne-km)
Intra-MS	430.000	286.000	860.000	104
Intra-EU	1.007.000	656.000	7.801.000	1.828
International	3.714.000	2.454.000	39.209.000	8.438
Total	**5.151.000**	**3.396.000**	**47.870.000**	**10.370**

a Estimates, distance only relates to inland waterway journey

Source: KombiConsult et al. (2015)

Table 9: Forecast of Combined Rail Transport in the EU until 2030

CT market segment	Volume 2011 (m TEU)	"Performance" 2020 (m TEU)	"Performance" 2030 (m TEU)	"Performance" CAGR (%)	"Complacency" 2020 (m TEU)	"Complacency" 2030 (m TEU)	"Complacency" CAGR (%)	"Trend" 2020 (m TEU)	"Trend" 2030 (m TEU)	"Trend" CAGR (%)
Intra-MS	3.2	5.0	8.1	5.0%	3.8	4.7	2.0%	4.2	5.7	3.0%
Intra-EU	4.9	8.2	14.7	6.0%	6.1	7.8	2.5%	7.2	11.2	4.5%
International	9.1	14.8	25.3	5.5%	11.9	16.0	3.0%	13.0	19.2	4.0%
Total	**17.2**	**28.0**	**48.1**	**5.5%**	**21.9**	**28.5**	**2.7%**	**24.4**	**36.1**	**4.0%**

Source: KombiConsult analysis

Table 10: Forecast of Combined IWW Transport in the EU until 2040

CT iww/road	Transport volume (m TEU) 2011	Growth p.a. until 2020	Transport volume (m TEU) 2020	Growth p.a. 2020 - 2040	Transport volume (m TEU) 2040
Total	**5,2**	**2,8% – 4,4%**	**6,6 - 7,6**	**3,1% – 4,7%**	**12,2 – 19,0**
by inland waterway corridor					
Rhine	4,0	2,8% - 4,8%	5,2 – 6,1	2,8% - 4,8%	8,9 – 15,6
North-South	1,3	3,0% - 3,7%	1,8 – 1,9	4,5% - 5,5%	4,2 – 5,5
East-West	0,1	1,8% - 3,7%	0,2	2,1% - 3,7%	0,3 – 0,5
Danube	0,02	2,2%	0,02	2,0%	0,03

Source: PLANCO analysis based on NEA/Panteia et al.

CAT: QA-02-16-204-EN-C (paper)
CAT: QA-02-16-204-EN-N (pdf)

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PHOTO CREDIT: iStock International Inc., Photodisk, Phovoir

ISBN 978-92-823-8825-9 (paper)
ISBN 978-92-823-8826-6 (pdf)

doi:10.2861/020861 (paper)
doi:10.2861/341261 (pdf)

Publications Office