ERRAC WORK PACKAGE 02: Encouraging modal shift (long distance) and decongesting transport corridors

Draft Freight Roadmap

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EXECUTIVE SUMMARY

The roadmap has been driven by EU transport policies, which call for a significant shift of freight transportation from road to rail if Europe is to deliver on the stated goal of a 60 per cent reduction of green house gases by 2050, and by the customer requirements. Stakeholder consultations in workshops and interviews with operators, shippers and infrastructure managers show that price, reliability and volume/destination adaptability are the main drivers behind freight customer's choice of transportation mode.

Improved reliability and competitiveness in a very regulated and complex environment cannot be obtained without addressing all the technical parameters of rail freight. New business models that integrate rail seamlessly in the supply chain and which use existing technologies in a smarter way or which capitalise on innovations are necessary for shifting more freight to rail.

As a train is composed of locomotives, wagons, drivers, running on tracks managed by infrastructure managers, it is necessary to analyze the possible efficiency improvements of each of these factors:

- Better wagon design for all type of services and reduced maintenance costs
- Efficient interfaces with other modes in the various categories of service offered
- Track maintenance
- Traffic management improvement to boost punctuality, reliability for the trains and capacity for the network

After addressing these technical matters it is important to address the rail system in order to create a network effect by:

- Developing flexible local distribution with specialized operators
- Developing interoperability
- Developing cross border information systems
- Harmonising safety rules to create a seamless network

The commercial and marketing issues must be addressed in terms of:

- Enlarging the variety of services offered to open new markets or reopen markets lost to road
- Efficient organization of co-modality which satisfies customer requirements of goods being delivered on time, in full and without damage
- Delivering adequate and reliable information to clients in real time
- Interconnecting clients' and operators' computer systems to facilitate tendering, contracting, informing and invoicing
- Integrating rail in the logistics supply chain
- Using spatial planning in order to enable traffic bundling, thereby ensuring more productive rail transportation

Important drivers such as energy efficiency and CO2 emissions reduction must be tackled across all the items listed above.

It is essential to achieve significant improvements in all of the above mentioned areas in order maximise net revenue and bring costs into a competitive arena with road freight.

The roadmap particularly stresses two complementary strands of development:

- Longer, commercially faster heavier trains to achieve transport industrialization
- Fast, flexible novel freight trains that can seamlessly interleave with passenger trains and provide service offerings tailored to capture until now unexploited market segments of lighter and more valuable goods

Train services must satisfy customer requirements on reliability, service quality and security.

Wagon load traffic still has a significant market share in some markets. In addition to the above mentioned strands, rail must make the necessary commercial, operational and technological improvements in order to make wagon load traffic a viable proposition.

1. PRESENT SITUATION
1.1 Scope of the Freight Roadmap

The scope of the Rail Freight Roadmap is to identify technologies and systems that will provide seamless and efficient door-to-door transport for goods and thereby satisfy the market's needs. It requires knowledge gaps to be identified – and prioritised so that research can be initiated that will facilitate efficient integration of rail with other modes in order better to meet customer needs. It should build upon and exploit the inherent advantages of rail as the most sustainable transport mode.

The Freight Roadmap is a deliverable from the ERRAC Working Group II "Encouraging modal shift and decongesting transport corridors". Based on today's situation the roadmap identifies major gaps which can be bridged by technical and logistics research in order to move the rail freight business towards achieving the stated ERRAC objectives of doubling the freight volumes by 2020

1.2 Overview

1.2.1 Rail's present position

Europe is in the middle of a transition from an industrial into a service-based economy. The traditional major bulk and low value cargo traffic are decreasing. New types of traffic are growing, particularly time sensitive logistics traffic requiring flexibility and reliability along complex supply chains. It is not that modern logistics requires short transit times- the shipping routes from Asia to Europe are not fast- but they demand a reliable and flexible service which can be monitored as required. These developments are penalizing the rail freight mode which traditionally was synonymous with large heavy bulk traffic flows.
Rail freight service quality must improve significantly if it wants to capture greater volumes of the cargo market, either in co-modal cooperation with or in competition against other modes of transport.
The market segments from which rail freight has been absent for decades are numerous and well identified. They represent a market opportunity for rail freight to grow. Increased traffic congestion on roads and the pressures favouring use of reliable and environmentally friendly transport modes provide the necessary incentive. However the central issues remain. Rail Freight must improve its overall performance in transporting smaller consignments, providing reliable transit times, handling specialized transport segments, automated tracking and tracing, delivering greater flexibility, price competitiveness, service quality and emergency response in case of incidents. Rail freight has also a unique opportunity to exploit its "transport industrialisation" potential, something that is particularly valuable at times of growing infrastructure congestion. It should not be assumed that a single solution will be appropriate as the needs of the market vary: a multiplicity of solutions is needed, some of them being radically different from some others, just as road transport utilises 3.5t light vans for some purposes and 44t trucks for others. One of the promising options for shifting more goods to Rail is by making Rail freight more attractive at regional, spatial and urban planning level. Logistics at high material flow locations (like distribution centres) have to consider more seriously the integration of Rail freight at planning level. As in any industrial process, interfaces play a key role

and careful attention needs to be given to improving performance at those points where different processes or modes meet (transfer between trains, handling in terminals…). Consideration is being given to the reintroduction of more and smaller storage and distribution facilities in order to make the system more robust.

Europe today relies on road-based distribution. Road accounts for over 70% per cent of land transport inside the EU. Not surprisingly, road congestion is growing to unacceptable levels. The congestion cost is often underestimated but is stated as around 0.5% -1% of EU GDP[1]. Statistics do not take into consideration both the remedial measures necessary for maintaining logistics chain reliability and the external costs for the citizens. Road will continue to be the dominant mode, with an infrastructure that interlaces urban centres, manufacturing districts and with a flexibility that cannot be realistically matched. What is required is a co-modal approach where each mode can play to its strengths and be developed in a sustainable way and competitively both separately and together. Rail needs to be an integrated partner in supply chains, bringing its strengths alongside maritime, road, air and inland waterways; competing and co-operating where appropriate, often at the same time.

Customers' requirements for transport value chain are:

- Price competitiveness for the rendered service products on sale.
- Volume adaptability
- Seamless International services.
- Frequent point-to-point services at scheduled times.
- Consistent performance.
- Reliable delivery times.
- Easy transport accessibility both physical and commercial.
- Wagons and intermodal unit availability with designs suited to customers' needs.
- Technology tools for cargo integrity and location provision, including automatic tracking and tracing.
- Emergency response in case of incidents.
- Direct ITC connectivity.
- Ability to handle less-than-Train-Load consignments and introduction of SLA (service level agreements)
- Private sidings and support facilities.
- Co-operative approach
- Harmonization of the transport documents processed by IT systems and in real time
- A faster response to queries
- Efficient connection to freight centres in or near airports

1 EU White Paper on Transport 2001 COM(2001) 370

1.2.2 Rail's market share

Total inland freight transport[2] in the EU-27 was estimated to be close to 2 200 000 million tonne-kilometres (tkm) in 2009; a little over three quarters (77.5 %) of this freight total was transported over roads in 2009 (see Table 1). The relative importance of road freight transport, as a share of total inland freight transport, rose by 3.8 percentage points between 2000 and 2009. The volume of inland freight transported by road was a little over four times as high as the volume transported by rail (16.5 % of inland freight transported in the EU-27 in 2009), while the remainder (5.9 %) of the freight transported in the EU-27 was carried along inland waterways. A break-down of the data into freight types and distances will show that rail, in some relations and market segments, has a high market share. The new transport White Paper[3] states that a significant shift from road to rail and inland waterways (more than 50 %) for medium and long distances must be achieved if EU is to comply with the targets for reduced green-house gas emissions from transport by 60 % to 2050.

1.3 Policy drivers

The overarching policy drivers are formulated in the EU 2020 growth strategy. EU is to become a smart, sustainable and inclusive economy which delivers on employment, productivity and social cohesion. Looking forward to 2050, the European Commission's Transport White Paper, 2011 identifies a set of policy initiatives that, taken together, attempt to reconcile the demand for increasing mobility with the need to cut greenhouse gas (GHG) emissions drastically and to promote Europe's independence from oil whilst alleviating worsening congestion. It charts a route towards a more sustainable future with the majority of goods transferring from road to rail and other greener transport modes. This implies a massive shift in individual behaviour and in the way that our society manages its logistics.
Rail currently has a share of around only16% of the inland freight market (measured in tonne kilometres)[4]. In contrast, road transport accounts for over 70% of all freight-tonne kilometres. If rail is to live up to the White Paper's aspiration that, together with inland waterborne transport, it should be attracting the majority share of medium to long distance haul by 2050, the European rail system must be capable of attracting and handling a significant increase in traffic volume.

[2] Source Eurostat. Data from September 2011.
[3] COM(2011) 144
[4] Source: *EU Transport in Figures, Statistical Pocketbook 2011*, tables 2.2.2 and 2.3.2.

The scale of the change required is accentuated by projections for growth in the overall volume of freight that will require transporting by 2050: volumes are projected to increase by more than 80%[5].

This challenge is daunting as well as exciting for the rail sector as it seeks to ensure the means with which to attract, manage and retain these new volumes of demand and still remain safe. Translating these high level objectives to the transport business means significant reductions of its environmental impact whilst at the same time promoting industrial competitiveness, integration of regions and the functioning of a single European market. A cut of transport-generated GHG emissions generated by 2050 means that rail must assert itself as an indispensable mode for medium-to-long-distance freight movements. This can only be achieved by inventing new business models, a continuing effort to harmonize rules and regulations governing cross border rail operation, bridging of technology gaps that puts rail at a competitive disadvantage vis-à-vis other modes and a reduction of system costs i.e. investments, renewal, maintenance and operation costs of infrastructure and rolling stock.

1.4 The project process and the Strategic Rail Research Agenda and Rail Route 2050

The FP7 project ERRAC Roadmap started on 1st June 2009. Its purpose is to follow through on the ERRAC Strategic Rail Research Agenda [6]. Inevitably the vision for the future railway is not fixed. The impact of climate change, energy costs, road congestion and global competition for the railway supply industry are to be evaluated and the vision and technical strategy are to be modified.

The impact of completed and on-going projects within the EU Framework Programme and national programmes changes the definition of research needs. These factors have been reflected in a recent ERRAC publication, *Rail Route 2050: the sustainable backbone of the Single European Transport Area*. *Rail Route 2050* provides an initial update of the ERRAC vision for railway research and innovation, projecting it to 2050.

[5] Source: Commission Staff Working Document accompanying the White Paper, SEC(2011) 391 final
[6] Strategic Rail Research Agenda www.errac.org

As part of the Roadmap process, open workshops have been held on a biannual basis by all work streams to ensure that the widest range of opinions and knowledge sharing are available for inclusion in the developed maps. The process aimed to:

- Define the updated vision for the future railway
- Develop the technology requirements to deliver the vision
- Examine past and current research projects to identify gaps in the research strategy for delivering these technology requirements
- Propose projects to deliver the research agenda in a logical sequence and timescale

Interviews among shippers, infrastructure managers, rail operators and intermodal operators in the spring of 2010 were also conducted. The interviews showed that reliability, competitiveness (price) and volume/destination adaptability are decisive for freight customer's choice of transportation mode.

The long-term framework for the SRRA sets out seven research priority areas. What follows relates directly to the work of that part of WP02's remit which was concerned with freight matters.

1.5 Legislative background

1.5.1 Railway packages

In order to address the decline in rail transport the commission launched proposals in 1988 to make existing legislation more effective. The council adopted what were to be called the first "rail infrastructure package" in 2001. It is based on provisions of the Railway Directive 91/440/EEC from 1991. The package consists of the following three directives:

- Directive 2001/12/EC clarifies the formal relationship between the state, the infrastructure manager and the railway undertakings
- Directive 2001/13/EC sets out the conditions for freight operators to be granted a license to operate services on the European network
- Directive 2001/14/EC defines the framework for charging and capacity allocation

This first railway package is currently the subject of a significant legislative recast with the aim of strengthening its provisions and enforcement.

In 2002, the European Commission proposed a new set of measures (known as the "second railway package") aimed at revitalising the railways through the construction of an integrated European railway area. Adopted in 2004, the second railway package consists of three directives and one regulation for the creation of the European Railway Agency situated principally in Valenciennes (France). It introduced

common procedures for accident investigation and established Safety Authorities in each Member State.

- Directive 2004/51/EC (revision of directive 91/440) opens up both national and international freight services on the entire European network from 1 January 2007
- Directive 2004/49/EC (the railway safety directive) lays down a procedure to obtain a safety certificate for every railway company to run on the European rail network
- Directive 2004/50/EC (on interoperability) harmonises and clarifies interoperability requirements
- Regulation 881/2001 sets up the European Railway Agency to coordinate groups of technical experts for the purpose of having common solutions on safety and interoperability

The third railway package adopted by the EU in March 2004 contains directives for opening up international rail passenger services within the community from 2010 and the introduction of a certification system for train drivers. The directives that concern freight the most in the third railway package are:

- Directive 2007/59/EC introduces conditions and procedures for the certification of train drivers (and crews) operating locomotives and trains.
- Directive 2007/59/EC sets up the allocation of infrastructure capacity and the charging system for using the railway infrastructures. I also envisages opening the market for international passenger services to competition from 1 January 2010.

A fourth railway package with the aim to further improve efficiency and quality of rail services is currently being discussed. The adoption of this new set of legislation is foreseen by the end of 2012.

1.5.2 Additional relevant policy documents and directives

EC COM(2009) 279 final COMMUNICATION FROM THE COMMISSION A sustainable future for transport: Towards an integrated, technology-led and user friendly system.

The rail (freight) sector is affected by several of the headlines of the 2009 Communication, for instance Environmental challenges, Increasing scarcity of fossil fuels, Smart prices as traffic signals, How to accelerate the transition to a low-carbon society and Governance through effective and coordinated action.

The rail sector's development through a range of EU initiatives and legislation is also pointed out and keeping the EU at the forefront of transport services and technologies is stressed in various ways;

- A well maintained and fully integrated network

- "Soft infrastructures", like intelligent transport systems for road (ITS[10]) and traffic management systems for rail (ERTMS[11])
- Logistics operations using synergies between sea and rail and/or river also have great potential for development
- An intelligent and integrated logistic system must become a reality, where development of ports and intermodal terminals is key element

Research as such, apart from what it is inherent in the bullet points above, is not mentioned in this communication, however.

EC The quality of rail freight services COM(2008) 536 final

In March 2004 the EC adopted a proposal for a Regulation on compensation in cases of non-compliance with contractual quality requirements for rail freight services. (COM (2004) 144 final).

For several reasons, including opposition from the rail sector the 2004 proposal is now withdrawn. However, the communication stresses the importance of improving rail freight quality, especially punctuality and reliability. The development of tools for measuring the performance of rail freight is mentioned. The Commission reserves the right to submit a new proposal for a Regulation if the development of rail freight so requires.

Regulation (EU) No 913/2010 of the European Parliament and of the Council of 22 September 2010 concerning a European rail network for competitive freight.

This regulation aims to develop a European rail network for competitive freight by establishing rules for the creation and organisation of international rail corridors for competitive rail freight. Nine initial cross-frontier freight corridors must be made operational by November 2015.

For each freight corridor, EU countries must establish an executive board, made up of representatives of the EU countries' authorities and each corridor will have a management board made up of representatives of the infrastructure managers. This will draw up an implementation plan which includes an investment plan, the measures foreseen to implement the corridor and the main elements of a market study. It will also set up an advisory group composed of managers and owners of the terminals of the freight corridor and another advisory group composed of railway undertakings interested in the use of the freight corridor.

The management board shall jointly define and arrange international prearranged train paths for freight trains to offer journey times corresponding to the needs of the freight operators.

The management board will establish or designate a joint body to provide authorised applicants with a single place to both request and receive answers relating to

[10] COM(2008) 886 and COM(2008) 886/2.
[11] COM(2005) 903.

infrastructure capacity for freight trains crossing at least one border along the freight corridor. This "one-stop shop" will take decisions regarding applications for pre-arranged train paths and the reserve capacity for international freight trains. Any applications which cannot be met by the one-stop shop will be forwarded to the competent infrastructure managers, who will take a decision on the application and communicate this decision to the one-stop shop for further processing. During times of traffic disturbance different types of traffic will receive priority in accordance with pre-determined rules..

Although research is not specifically mentioned in the Regulation it places particular emphasis on the importance of providing freight transport services under good conditions in terms of commercial speed, journey times and reliability, passing easily from one network to another. The new corridors are to be integrated into the TEN-T network and with the ERTMS corridors. The development of inter-modal terminals is regarded as necessary to support the corridors together with the development of interoperable systems and measures to increase the capacity of trains themselves. Effective train planning systems are accorded particular importance in achieving high levels of reliability, punctuality, capacity utilisation and flexibility. All these considerations are likely to give rise to significant R&D demands.

This approach is reflected in the revised plans for TEN-T that the European Commission published in 2011. This aims to create an EU-wide transport infrastructure, focussed on transport modes such as rail that are less polluting, by removing bottle-necks and providing missing links to create a series of multinational 'core' network corridors by 2030. A larger, high-quality and high-capacity, 'comprehensive' network is planned for completion by 2050. Core network airports will be connected with the rail network, usually with high-speed rail services, while all core seaports will be connected to the rail freight and, where possible, inland waterway system. The revised plans were accompanied by the unveiling of the associated financing facility which is designed to mobilise private financing in order to gain maximum leverage from EU funding – the Connecting Europe Facility.

Communication of 18 October 2007 from the Commission: Freight Transport Logistics Action Plan COM (2007) 607 final

Although principally concerned with Road freight and transport logistics policy focusing, on the planning, organisation, management, control and execution of freight transport operations in the supply chain there is an intermodal dimension to this Communication with implications for Rail freight.. It follows the previous Communication on Freight Transport Logistics in 2006.

It emphasizes the role for advanced information and communication technologies (ICT) and their potential contribution towards co-modality by improving infrastructure, traffic and fleet management, facilitating a better tracking and tracing of goods across the transport networks and better connecting businesses and administrations. The Commission proposes to develop a plan for the implementation of e-freight, which consists of a paper-free, electronic flow of information, including the ability to

track and trace freight along its journey across different transport modes. The practicality and affordability of this will be improved by emerging technologies such as radio frequency identification (RFID) and the use of the Galileo satellite positioning system. In future this could lead to an "Internet for cargo" where information would be securely available on-line.

The Commission proposes to establish a set of generic performance indicators for freight transport logistics chains, which would not only be useful for encouraging service quality but also to measure environmental and social impacts. This would encourage more efficient and sustainable forms of transport and generally improve transport logistics performance.

The Commission argues that lack of knowledge of the benefits of alternative modes of transport, integration between transport modes and the additional costs of transhipment could all be reasons why multimodal freight transport is still relatively underused. This could be changed with the promotion and exchange of best practice and the provision of practical assistance.

The simplification of exchanges of freight-related information, by creating a 'single window' access point and a 'one stop shop' for administrative procedures in all transport modes is thought likely to reduce the cost of compliance with regulatory requirements for the logistics industry. A single transport document for all carriage of goods on any transport mode could facilitate multimodal freight transport. The Commission therefore plans to examine the possibilities and added value of this document.

Transport corridors are marked by a concentration of freight traffic between major hubs and by relatively long distances of transport. Green transport corridors would reflect an integrated transport concept where short sea shipping, rail, inland waterways and road complement each other to enable environmentally friendly transport options. The Commission proposes to reinforce green corridors within the Trans-European Transport Network and the Marco Polo programme, as well as to cooperate with authorities and freight transport logistics operators in order to identify improvements to ensure adequate infrastructure for sustainable transport.

Freight transport logistics has an essential urban dimension. This communication therefore suggests reinforcing the freight part of the CIVITAS Initiative towards an improved integration between passenger and freight transport and between interurban (long-distance) and urban transport logistics.

EC Second (RMMS) report on monitoring development in the rail market COM(2009)676 final

- This report is not part of the European Legislation as such but Directive 2001/12/EC[12] obliges the EC to monitor developments thorugh a Rail Market Monitoring Scheme (RMMS).

[12]Section Va of Directive 2001/12/EC of the European Parliament and of the Council of 26 February 2001 (OJ L 75, 15.3.2001) amending Council Directive 91/440/EEC on the development of the Community's railways.

In brief this report points out that although the drop in rail's market share seems to have levelled out in recent years there are still concerns about financial performance, great differences in access charge levels and service quality. The report also highlights the rail sector's quality problems.

1.5.3 Technical Specifications for Interoperability - TSI

Technical specifications of interoperability (TSI) are made according to the EU Directive 2001/16/ED of the European Parliament. Each of the railway subsystems (or part of it) is covered by these specifications in order to ensure the interoperability of the rail system in Europe and to meet the essential requirements (safety, reliability and availability, health, environmental protection, technical compatibility). All EU-members are obliged to implement these specifications. Most of them have already made different deployment plans for different TSIs. The structure of a TSI is as follows:

- Description of its intended scope of the subsystem
- Definition of the essential requirements for this subsystem and its interface vis-à-vis other subsystems
- Establish the functional and technical specifications to be met by the subsystem and its interfaces vis-à-vis other subsystems
- Determine the interoperability constituents and interfaces covered by European specifications, including European standards, which are necessary to achieve interoperability within the trans-European conventional rail system
- State, in each case under consideration, the procedures for the assessment of conformity or suitability for use.
- Indicate the strategy for implementing the TSI. In particular it is necessary to specify the stages to be completed in order to make a gradual transition from the existing situation to the final situation in which compliance with the TSI shall be the norm;
- Indicate, for the staff concerned, the professional qualifications and health and safety conditions at work required for the operation and maintenance of this subsystem, as well as for the implementation of the TSI.

The table lists the most relevant TSI's for the roadmap.
TAF-TSI, OPE-TSI and WAG-TSI will be discussed further. The remaining TSI's listed below are considered in other work packages but included here for the sake of clarity.

TAF-TSI Telematic applications for freight service	Common standard to increase operability through integrated information systems. Applications for freight services, including information systems (real-time monitoring of freight and trains), marshalling and allocation systems, reservation, payment and invoicing systems, management of connections with other modes of transport and production of electronic accompanying documents. The implementation is not yet done, it is still too early to measure the effect.
WAG-TSI Rolling stock- freight wagons	Structure, command and control system for all wagon/train equipment, current-collection devices traction and energy conversion units, braking, coupling and running gear (bogies, axles, etc.) and suspension, doors, man/machine Interfaces and passive or active safety devices. This TSI is oriented to the new, upgraded or renewed freight wagons placed in service after entering this TSI into force.
OPE-TSI Operation and traffic management	The procedures and related equipment enabling a coherent operation of the different structural subsystems, both during normal and degraded operation, including in particular training and train driving, traffic planning and management. The professional qualifications which may be required for carrying out cross-border services.
INF-TSI Infrastructure*	The track, points, engineering structures (bridges, tunnels, etc.), associated station infrastructure (platforms, zones of access, including the needs of persons with reduced mobility, etc.), safety and protective equipment.
ENE TSI Energy**	The electrification system, including overhead lines and on-board parts of the electric consumptions measuring equipment.
CCS TSI Control command and signaling	All the equipment necessary to ensure safety and to command and control movements of trains authorized to travel on the network.
Maintenance *	The procedures, associated equipment, logistics centers for maintenance work and reserves allowing the mandatory corrective and preventive maintenance to ensure the interoperability of the rail system and guarantee the performance required. This TSI have high speed trains in focus.
NOI TSI Noise*	This TSI covers noise, includes limits for stationary noise, starting noise, pass-by noise and driver's cab interior noise, emitted by convectional rail rolling stock.

*Covered by ERRAC WP 5, **Covered by ERRAC WP 1

TAF-TSI stands for *technical specification for interoperability relating to the telematics applications for freight subsystem of the trans-European conventional rail system.*

The TSI contains standardizations for integrated information and communication system that plays an important part for a coherent system through the trans-European conventional rail system. The standardizations will guarantee a consistency of rail interoperability by providing a set of centralised services. The TSI is regulated for the EU-members, but there are also possibilities for non-EU members to adapt the new system. The consequence for this is that the regulation is not mandatory for freight transport arriving from or going to a non-EU country.

To make sure that the implementation will be efficient, a Strategic European Deployment Plan has been developed. The Railway Undertakings and Infrastructure Managers have been contributing to the deployment plan by providing information about the existing individual telematics applications for freight that has often been implemented according to national market requirements. The realisation of the requirements is not a completely new system but it is rather based on changes, upgrades or functional enlargements. There is possibility for different kinds of local information system features such as security level or design. The information in the database should only be written once, to avoid multiple manual data.

The regulation of the railway system by the TSI is associated with costs for implementation of the standardized system. There are synergies (cost-savings) from developing a seamless information service across the whole trans-European rail system. A seamless information service would enhance the performance of rail freight transport and help maintain and expand its market shares.

There are connections between the TAF-TSI and OPE-TSI. It is therefore important to consult the body in charge of the related TSI if it there are changes in one of them that affects the other.

Implementation of this TSI is coordinated by Infrastructure Managers and should be finished by 2014.

OPE-TSI stands for *technical specification for interoperability relating to the 'operation and traffic management' subsystem of the trans-European conventional rail system*

To implement the TSI the EU-members must draw up a national implementation plan, at the latest 31 December 2012. This will contain information about human factors associated with operating the line, the operating and safety elements of each line and whether the implementation would be for all lines or for only specific lines. The implementation can't be fully integrated until the hardware has been harmonised. The specifications is relating to staff, trains and train operations.

The TSI main goal is to get a comprehensive regulation that prevents incidents and accidents to happen. Most of the requirements in OPE-TSI relate to processes and procedures, there is also a couple of physical elements that needs to be regulated. Some of the regulation to ensure safety is:

- Drivers Rule Book (to describe the set of common rules and procedures valid across the TEN)
- Route Book (to inform drivers of any changes to the line)

- Specific indication on trains will be at the front and rear of the train.
- The signals on the line will be placed to be observable by the driver.

WAG TSI stands for *technical specification for interoperability relating to the rolling stock – freight wagons subsystem of the trans-European conventional rail system.*

WAG TSI defines more detailed specifications for freight wagons which travel on European railway networks. It includes the structure of the vehicles, braking equipment, coupling and running gear (bogies, axles etc.) suspension, doors and communication systems as well as the procedures for maintenance work allowing the mandatory corrective and preventive maintenance to assure safe operation and the performance required.
The main idea is that WAG TSI replaces the previous regulation about using wagons in international traffic (RIV).

The application of this TSI is limited to wagons with a maximum operating speed lower than or equal to 160 km/h and a maximum axle load lower than or equal to 25 t. The TSI applies to wagons which are intended to be operated on one or more of the following nominal track gauges: 1435 mm, 1524 mm, 1600 mm, 1668 mm. These limitations are made according to possibilities and technical solutions which are in use today. These limits will probably increase in the future because of new technical solutions which will come. That's why it is very important to be aware of fact that this TSI is changeable and to really change it when it is needed.

The rolling stock, in this TSI, consists of the freight wagons which travel on all or part of the trans-European conventional rail network and the freight wagons designed to carry lorries.

The TSI applies to new, upgraded or renewed freight wagons placed in service after its entering into legal force. It doesn't apply to wagons being subject to a contract already signed before the date of entry into force of this TSI. It is understandable that it wasn't possible to ask for already existing wagons to be reconstructed in accordance with this TSI. Because of this the first effects of implementation of this TSI can't be expected for many years. That can cause many critics and many unfulfilled expectations.

The implementation of the TSIs must take into consideration the overall migration of the conventional rail network towards full interoperability. In order to support this migration, the TSIs allow for staged, gradual application and co-ordinated implementation with other TSIs. This TSI shall be implemented in close co-ordination with the Noise TSI.

Some remarks

The implementation of TSIs is one of the most important things which have happened to the European railways. The disadvantage of the system is that it is costly, may require organizational changes and takes time to implement while the effects are often not immediately visible. The high costs for certification of innovative new technologies or improvements are also something which needs to be addressed.

More standardization will open up the market for new suppliers of railway materials and allow for a more industrialized production which is necessary in order to drive down the costs.

European rail freight must improve its track record on meeting the customer needs in the areas of reliability, cost, transit time and shipment information delivered through IT systems. Technical specifications of interoperability are one of the measures which will contribute to make rail more efficient and reliable.

1.6 Scarcity of infrastructure funding

The cost of providing the infrastructure necessary to match the growing demand for transport across all modes is estimated to be over € 1.5 trillion between 2010 and 2030 – of which rail will require the greater share if Greenhouse Gas (GHG) reduction targets are to be achieved[13]. It is likely to be increasingly difficult to find this money from the public purse without significant economic growth. The cumulative effect of competing demands of ensuring adequate welfare for an increasingly ageing population and the likelihood that excise duties will fall as reliance on gas and diesel powered transport declines means that ever more innovative methods will be required to reduce costs and secure new sources of finance. A number of private public partnership schemes in different member states and innovative leasing arrangements have already demonstrated the sector's capacity to tap new sources of international funding. Sale of the 30-year concession that manages High Speed 1 Limited, the 109km high speed line between London and the Channel Tunnel, attracted investments of €2.5 billion by Ontario Teachers' Pension Plan along with Borealis Infrastructure, the infrastructure investment arm of OMERS Worldwide, one of Canada's largest pension plans. The European rail sector has gained access to a major new funding source which may in time be replicated by even more substantial deals in other European states.

2. MEGATRENDS

ERRAC WG 02 identified a number of mega trends. The most relevant for the Rail Freight Roadmap are indicated below.

- E-27 economic growth leads to increased transport demand (freight and passenger)

  The continuing integration of the European economies following the EU enlargement is resulting in factories delocalisation. Products and components up to final products assembling can be carried out where economic conditions are most favourable. Logistic chains become more complex coupled with and increased transport demand.

[13] Source: Commission Staff Working Document accompanying the White Paper, SEC(2011) 391 final

- Urban expansion requires effective transfer/distribution terminals

  The population around bigger cities in many European countries is growing creating highly dense populated areas. This development impacts the consumption patterns of these regions with significant logistic system consequences. The emergence of distribution centres and logistic villages supplying the inhabitants of these cities is becoming a common denominator. Often these facilities are placed outside the inner core of these cities. It is of paramount importance that these facilities are properly planned to cater for existing and future logistics needs and for this purpose proper railways connections and accessibility must be provided.

- Information technology enables planning towards shorter lead times

  ICT technology offers big opportunities for improved planning processes facilitating total logistics chain management between the raw material procurement to the products manufacturing and ultimately up to storage and distribution to final customer. The technological progress of intelligent and management tools offering real time information is in continuous evolution.

  Interchangeability of data is a key need. The ability to plan and execute freight transport seamlessly irrespective of mode with a unique report to the various authorities will be a key enabler for increased efficiency, competition, and sustainability in logistics. Rail needs to deliver integration into the emerging E/Freight interoperability seen in Freightwise, SMART-CM, INTEGRITY, EURIDICE and Freight as well as global initiatives by GS1 and the US DOT. It is not necessary to abandon rail based systems, but rather to develop efficient interfaces allowing planning and executing seamless transports.

  Rail needs to address the need for a single transport document and as such needs to join the debate over liability in such a document. This discussion is global since trade is global.

- Globalization leads to more international trade

  The trade between Asia and Europe is expected to grow. This trend is likely to continue in the foreseeable future. China and South East Asia have become the manufacturing facilities of many consumer products. The trade globalization and the increasing economic activities in these areas of the world will affect the European ports and the overland Road and Rail infrastructures.

  European imports of goods have created congestion in the NW European ports of Antwerp and Rotterdam and on their hinterland connection. This is also a problem for Hamburg, Bremen etc. Growth, and also proximity of consumption centres, suggests that rail needs to address the South East of Europe where goods may well be better imported (after passing the Suez Canal) and also where internal EU delocalisation and growth is happening and likely to continue (Hungary, The Balkans, Romania, Bulgaria).

- Environmental consciousness leads to transport efficiencies

  Higher capacity utilization, effective terminal operations and more suitable units/vehicles/wagons will lead to a lower environmental impact improving the profitability of the logistics business. The railways have a significant potential in exploiting the new potential services demand.

- Increased production of higher valued products

  The manufacturing industry is expected to increase its production for higher technological components. The fields likely to be positively affected are electronics, telecom, machinery, pharmaceuticals and other finished products. Chemicals, paper, food and beverages, consumer goods, steel, furniture, construction materials, etc will continue to constitute the bulk of the transported goods in Europe in the coming decades both measured in weight and value.

- Specialisation leads to bigger production units and centralized depots

  There is a clear trend towards specialisation and use of large scale production units located in places where competitive production costs can deliver a competitive advantage. The individual production units get fewer and bigger. The transports are evolving from a non industrial concept into more industrialised logistic solutions. Outsourcing of whole logistic chain is becoming common place. Transportation is becoming more and more part of such logistic solution. The central distribution depots are becoming fewer and bigger. Railway terminals, freight villages and hubs have to take into consideration this new situation. The hub and spoke model is discussed. It is also necessary to address the move to smaller consignment sizes and the use of transport to replace inventory.

- Increased competition and liberalization of the European railway market with higher emphasis on rail and sea.

  Freight deregulation is a reality. According to DB Netz there are more than 350 rail operators on the German network. The European Commission and the emerging regulations are in favour of modal shift from road towards rail and sea. All these modes of transport can interface each other in strategic nodal points or hubs. Each modality is asked to deliver its best performance in order to contribute to a true European co-modality system.

- Changes in tariffs and regulations generates opportunities for a traffic increase on rail

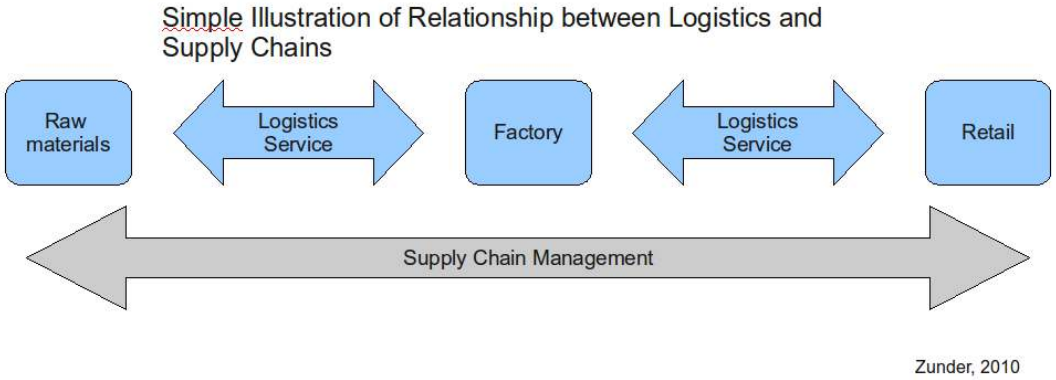
  The Eurovignette regulation and the LKV MAUT in Germany are examples of changes that could affect the modal choice. Such rules together with road congestion, pollution and climate change are likely to increase the pressure in favour of modal shift.

- Containerization and unitized cargo play in favour of co-modality

  Products containerization has reached gigantic volumes and global dimensions. This trend is not expected to stop. The new generation container ships with 10.000 TEUs or more indicate that this trend is likely to continue. This in itself is a formidable engine for transport industrialisation which will drive also substantial changes in rail inland transportation.

3. STATE OF THE ART and RECENT RESEARCH

Rail transportation of today is often reduced to only a fraction part in a logistics chain. It is therefore imperative that European freight mobility systems and logistic chains are developed in a co-modal transport perspective where the ultimate competitiveness is resulting from the combination of the best performances that each mode is capable of delivering. Rail must enhance its present role in co-modality by tackling the challenge of physical movement of load units as an industrial process and the options resulting from that. In order to translate this task into an operational proposition the European freight and logistics research can be addressed on several topics:



- Products' segments that up to now have not been transported by rail.
- Industrial needs of the shipping and other container related transport industry.
- Development of co-modality, with particular focus on physical movement of load units.
- Transport industrialisation by rail, which is a specific competitive advantage of Rail when compared to Road.

- Application of ICT technologies such as RFID and other identification technologies as well as intelligent planning and management tools supporting rail transport industrialisation as such.
- Rail traffic consolidation between various shippers and operators.
- Harmonization and standardization.
- Rail infrastructure and network optimisation
- Technical and operational step changes to modernise equipments and operating practices.
- New business models for rail freight to better meet market demand e.g.
    - joint ventures;
    - new entrants;
    - collaborative enterprises;
    - shipper led initiatives

- Knowledge and Technology Transfer from other sectors;
    - technologies;
    - organisations;
    - logistics and supply chain methods

Europe needs an effective sustainable logistics system to support its competitive growth and the quality of life of its citizens. Rail freight plays a key role in fulfilling this objective

A number of EU funded research projects have to date addressed various key questions. The projects deal with a broad range of items such as containers traffic development, high speed freight, corridor analysis, longer trains, terminals efficiency, systems and technologies. In addition to EU funded projects there are other National programmes which support logistics projects relevant to rail such as the German Federal Governments Transport Research Programme. The strength of ERRAC is that it gathers all the stakeholders which are part of the Supply Chain. Below is a description of recent finished and on-going EU funded rail research projects.

Project	Timeframe (years)	Participation	Content	Results
Completed Projects				
Projects in category: Technical Solutions for Wagons				
FASTRCARGO Fast transship-ment equipment and novel methods for Rail Cargo in Europe	2006-2009 Project cost: € 3 635 820 Project Funding: € 1 950 000	Consortium of: EU FP 6, industries (A , D), Business school (DK), University (S), Transport organization (E)	The project aim is to investigate ways for faster and more efficient transshipment technologies.	The principles of a new way to shift containers between rail and road were presented.
Projects in category: Logistics Solutions				
TREND	2005-2006	Consortium of:	TREND studied the	Increased development of rail

Towards new Rail freight quality and concepts in the European Network in respect to market Demand	Project cost: € 3 127 001 Project Funding: € 3 099 812	EU FP 6, Transport research institute (CZ), Union of Transporter (B, D), Community of Euro Railways (B), Transport Management (H, I), University (D), Industry Partners (F)	hindrance to the development of rail freight transport.	freight transport is to be done by analyzing six European freight corridors with focus on border crossing bottlenecks, inadequate infrastructure, lack of inter-operability, resource - and operational problems.
NEW OPERA New European wish: operating project for European rail network	2005-2008 Project cost: € 3 944 015 Project Funding: € 3 596 946	Consortium of: EU FP 6 Transport infrastructure Managers and organizations (A, F, I, NL, E, CH, UK, Industry (D, F,)	The role of rail as an alternative to freight transport and being a part of logistics chains, also through the international borders was investigated.	The project dealt with issues such as rail freight being an effective alternative for road, but that the level of service quality is unsatisfactory. During the project, the rail business model was reviewed to look at the development opportunities.
CREAM Customer-driven rail-freight services on a European mega-corridor based on advanced business and operating models	2007-2012 Project cost: € 24 912 161 Project Funding: € 12 213 202	Consortium of: EU FP 6 - Transport research institute (F, UK, A, CH, B, D, RUS) Industry (H, GR F)	CREAM will respond to demand for rail-based logistic systems, and by the European legislation initiated change in the European railway area. Cases will be developed with respect to: - Innovative rail-based supply chains incl intelligent rail models - Quality management system.	CREAM will analyze the operational and logistic prerequisites for developing, setting up and demonstrating seamless rail freight between the Benelux countries and Turkey. Best-Practice will be validated within the project. The activities are based on the Corridor Action Plan implemented in the framework of the TREND project.
Projects in category: IT-Solutions				
REORIENT Implementing Change in the European Railway System	2005-2007 Project cost: € 7 012 421 Project Funding: € 6 097 775	Consortium of: EU FP 6, Transport organization/institute(Spain , Germany, Netherlands, Nor-way),University (Italy, UK, USA)	REORIENT's aim is to set up a knowledge base and project support for an international railway project and making large scale freight data accessible.	Through the identification of significant relationship among interoperability aspects and specific country conditions affecting inter-operability status, the project was able to ascertain the most critical barriers to be removed in order to improve interoperability.
Projects in category: Development of Freight Corridors				
RETRACK Reorganization of transport networks by advanced rail freight concepts	2007-2011 Project cost: € 23 807 939 Project Funding: € 10 972 585	Consortium of: EU FP 6, Consultants (D, RO, NL, F) Railway org. (H) Research Institute (NL, N)	To demonstrate and implement an innovative and market-tested rail freight service along an East-West trans-European corridor.	RETRACK will support the commission's aspirations to induce a sustainable modal shift of freight traffic from road to rail to archive a market share of 15% by 2020.
On-going Projects				
Projects in category: Technical Solutions for Wagons				
VELWAGON Versatile, Efficient and Longer Wagon for European Transportation	2010-2012 (o	Consortium of: EU FP 7, University (S, D, SK), Industry (SK)	Aim of the VELWAGON is to demonstrate that fewer elements and less dead weight can result in the same or even more transport output.	The project will be executed by designing a versatile platform element to bring gain of flexibility, accessibility and efficiency of railway services. The basic working paradigm is the markets need for longer and lighter wagons with fewer axles.

SUSTRAIL The sustainable freight railway: Designing the freight vehicle track system for higher delivered tonnage with improved availability at reduced cost	2011-2015 Project cost: € 9 438 780 Project Funding: € 6 599 933	Consortium of: EU FP 7, Transport research institute (CH), University(UK, S, D, E, I, BG, RUS, USA), Industry (I, B, UK, S, RO), Consul-tants (N, I, S), Interna-tional Union of Railway – UIC (F), Transport Operator (UK, BG), Transport Administration (E, BG, RO).	To improve the sustainability and competiveness of railway freight transport by reducing maintenance and cost.	The correlation between vehicle and track design parameters and track degradation is studied and this will lead to improvement of the geometry and components.
SPECTRUM Solutions and Processes to Enhance the Competitiveness of Transport by Rail in Unexploited Markets	2011-2015 Project cost: € 4 326 111 Project Funding: € 2 785 539	Consortium of: EU FP 7, Transport Administration (S, TR), Transport research institute (NL, S, I), University (UK, I), Transport Association (B, F), Industry (B, S) Transport operators (UK, F, I, S, D), Consultants (N, D, Others (NL)	SPECTRUM will develop a rail freight train that pro-vides a higher speed ser-vice for high value, low density and time sensitive goods with the performan-ce characteristics of a passenger train. A long term project for deliver a new rail freight offering that can compete with road and air.	SPECTRUM's aim is to investigate a freight train that behaves like a passenger train in terms of speed, acceleration and braking; allowing full scheduling on urban and sub urban train networks and has a standardized and universal power supply system.
Projects in category: Logistics Solutions				
ON-TIME Optimal Networks for Train Integration Management across Europe	2011-2014 Project cost: € 7 970 833 Project Funding: € 5 381 969	Consortium of: EU FP 7,University (UK, NL, S, F, I, D, CH), Transport Operator (D, UK),Transport Administration (S), Industry (I), Other (I, UK)	To introduce methods and algorithms for smoother running of trains.	ON-TIME Will lead to energy savings, better punctuality and gains of capacity.
TIGER Transit via Innovative Gateway concepts solving European-Intermodal Rail needs	2009-2012 Project cost: € 13 595 279 Project Funding: € 8 633 020	Consortium of: EU FP 7 - Transport research institute (I, B, E), Transport Administration (D,I), Transport operator (CH, I, D), Industry (B), Consultant (I, D), Others (I)	Development of rail transport in competitive and co-modal freight logistics chains	The aim is going to be con-ceived by taking in considera-tion four basic European trans-port constraints; freight mobility as insufficient, ports of entry, environmental situations and cost and construction. TIGER is providing a solution to EU ports and road congestions.
Projects in category: IT-Solutions				
E-FREIGHT European e-freight capabilities for co-modal transport	2010-2013 Project cost: € 12 634 073 Project Funding: € 8 389 250	Consortium of: EU FP 7 – Transport research institute (GR, FIN, D, N, P), University (N, UK, H, GR), Sea Transport Administration (LV), Transport Operators (S), Consultants (UK, GR, NL)	To adress the development, validation and demonstration of innovative e-Freight capabilities	E-freight capabilities will be developed to support the following four main categories of e-freight stake-holders: transport users, transport service providers, transport infrastructure providers and transport regulators.
Projects in category: Development of Freight Corridors				
MARATHON Make Rail The Hope for protecting Nature	2011-2014 Project cost: € 4 382 748 Project Funding: € 2 699 992	Consortium of: EU FP 7, Transport research institute (B), University (S, I), Inter-national union (F, B), Transport Administration (S), Industry (I,S,CH, F), Consultants (F, E)	Create a business case of operating longer heavier and faster trains on a selected high-volume on Trans-European freight corridor	The increase of trains length, speed and weight on a currently constrained rail infrastructure is the key element of this project. This effectiveness would also lead to a more environment friendly and sustainable cargo mobility.

4. IDENTIFICATION OF GAP THEMES

Rail freight has lost market shares over recent years mainly due to changes in market conditions and trends, which favoured more flexible modes supporting better the market and policy driven strategies of free global trade paradigms. Rail freight by its nature was for many reasons not flexible and quick enough in responding to those challenges. Now, since more rail transport affine criteria, like environmental data, are gaining in political priority there is a genuine chance for a renaissance for rail transport. By combining the lessons learned in last decades and matching them with new technologies, structural changes and socio-economic and ecology strategies, European rail actors have a unique chance of regaining share of market. A window of opportunity exists for next few years for paving the way towards that development. Rail freight is however more complex by its nature compared to competing modes and it is not always possible to simply transfer technologies from other modes. Heavy investments (sunken) and technological procedures have made rail an efficient and safe mode. From now on it is necessary to start a rejuvenation of rail by introducing ground breaking innovations and business terms for all mass transport, especially in contained and boxed consignments as LWL (less than wagon load) and FWL (full wagon loads). Creating a new mind set is essential.

The general strategy to preserve and develop European rail freight

As long as the other competing modalities are capable of offering better services at lower costs, rail freight will not be in a position to conquer any additional market share. During an economic recession period road, – as a more flexible mode - further erodes the rail freight market share, which is already at an unsatisfactory level despite all the efforts being made by the European Authorities and operators. The paradigm to be followed is reducing considerably the production cost base without reducing the safety level, and, at the same time improving the service quality of rail freight, both as a single mode, and as the main segment of the door-to-door transport chain.

4.1 The Scorecard framework

The scorecard is divided into four areas where progress has to be made on bridging gaps in order to reposition rail freight as the mode of choice for medium to long haul.

- Technical solutions for wagons and train sets
- Logistics solutions
- IT solutions
- Development of rail freight corridors

The scorecard identifies the main items or hurdles that should be overcome by 2015, 2020 and 2030. EU funded research projects play an important role but it is not the sole tool for overcoming the hurdles in the score card. Demonstration, changes in regulatory framework must accompany research to achieve market implementation of results. Realisation of freight oriented corridors i.e. TEN-T network is not a research

issue but important for rail freight which is often hampered by degraded prioritization on mixed traffic lines.

The items in the scorecard can be combined into two main thrusts of development.

Transport industrialization by economies of scale through improvements in the existing system.

Technological solutions to enable operation of longer – 1500 meter – trains between megahubs on main European freight corridors. Among the items that needs to be addressed in order to achieve full system benefits are better brake performance, introduction of central couplers for easier assembling and reduction of pull and stress forces between wagons, IT systems that enable buying and selling of capacity in the wagons and functioning door to door track and trace of loading units and goods and real time information of the actual and forecasted train position.

Faster, flexible freight trains with performance similar to passenger trains

These trains should be able to address market segments which up until now are largely unexploited by rail i.e. lighter more valuable goods. Faster freight services would be able to use passenger quality train paths and thus enable new business propositions. It would also support improved capacity utilisation of the network. Necessary technology developments include electrification of wagons for new brake systems, monitoring of the rolling stock itself and the cargo.

The complete picture

Both of the above mentioned propositions need development of new business models in order to achieve full utilization of the train carrying capacity. Rail must also work on the development of new loading units or logistical load devices for tailored transhipment solutions, better and smarter interfaces between modes and development and more intelligent traffic management in order to bring out the rail's full potential and thus be the mode of choice for the major share of inland freight services.

Progressive development of wagon load traffic

Wagon loads, although in decline, still has a significant market share in Europe. It should be recognized that wagon load traffic can sometimes be cost effective as a business model with the right sort of operational, commercial, technical and financial positioning. This has been proven for example in the Retrack project which is summarily described in the annex.

4.2 The completed Scorecard

Insertion of score card

4.3 Implications for research

The arrows in the roadmap shows the need for research and development, demonstrations, changes in regulatory framework necessary for market introduction of the items that are listed in the roadmap. The numbers in the area box refer to EU research projects that to "fully" or partially cover the research needs. Those projects are briefly described in the Annex. The research implications have been analyzed by EURNEX. Only blue and or green arrows indicate that there is no need for additional EU funded research in order to achieve market introduction. EURNEX has also made a commented prioritization of items which they think are important to address with research and where they have particular research capacities. The EURNEX prioritization is indicative and meant to serve as a basis for further discussions.

Insertion of arrows table

4.4 Priorities

On the short term, within the next five to ten years, research and other actions should focus on steps that maximize the efficiency of the existing network. The key success factors are Reliability, Competitiveness, Capacity and Information. The priorities are:

- Enhancing Freight Priority for higher path quality by better operational train management and preservation of freight paths.
- Recalculating Estimated Time of Arrival in order to enable stakeholders in the receiving end of the supply chain to optimize production resources.
- Traffic consolidation (bundling) in order to get higher train load factors. This includes creating multimodal freight villages, their spatial planning and a cooperative business approach for fully loading train sets.
- The third bullet point leads to transport industrialization in order to cut costs and increase competitiveness by introducing longer, heavier and faster trains (more efficient trains) between major hubs on important corridors.

The priorities above are supported by a short survey conducted in the spring of 2010 of the actors' opinion:

- The shippers or MTOs who are taking the final decision
- The Railway undertakings must be a reliable and competitive link
- The Infrastructure managers which have a fundamental role in creating the conditions for a service to offer a high level of quality and competitiveness
- The Intermodal operators which have a fundamental role to enable traffics to switch rapidly from road to rail.

From this survey, having identified the most important factors of decision, it is suggested to study the factors components and research on those which will have the highest and quickest effect on the factors improvement.

On the medium to long term action leading to a well functioning border less European rail freight area should be taken and put into practice. A modern wagon fleet which satisfies customer requirements with good noise and maintenance characteristics both with regards to the wagon itself and the track infrastructure should transport the bulk of rail freight. IT solutions enabling track and trace of wagons and loading units and effective fleet management to avoid empty running should be implemented. Cross border rail freight corridors equipped with affordable ERTMS should be realized together with green logistics nodes which connect to secondary and tertiary comprehensive networks. Faster flexible freight trains that can blend in with passenger trains on mixed traffic lines would enable service offerings that could capture lighter and more valuable cargo. These trains could service terminals close to delivery collection centres.

The corridor concept is based on the combination of mega hubs and freight villages interconnected between themselves through the European Rail freight network and particularly through the major Rail corridors. The European transport white paper says that the main freight hubs should be interconnected over the period of 2015-2020. These Mega hubs and freight villages should be efficiently linked to the end users. Long distance transportation is taking place between the hubs using longer heavier and commercially faster trains. Connection to the main airports, inland navigation and short sea shipping are supporting such infrastructures. These Mega hubs and freight villages are also the distribution platforms for entering by green distribution vehicles the city centres achieving in this way the most effective co-modal solutions. At the same time from these platforms, fully loaded trucks or wagons are delivered to the industries for further products transformation or industrial processes. Efficient rail freight transportation requires a completely new business model based on the adoption of longer heavier and commercially faster trains necessary for reducing substantially the operating costs, maximising the use of existing network capacity and enabling the restructuring of the service offers. Transport industrialisation is a key success factor. The so long awaited step change is achieved by producing better service at considerably lower costs. The innovative corridors management necessary for overcoming the cross border difficulties and the ERTMS technology introduced on the European Rail network have to produce the desired results in accordance with the European transport white paper i.e. replacing the many incompatible systems existing on the European network. Operational practices and procedures must be further harmonised and standardised with the support of ERA. The Rail operators by sharing with the cargo owners/ cargo managers/ optimisers/ logistics operators/ intermodal companies/ conventional cargo operators/ integrators/ forwarding agents etc. the cost benefits achieved by the new business model, have implemented the collaborative approach. Such collaborative approach achieves the multi channel service products distribution organisation capable of accessing all those market segments in which Rail freight had been historically absent. New operating logistics specialists allow Rail freight to access new market segments.

The roadmap points out that progress has to be made in all of the areas and items listed in the score card. For some items this requires additional research supported by EU while for other items progress depends on changes in policies, regulatory framework or business models.

5. VISION

The future challenge for Rail Freight is ensuring adequate freight capacity provision on the European rail network. This requires better use of existing infrastructure, with measures to deliver substantial productivity enhancements, reflecting the principles underlying Regulation (EU) No 913/2010 concerning a European rail network for competitive freight and the 2011 White Paper on Transport. The new freight paradigm can be summarised as investment in increasing capacity through the elimination of bottlenecks and the development of dedicated freight routes, longer, faster and heavier trains that are tailored to commercial needs and supported by spatial planning around development of modern freight-bundling mega-hubs which are connected by the fully-interoperable European rail freight network where harmonisation and standardisation has been achieved with the support of the European Railway Agency to freight villages and ports, innovative use of IT and data systems and deployment of management and industrial processes that are better attuned to transportation needs of all the actors in the transport chain. The paradigm also encompasses the capturing by rail of lighter more valuable goods which until now is shipped mainly by road. This requires new logistical solutions enabled by faster flexible freight trains with performance similar to passenger trains which enables them to blend in with passenger trains on mixed traffic lines.

The new European freight mobility vision must rely on a new logistics concept in which rail plays a central role.
The ERRAC Strategic Research Agenda (update 2007) predicted that the overall European transport demand would grow by 70 per cent for freight by 2020 compared with 2000. The transport white paper aims at shifting 30 per cent of road freight over 300 km to rail or waterborne by 2030 and even more than 50 per cent by 2050.
In addition to the establishment of a dedicated freight network serving the economy with longer, heavier and faster trains running, freight transport will increasingly be undertaken by containerised trains that look like a passenger train in terms of loads, average speed, reliability and performance. This results in better traffic management opportunities, lower maintenance costs and higher capacity of the rail network. Together with the construction of dedicated lines, efficient terminals for container transhipment and improved interfaces to other modes, this will enable the railway to deliver faster and reliable services for freight customers in medium and long distance freight transport – the area where rail has an evident comparative advantage compared to other modes.

Annex: List of recent EU freight projects

Recent rail freight projects which ERRAC has considered most relevant for the Roadmap are presented in this section; TREND, NEW OPERA, REORIENT, CREAM, RETRACK, FASTRCARGO, E-FREIGHT, MARATHON, SPECTRUM, VELWAGON, SUSTRAIL and ON-TIME

1. TREND

The EU FP6 TREND project (Towards new Rail Freight Quality and Concepts in the European Network in Respect to Market Demand (www.trend-project.com) pointed out the main hindrances to the development of rail freight transport on the basis of analyses carried out in six European freight corridors:

• Border crossing bottlenecks. Main causes are, for example, too many locomotive changes due to different railway equipment, lack of operational co-ordination, administrative burdens, inefficient transport data management, insufficient infrastructure, specific problems due to special geographic situations.
• Inadequate infrastructures. In general, scarce capacity and quality of stations, nodes, terminals, or along lines lead to expensive operational procedures increasing total costs and negatively affecting the market position of rail freight traffic. More specifically, impediments are high traffic volumes resulting in capacity limitations for additional rail freight, tunnel sections limiting the intermodal gauge, speed restrictions due to line layout, single track line sections, insufficient length of tracks in stations limiting the train length, congested intermodal freight terminals.
• Lack of interoperability. Many factors contribute to interoperability problems, such as different energy systems, different widths of the pantograph, incomplete electrification, different permitted train parameters (length, load, line category, intermodal gauge), and different signalling systems, different track gauge, different wagon coupling modes.
• Resource problems. The main resource problem concerns the rolling stock, especially multi-system locomotives. In many cases interoperable engines for different signalling systems are regarded too expensive by Railway Undertakings, and the poor quality of the wagons causes delays in the border crossing procedures.
• Operational problems. These include operational priority of passenger trains over freight trains in infrastructure bottlenecks, controlling of cross border train operations (currently mostly carried out by national dispatching systems), inefficient operations in marshalling yards, and lack of EDP solutions or different EDP standards.

2. NEW OPERA

EU FP6 project NEW OPERA aimed at contributing to revitalise the role of rail in freight transport and logistics chains, and to develop international corridors able to ensure smooth and free movement of freight trains in the internal borders of the European Union. www.newopera.org

NEW OPERA dealt with

• State of innovative experiences. A first group of activities aimed at carrying out an analysis of the market variables, which outline the scenario, which future freight mobility must confront with. There are a number of findings, such as substantial changes in trade patterns, faster growing trade with NMS and between New MS, and trade with extra EU countries growing faster than intra EU ones. There is a strong attraction for trade with EU but also a strong impact is noted on non EU trade particularly between CIS and MEDA countries excluding oil. Also the exchanges with China and South East Asia are very rapid and very substantial (however there is a huge trade imbalance in tons or units imported into the EU).

• Future Trends within Supply Chain Development and Philosophy. A survey has been carried out to examine the drivers of supply chain development and the tools supporting its evolution, as well as to assess the infrastructure role (in terms of rail network) in a market driven by supply chain trends. The survey found that there are many drivers pushing towards globalization. Trade and service companies are synchronising their supply chains strategies and structures through a collaborative approach and information sharing. The organisations structure is changing from vertical to horizontal, focusing more on processes than functions. Furthermore, most European companies consider rail and intermodality a viable cost effective alternative to road, but the level of service quality is still unsatisfactory. If rail or intermodality starts offering services in line with market expectations, these companies would use rail instead of other modalities. Finally, the existing rail business model based on sharing the rail infrastructure between passengers has proved to be unable to meet market expectations resulting in a decline in rail freight volumes. To reverse this negative trend it is necessary to rethink the rail business model which allows rail freight to exploit the many development opportunities.

• Rail Freight Traffic Operational Management. Research has shown that different categories of trains (with their own characteristics and priorities) negatively affect the corridor productivity, generate delays, offer little scope for improvement and do not offer long term solution to the European freight mobility requirements. The solution is to progressively separate train categories through either a rail freight dedicated infrastructure, primary rail freight network, or an effective implantation of rail freight windows.

• Operating rules. Research has performed an evaluation of current prevailing operating rules in selected European countries. The main research findings are that countries developed their own operating rules and national networks, which differ in terms of equipment, operating methods, safety rules and priorities (this has resulted in a lack of interoperability).

After the Newopera project completion, an International Non profit Association was formed named NEWOPERA Aisbl registered in Belgium, having the main objective of continuing the Newopera project work striving for its full market implementation.

Having fostered through its Members the NEWOPERA PROJECT, is the leading promoter of the 2020/2025 Rail Freight dedicated/priority lines concept.

NewOpera Aisbl is pursuing through its network of Members/Partners and through the participation to EU Commission projects the fulfillment of this Vision.

3. REORIENT

REORIENT (Implementing Change in the European Railway System) www.reorient.no aimed at setting up a knowledge base and project support for a major international railway project and making large scale freight data accessible, readily documented, findable, and possible to explore with tables, analyses, graphs and thematic mapping in a single data repository.

One objective of the project was to document and explain the pace of transformation of the European railway sector from nationally fragmented railway operations toward a functionally integrated, interoperable system providing seamless international rail freight transport. REORIENT assessed the status of interoperability within and between eleven countries associated with a railway corridor stretching from Greece to Norway, Sweden, and Finland. The variation in interoperability status across countries according to a variety of aspects, and identify conditions in the countries that are associated with different levels of interoperability was also assessed. The primary source of data for the analysis was a set of interviews in each country with the major actors and stakeholders associated with the country's rail freight system. The (qualitative) information from the interviews was translated into numeric scores, which were subjected to statistical analysis. The analysis showed considerable variation in interoperability status across countries. Through the identification of significant relationships among interoperability aspects and specific country conditions affecting interoperability status, the project was able to ascertain the most critical barriers to be removed in order to improve interoperability. Greece is the country suffering most from barriers. Other countries with relatively high barrier values are Bulgaria, Hungary, and Romania. Norway and Sweden suffer least from barriers. Over all countries, the most critical barriers to improved interoperability fall into the categories "institutional & organizational", "financial", and market.

4. CREAM

CREAM refers to a pan-European transport corridor of an entire length of about 3 150 km. It draws a bow between Western and Central Europe and the Balkan states towards Turkey/Greece. The corridor stretches across Benelux – Germany – Austria – Italy – Hungary – Romania – Bulgaria– Serbia-Montenegro – Turkey / Greece and links most relevant highly dense industrial and rural areas. In respond to the call the particular challenge within this corridor is to integrate not only traditional European member states but also new Member States, Acceding Countries, Candidate Countries and Western Balkan Potential Candidates, and thus cope with the different progress that was made with respect to implementation of change in the European railway area. A transfer of best practices will be assured by the Consortium.

The CREAM-Project's technological and operational activities have been identified by the stakeholders that are active in the corridor as infrastructure managers, railway undertakings, intermodal operators or customers. The activities will lead to a further increase in rail freight transport on this important
East-West freight corridor and thereby contribute to the EU transport policy goals. The activities are based on the corridor analysis and Corridor Action Plan adopted in the framework of the TREND project.

5. RETRACK

RETRACK Reorganisation of Transport networks by advanced Rail freight Concepts www.retrack.eu is in its final phase. The official end date of the project is August 2012.

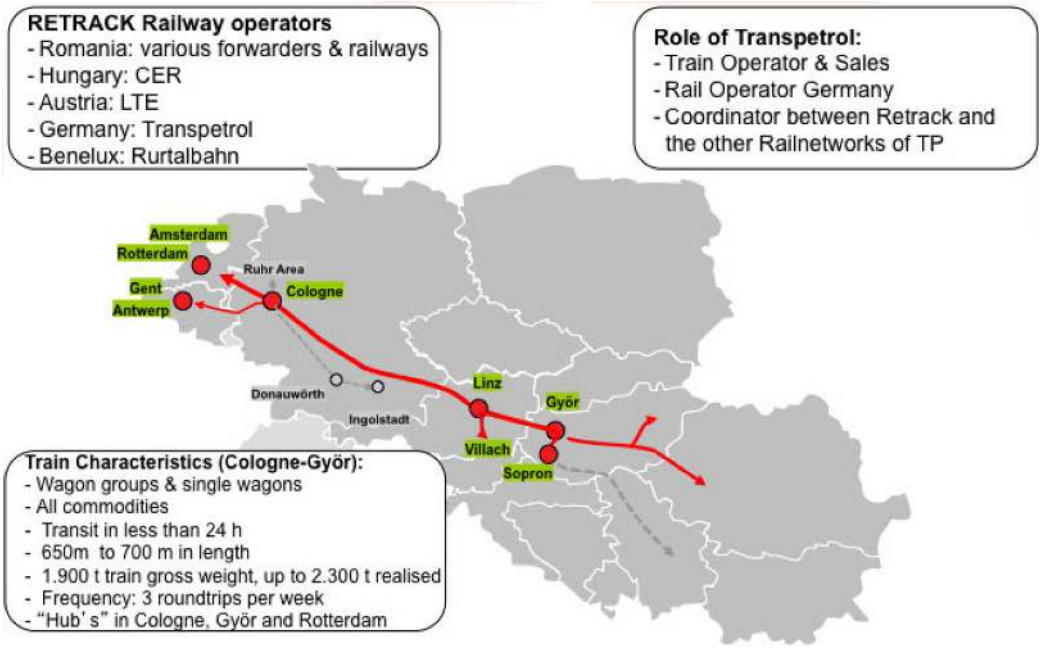
The main objective of the RETRACK project is to develop, demonstrate and implement an innovative and market-tested rail freight service along an East-West trans-European corridor. This axis will be composed of a backbone corridor connecting Rotterdam with Black Sea seaport Constanza in Romania, as shown on the map below. Subsequently, this business plan is extended to service of the Bratislava—Budapest logistical hub located at the new Central European industrial cluster which covers Poland, Czech Republic, Slovakia, Hungary, and Austria. New service lines connecting Bratislava-Budapest with Nordic and Baltic States will be opened, followed by establishment of south-east corridor section linking this new European powerhouse with important trade partners in Black Sea region such as Turkey and Ukraine.

RETRACK will support the Commission's aspirations to induce a sustainable modal shift of freight traffic from road to rail to achieve a market share of 15% by 2020. This aspiration is also supported by the European Rail Research Advisory Council's (ERRAC) declared aim of bolstering rail's market share of freight to a similar level.

The main activities in the final year of RETRACK are focused on: enlarging the pilot base - by extending the number of services and clients; the development of the knowledge base and the research on the extension of the corridor towards Russia and China.

A knowledge base will enable policy makers, at regional, national and European level - as well as users and suppliers of rail freight services - to obtain policy and business information on status, potential and bottlenecks of rail freight.

The knowledge base will be linked to the latest European Transport Information System: ETIS,+ allowing ETIS+ information to be incorporated into the RETRACK knowledge base and vice versa. An open design will be selected, enabling further development for other rail corridors in Europe.



6. FASTRCARGO

FASTRCARGO was an EU project under the FP 6 that about faster and more efficient transhipment technologies. The project focussed on two issues: a) designing and manufacturing a full scale demonstrator and, b) developing novel principles for rail transport benefiting from fast train loading below the catenaries. Due to the economic crisis, the full demonstrator could not be completed during the projects lifetime. With means of one prototype lift and hardware-in-the loop simulations, the principle and superior performance of this new way to shift containers between rail and another mode were tested and proven. A similar system from Metrocargo, using same design principles has come-up with a full scale prototype running in Italy after the FastRCargo demonstrator was shown in public.

The FastRCargo team continued the development work after the project closure and published three new concepts since: 1) an integrated rail-logistics interface for automated high performance rail logistics facilities, 2) an AEGR (Advanced Extended Gateway for Rail) for supporting single or group of sea port terminals in their strategies for serving their Hinterland in a competitive rail based service operation and 3) an integration of fast container handling facility within a strategically selected existing shunting yard.
All concepts are based upon same principles and meeting following main objectives: 1) Strengthening the rail transport cost and service competitiveness, 2) supporting cost-efficient modal shift strategies for significant more transport volume on rail, 3) introducing modern technologies in rail-logistics interface operations.

7. E-FREIGHT

The FP 7 e-Freight Integrated Project (European e-Freight capabilities for Co-modal transport) started 1st January 2010 bringing together 30 partners from 14 Member States and Norway for a program of work that will cover 4.0 years, addressing the development, validation and demonstration of innovative e-Freight capabilities.

E-Freight capabilities will be developed to support the following four main categories of e-Freight stakeholders: Transport users, transport service providers, transport infrastructure providers and transport regulators.

8. MARATHON

The FP 7 funded MARATHON project is set to implement in practice the business case of operating longer heavier and faster trains on a selected high-volume Trans European freight corridor. The increase of trains length, speed and weight on a currently constrained rail infrastructure is the key element of this project.

The bundling of freight volumes combining intermodal with other corridor directional traffic between large scale terminals/hubs/ports is expected to generate the critical mass fostering advanced rail freight services based on transport industrialization produced at lower costs. Furthermore the rail system management will be rejuvenated by adopting a cooperative approach between the transport actors of the entire rail freight transport chain as largely applied in other modalities.

The MARATHON project through the adoption of innovative hardware/software and radio communication technologies is to set an example for other European infrastructure managers and operators aiming at implementing these longer faster and heavier trains. The achievement of greater lines productivity combined with EU standards and recognised safety rules are a step change towards greater effectiveness on rail tracks delivering the EU citizens a more environment friendly and sustainable cargo mobility.

9. SPECTRUM

The FP 7 funded 4 year SPECTRUM takes a longer term, radical and first principles approach to deliver a new rail freight offering that can compete with road and air in the growing sectors of logistics where rail freight has traditionally little to offer. We shall work towards a freight train that: Behaves like a passenger train in terms of speed, acceleration, braking, momentum: allowing full scheduling on urban and sub urban train networks; Has a standardised and universal power supply system for the delivery of power to temperature controlled containers (reefers) in a controllable fashion. The project is expected to end in 2015.

10. SUSTRAIL

The 3 year SUSTRAIL FP 7 project aims to improve the sustainability and competitiveness of railway freight transport by reducing maintenance and costs. SUSTRAIL will study the correlation between vehicle and track design parameters and track degradation. It will also serve to demonstrate the improvement of the characteristics bogie/suspension along the running rail and the optimization of the geometry and components which will be proven through SUSTRAIL validation in vehicle/track system. The project is expected to end in 2014.

11. VELWAGON

The 2 year FP 7 Project VEL-Wagon will demonstrate that fewer elements and less dead weight can result in the same or even more transport output. Coherently, the project will design a versatile platform element for a multipurpose function and intermodal use that will bring about an important gain of flexibility, accessibility and efficiency of railway services. The project will investigate the current status of the European freight railway market and look at the trend thereof and its associated logistics. In synchronisation, a wagon engineering activity will be launched for determining the final costs of a solution matching the market requirements. The basic working paradigm is the markets need for longer and lighter wagons with fewer axles. The project is expected to end in 2013.

12. ON-TIME

ON-TIME is an EUFP 7 funded project that aims to achieve better train operation management by introducing methods and algorithms for smoother running of trains. This will lead to energy savings, better punctuality and gains of capacity. The project is expected to end in 2015.

13. TIGER

TIGET is a FP 7 *Large Scale Integrated Collaborative Project* for the development of Rail transport in competitive and co-modal freight logistics chains that started 2009 with a duration of 36 months.. TIGER project development was conceived by taking into consideration four basic European transport constraints:

- Substantial increase of freight mobility demand versus an insufficient or constrained infrastructure and particularly the rail one.
- The Ports of entry into the Union, both North and South are congested due to difficulties of moving their traffic inland in an industrial way coherent with their traffic volumes.
- The environmental situation and climate changes are imposing transport solutions towards a more sustainable mobility. Modal shift is being encouraged.
- Costs and construction timings dictate that any infrastructure expansion will take at least a decade to produce its beneficial effects. It is therefore imperative that the best possible productivity is extracted from the available European infrastructures.

TIGER studies the necessary step changes for providing a solution to EU ports and road congestion. Traffic should reach European inland destinations in an industrial way leading to a more sustainable mobility. This can be achieved through the application of a new business model based on DRY PORTS which are capable of receiving regular trains from Sea Ports in economy of scale. The DRY PORTS or MEGA HUBS are capable of dealing with all transit and customs operations which today are handled in the Sea ports. This new approach allows the Sea Ports to load containers at random on the trains sending them immediately nearer to their final destination cutting both costs and transit times. DRY PORTS and MEGA HUBS are restructured accordingly for receiving these additional traffic volumes through private investments.

In order to approach these challenges from different geographical locations, four separate demonstrators are planned to support the development of co-modality in Europe providing suitable answers for problem solving. This objective carries another challenge. The solutions must be achieved by finding the right balance between geographical locations, existing infrastructures, local characteristics, natural barriers, hinterland penetration and environmental protection. The TIGER Project is constituted by 4 Demonstrators GENOA FAST CORRIDOR.MARIPLAT INNOVATIVE PORT & HINTERLAND OPERATIONS INTERMODAL NETWORK 2015

Questionnaires

In order to validate the roadmap and the conclusions of the Brussels workshop 25 February 2010 questionnaires were sent to rail freight stakeholders. These questionnaires are attached below. The actual scores and participating stakeholders are confidential but they strongly support the prioritization put forward in the roadmap.

ERRAC Work Package 02 Freight Core Group
Banverket, D'Appolonia S.p.A, Gruppo CLAS s.r.l. New Opera AISBL, Unife, VTI

QUESTIONNAIRE FOR INFRASTRUCTURE MANAGERS

HOW TO GIVE RELIABILITY AND COMPETITIVENESS TO YOUR RAIL CLIENTS

Question 1:

Among the following parameters, choose the 3 most important ones to enhance the competitiveness of your customer service , and rank them (1 is the most important)

RANK	Parameter
	Lengthening the trains
	Speeding up the trains
	Slowing down the trains
	Having a dedicated rail freight network or at least a freight oriented network
	Decrease infrastructure tolls
	Introduce ERTMS (1 or 2 or 3)
	Avoid maintenance works during period of operations
	Sell the path to the RUs according to a bidding procedure to get the best ones
	Increase the gauge to accomodate larger units on wagons
	Reorganizing the paths to withdraw unuseful stops
	Any other Item :

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QUESTIONNAIRE FOR RAILWAY UNDERTAKINGS

DECISION IN FAVOUR OF THE RAIL MODE :

MOST IMPORTANT PARAMETERS

MOST IMPORTANT FACTORS TO OPTIMIZE THESE PARAMETERS

QUESTION 1:

Among the following parameters choose, according to your expertise, the 3 most important ones to get a positive decision for the rail mode from your client and rank them from 1 to 3 (1 is the most important).

RANK	PARAMETER
	Reliability of the service
	Price of the service
	Short transit time
	Capacity of introducing rapidly a new service
	Capacity to give a quotation rapidly
	Cargo safety
XXXXXXX	Green transport
	At same price as road
	At 5% more
	At 10% more
	At 20% more
XXXXXXX	Information
	On position
	On ETA (estimated time of arrival)
	Insurance guarantees harmonized with road guarantees
XXXXXXX	Government grant to shipper
	At 5%
	At 10%
	any other parameter for your client to decide a modal shift to rail:

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SHIPPERS QUESTIONNAIRE

DECISION IN FAVOUR OF A RAIL TRANSPORT

QUESTION:

Choose the 3 most important factors in the following list to decide in favour of the rail mode for your transports by putting the rank in front of your choice. (1 for the most important decision factor)

RANK	FACTOR
	Reliability
	Price
	Volume increase and variability
	Density of the network for conventional
	Existence of logistics zone around rail terminals
	Short Transit time
	Information on cargo situation
	Information of ETA (estimated time of arrival)
	Timing for a response to a call for a quotation
	Short Timing for introducing a new service to satisfy a new order received
XXXXXX	Green transport
	At same price as road
	At a higher price 5%--10%--20% (bar the wrong values)
	Cargo safety
XXXXXX	A government grant
	5%
	10%
	ANY OTHER FACTOR::…

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INTERMODAL OPERATORS QUESTIONNAIRE

HOW TO ENHANCE THE ATTRACTIVENESS OF INTERMODAL TRANSPORT

QUESTION:

Choose the 3 most important parameters for your clients decision in favour of intermodal transport by rail, and rank them (1 is the most important)

RANK	FACTOR
	Reliability
	Price
	Short transit time
	Capacity of introducing rapidly a new service
	Capacity to give a quotation rapidly
	Cargo safety
	Green transport
	At same price as road
	At 5% more
	At 10% more
	At 20% more
	Information
	On position
	On ETA
	Insurance guarantees harmonized with road guarantees
	Government grant to shipper
	At 5%
	At 10%