ERRAC

European Rail Research Advisory Council

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

Draft Freight Roadmap

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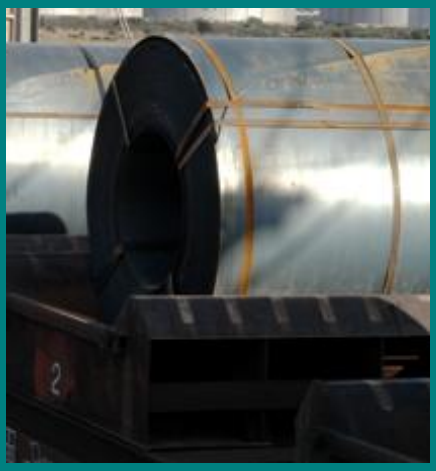
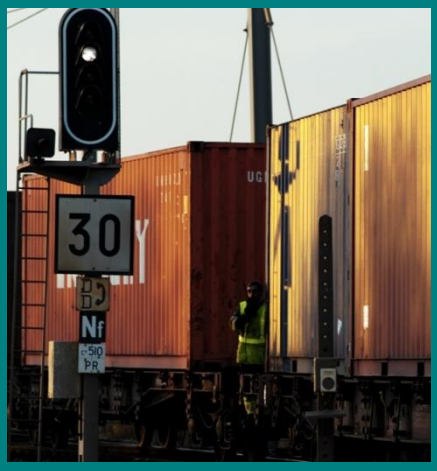

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The Roadmap Red Thread Executive Summary

Starting by emphasizing the necessary change of mentality (from a production oriented and rule driven attitude to an opened minded attitude open to research and change) the analysis is driven by the major customers request to chose the railway mode for their freight transport.
Stakeholder consultations in workshops and interviews with operators, shippers and infrastructure managers show that price, reliability and extension of services are the main drivers before the volume adaptation follow demand up and down capability.

Reliability and competitiveness in a very regulated and complex environment cannot be obtained without addressing all the technical parameters influencing this efficiency before addressing the commercial and eventually the behaviour ones.

As a train is composed of locomotives, wagons, drivers, running on tracks managed by Infrastructure managers and operating under their train management control 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
- Enhanced train and interfaces with other modes efficiency 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 view of creating a network effect by:

- Developing flexible local distribution with specialized operators
- Develop interoperability
- Develop cross border information systems
- Harmonize 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
- Organizing co-modality efficiently
- Delivering adequate and reliable information to clients in real time
- Interconnecting clients and operators computer systems to easy tendering, contracting, informing and invoicing
- Integrating rail in the logistics supply chain
- Organising an efficient spatial planning to be able to bundle traffic in order to support more productive rail transportation

Finally important drivers as energy efficiency and CO2 emissions reduction must be tackled across all the items listed above when assessing the real progress efficiency.

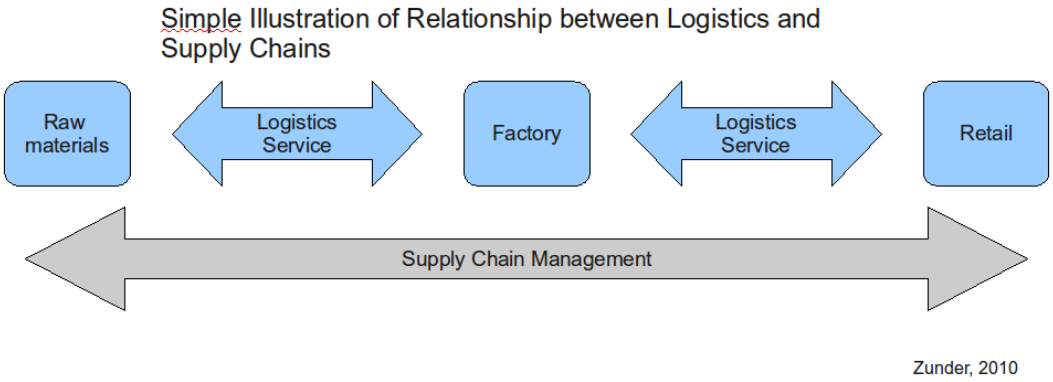
1. Scope of the Rail Freight Roadmap

The scope of the Rail Freight Roadmap is to satisfy the markets needs with seamless door-to-door transport for goods and with technologies and systems to ensure effective and efficient co-modality. Delivering on this broad scope means identifying and prioritizing knowledge gaps that can be researched in order to integrate the railways in an efficient way with other modes in order to meet customer demands. At the same time it should support a sustainable development, 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

2. Freight Research in Europe (State-of-the-art)

The freight sector is enabled by the utilisation of science, art and skills to deliver logistics and supply chain solutions. Logistics[1] is the management and executions of systems to move goods from A to B and provide services to meet customer demands. Supply chain management[2] (SCM) is the management and execution of systems to implement a series of integrated logistics and production process along a vertical chain from raw materials to final consumer goods, usually involving multiple organisations to meet the final consumer demand with the greatest added value.



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 logistic 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.

1 Rushton et al, Handbook of logistics and distribution management
2 Martin Christopher, Logistics & supply chain management

- 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. An assessment of some of these projects was carried out by the WG 02 when formulating the topics for the FP 7 third call. 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. Each one of them has individual knowledge and competence about the freight business. This knowledge is used to identify new research topics suitable for EU funded rail freight and logistics research. The Roadmap is a strategic document and a practical advice guide for new research.

2.1. Today's position (State-of-the-art)

Any Supply Chain is as strong as its weakest component. In some customer supply chains though rail is the weakest component it has a given role in many types of freight services. This is something that penalises Rail Freight development. In addition the rail market volumes are decreasing due to structural changes in the economy. Europe is in the middle of a transition from an industrial into a service-based economy. The traditional major bulk and low value cargo traffics are decreasing. New types of traffics are growing which are time sensitive logistics traffics requiring flexibility and reliability along complex supply chains. It is not that modern logistics requires short transit times, as the shipping routes from Asia to Europe are not fast, but demand a reliable and flexible service which can be monitored when needed. These developments are penalizing the rail freight mode which was favoured by former large heavy bulk traffics.

Rail freight service quality must improve significantly if it wants to capture more cargo volumes either in cooperation or in competition against other modes of transport.

The market segments where 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 public need for the 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 the areas of solutions for smaller consignments, for reliable transit times, for specialized transport segments, for automatic tracking and tracing, for flexibility, for price competitiveness for service quality and for emergency response in case of incidents. Rail freight has also a unique opportunity to exploit its "transport industrialisation" possibilities particularly valuable in infrastructure congestion times. It should not be assumed that a single solution should be developed as the needs of the market vary and therefore, a multiplicity of solutions are 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 rails is to raise the attractiveness of Rail freight at regional, spatial and urban planning level. Logistics at high material flow locations (like distribution centres) has to consider more seriously the integration of Rail freight at planning level. As in any industrial process, buffers play a key role and interface between processes require a lot of attention and improvement (transfer between trains, handling in terminals…). There is a discussion in the business about the reintroduction of more and smaller storage and distribution facilities in order to make the system more robust.

Europe is still relying today on a Road based distribution. Over 70% per cent of land transport inside the EU is captured by road. Road congestion is growing to unacceptable levels. The congestion cost is often underestimated but is stated as around 0.5% -1% of EU GDP[3]. 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 be developed in a sustainable way and competitively both separately and together. Rail needs to develop as an integrated partner in supply chains, bringing it's 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.
- Price stability
- Seamless International services.
- Frequencies in point-to-point services at scheduled times.
- Performance consistency.
- Reliable delivery times.
- Easy transport accessibility both physical and commercial.
- Wagons and intermodal units availability with a design suitable to fit the 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

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

2.2. Mega trends (State-of-the-art)

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.

- 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.

2.3. General trends (State-of-the-art)

The world economy today is dictated by customers needs. In the last 20 years the basic business philosophy has moved from “Push to Pull”. The new Pull philosophy is reflected in the customers supply chain. The transport and logistics industry has to find adequate answers for addressing such needs. The main topics characterising the new business processes are:

1. Rail freight competitiveness and price stability
2. Shorter cycle times;
3. Real time information flows and emergencies response in case of incidents as well as faster response to customers’ needs
4. Transport planning;
5. More frequent and reliable deliveries;
6. More flexible delivery patterns reflecting short-term forecasting and order variations;
7. Partnership relations with fewer suppliers and Logistic outsourcing to third party logistics
8. Performance consistency over time
9. Reverse logistics for packaging, recycling, returned goods and waste in general.
10. Harmonization of the transport documents

Rail freight must find adequate answers for inserting itself as a driving force into this modern supply chain process.

3. Gaps' Identification

One of the strategic drivers of this document is to **start from the identified customer needs and gaps** which are impeding rail freight development for fulfilling these needs. On top of the Gap List there is the central issue of rail freight competitiveness which can be generated only by a substantial reduction of the rail freight services cost base. Such reduction can be driven only by rail freight industrialisation. Summing up, the gaps dimension is encompassed in the following families:

	Gaps determined in families	Addressing customer needs
3.0	Philosophy Gap	Business perception, facts and image
3.1	Co-modality, vehicle and logistics Gaps	Generic requirements for all services
3.2	Cross border Gaps	European Services
3.3	System performance Gaps	Capacity of the services
3.4	Service performance Gaps	Service quality
3.5	Competitiveness Gaps	Competitiveness

3.0 Philosophy Gap

Rail freight has lost market shares over recent years mainly due to market and ambient changes, 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, gaining 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.
Still, there is a PHILOSOPHY GAP. Rail freight is more complex by its nature compared to competing modes and it is not possible to simply transfer technological progress results 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.

<u>The general strategy to preserve and develop European rail freight</u>

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.

3.1 Co-modality, vehicle and logistics Gaps

Increasing the loading factor of the train by achieving the design of more efficient wagons (optimal length and less deadweight for an enhanced carrying capacity) is a permanent research topic. Also, when extending the market coverage new wagon designs for matching the logistics requirements more efficiently are needed.

3.1.1 General wagon issues

Co-modality, vehicle and logistics gaps	Milestone 1	Milestone 2	Milestone 3
	2015	2020	2030
General wagon issues	Light weight rail cars for increased payload and energy efficiency	Modern wagon concepts with low noise, track friendly bogies	
	Improving Freight wagon designs for better usage of infrastructure conditions - at least in selected corridors	Implementing high efficiency trains in selected corridors	Minimum 15% of all goods transport with high efficiency wagons.
	Preventive axle bearing condition monitoring, improved braking and common data exchange protocols		

Light weight rail car concepts will make it possible to increase the payload without increasing the axle loads. This will raise the capacity of the railway system to carry more goods and make it more profitable. It will also save energy.

Modern wagon concepts with low noise and track friendly bogies; Noise is a big problem for railways which must be mitigated if citizens are to accept more trains on existing and new lines. A lot of work has been done on that subject e.g. noise reducing rail dampers, tests with composite brake blocks and innovative noise screens. Transfer of noise reduction and compensation methods from other industries (i.e. car and track engines) should be studied and considered. A specific problem to tackle in this context is the noise generated by wagons crossing steel bridges in cities.
New bogies and brakes should have low noise emission properties as general requirement. They should also be less damaging to the track; track maintenance raises costs and disrupts traffic. Ways to minimize the track maintenance by deployment of better wagons must be studied.
Also, the whole complex of noise regulation, noise measurement in real time, noise initiated costs and its socio-economic dimension should be tackled as a key challenge in a holistic way. This is an example for tackling a problem according to the philosophy gap: a higher rail transport share in future will highlight this problem and radical solution strategies are needed for communication to the public and modern societies.

Improving freight wagon designs is a need created be the need for logistics efficiency and publics acceptance and application in a given market and it is foreseen to lead future designs. All new designs within an existing logistics network will start with test installations, demonstrators, pilots, regional deployments and then: deployments in a wider field of applications. New freight wagons with a perfect match of logistics requirements could

become a key for conquering new markets on first operations at specific corridors and applications.
Example: a new designed container wagon for high frequency shuttle transports between nodes should feature: low noise boogies (for acceptance in densely populated areas), central coupling (for highly efficient operation), fitting cone placements (for fast and dense loading process), and remote maintenance detection (for high dependability of the wagons).
On a long run a more differentiated wagon set is foreseen without the qualification of operations across the complete European network. A successful local solution can conquer a share at other markets too without being designed for meeting a cross European standard. It is foreseen that this concept will capture a significant share of the future co-modal transport market.

Preventive monitoring of axle bearing condition aims at handling the problem with axle box defects which is a source of wheel flats, track damages and disruption of services. It is necessary to mitigate these problems before they happen i.e. with preventive service of the wagon. In that context, all wearing and material fatigue relevant parameter should be monitored.

3.1.2 Single wagons and their future

Co-modality, vehicle and logistics gaps	Milestone 1	Milestone 2	Milestone 3
	2015	2020	2030
Single wagons	Tagging standardisation (RFID) of wagons	Automatic coupling and decoupling, improved braking	Introduction of competitive cross border SWL transport
	System integration to improve efficiency and competitiveness of single wagon load traffic	Wagons addressing last mile issue - autonomous/remote driving	

The single wagon or group of wagons loads are capable of competing with the single truck load. Unfortunately whereas the truck is provided by the operator in the type required by the user, the consignors' access to the wagons is not as easy. Many wagons have between 25 to 30 years of age and have sometimes to be modified to handle the type of cargo available in the market place, which has significantly changed over the same period of time. Private wagon owners have more modern fleets but the access to such fleet is largely done through long term commitment to obtain competitive renting prices.

Tagging standardisation (RFID) would allow operators, freight forwarders and end customers to track and trace the wagon throughout the supply chain all over Europe. This means better knowledge of the position of the freight on the wagon and a possibility to plan the subsequent stages of the supply chain in case of incidents within an appropriate reaction time schema (real-time, quasi real-time or by event).

Automatic coupling and decoupling and improved braking would greatly enhance flexibility and cut costs. Improved braking would also allow freight trains get better time slots. This technology advances have to be complemented by marshalling yards for automatic directed grouping methods. A fresh effort is needed to introduce the use of that feature with state-of-the-art components featuring all functions needed for proving competitive services within selective network areas. The area selected must prove some wagon technology choices to support SWL bridging the philosophy gap.

System integration to improve efficiency and competitiveness of single wagon load traffic is one of the most complex challenges in rail freight transport. Here, all traditions in rail transport are challenged by the modern (commercially driven) logistic requirements and cost competitions combined with (societal driven) socio-economic and ecology future demands. Because of that, the rail freight transport community must prove its innovation potential and demonstrate its willingness to fight back for gaining lost markets in a systematic and coherent approach with the help of means and actors which are equivalent to the magnitude of problems to solve. The roadmap must include the following elements:

a) capturing trends and results from national and regional developments
b) developing efficient and demonstrating competitive regional solutions in regions with high market shares and willingness to introduce (here, innovations play a key role)
c) transferring these developments cross border into regions with high potentials
d) developing road maps for cross European deployment.

New wagon concepts addressing the last mile are necessary if rail freight is to be able to capture market shares in the smaller sidings-driven door-to-door transport market from big trucks that don't have this problem. The markets here include mainly transports from raw material producers to manufacturing or consumption sites and to a lesser degree from manufacturing sites to ware houses. These new wagon concepts include two aspects:

a) the autonomous driving capability for driving few (last) miles on non-public tracks (FlexiCargoRail and CargoMover were early examples for this type of development),
b) the use of new type of larger size and customized containers suitable for sidings-to-sidings transport and more efficient loading mechanisms (the new TelliBox is a first example for that trend).

Inner city distribution is often made by smaller road vehicles. If rail cars can handle the last mile with similar efficiency as big trucks then the final shipment (last miles to customers) by the smaller road vehicles would present competitive cost per tons or per volume for both modes.

R&D efforts are planned within the 5th Call of FP7.

3.1.3 Trains and Terminals: Block Trains, Combined Transport, Rolling motorways and Semitrailers

Co-modality, vehicle and logistics gaps	Milestone 1	Milestone 2	Milestone 3
	2015	2020	2030
Block Trains	Lengthening the trains		
Combined Transport	Adaptation existing terminals for more efficient handling of seaport hinterland transport	Adaption of wagon fleet to modern market needs	Trains simultaneously carrying containers, swap bodies and conventional cargo
	Seaport hinterland transport concepts with further process automation complementing combined transport as mode of transport	New loading technologies for cheap terminals and remotely operated loading nodes	
Rolling motorways and semi trailer transport in Combined Transport	Optimizing existing gauge	New transfer technologies for cheap terminals	
	Better pocket wagons reducing wheel ware and optimizing existing gauge	Special booking system	

Lengthening of block trains significantly increase the efficiency, cut costs and increase capacity utilization. R&D project is in execution.

Combined transport for maritime containers in its present form as a terminal to terminal transport mode carries actually the main burden for gaining back market shares, in particular in seaport hinterland transport between seaport and hinterland terminals. The logistics and management interaction requirements of seaport hinterland transport however, are not exactly compatible with combined transport. Also, the buffer needs of seaport hinterland transports require a seamless integration of that buffer into the material flow, which is not required in Combined Transport so far. There is therefore a need for enhancing present terminals to comply with that within short time for maintaining the share for rail transport at main haul.

It seems obvious, that seaport hinterland transport becomes the next natural playing ground for developing and implementing strategies for industrialisation of the transport service by rail or co-modal. The reasons are: volume growth, price competition, scarcity of land at ports, environmental requirements, requirement for buffer-integration and the high potential for automation operation and processes.
It seems also obvious, that the present European Combined Transport system cannot handle this challenge in a sufficient manner. New hinterland strategies are under review by main ports in the north range (i.e. Rotterdam, Hamburg, Antwerp, Bremen). Rail transport is in fierce competition with barge transport. First projects with rail transport as main haul are undergoing their prove-of-concept phase, but concepts with complete process automation have not started yet.
An adaptation of wagon fleet towards catching up shares of seaport hinterland transport would also have an effect within short time.

Loading and handling technologies and legal frameworks for all types of load units that drive down the cost for swapping containerized freight within modes (mono-modality) and between modes (co-modality) must be developed for smaller terminals and remotely operated loading nodes where the amount of cargo is too small to support the cost of existing transfer technologies.

Trains simultaneously carrying container, swap bodies and conventional cargo increases the flexibility of use of rail freight and makes it easier to achieve higher train and network capacity utilization for the full length of the train set. This operation model suits mainly trains with container wagons for carrying “optimisation” load being served by small and fast (preferable remotely operated) container loading stations. Another alternative would be the technique of shunting wagon groups as a method of lean marshalling. Both methods require intense IT-support for booking and managing customer orders. This strategy must also be accompanied by new collaborative business models where competing freight forwarders share train sets like is the case for big container vessels. This strategy is also very efficient if inland terminals are designed like freight villages including a marshalling yard , a combined terminal, a conventional terminal, a logistics area in the same area where you do not loose your competitiveness gained on the trunk transport in costly transfers.

Rolling motorways with small wheels suffer from costly maintenance which is a problem that hasn’t been solved. Other types of wagon exist but the terminal costs have to be less expensive and require innovation. Also here, a holistic approach is needed for finding a common understanding across Europe and not only at national level alone; the limits of funds available across Europe compared to a commercially attractive supplier proposition does not match yet.
Better pocket wagons for more efficient on and off loading of semi trailers and with dynamic properties that enables them to optimize the existing gauge are necessary. Reanalyzing rapidly existing gauge profile in difficult points on the main network would be worthwhile even if older locos and wagons would have to respect different operating rules.

The transfer technologies for handling semi trailers require heavy investments in rail infrastructure and in rolling stock. Solutions are needed which are system compatible and allow to build a network of cheaper terminals.

Special booking systems have shown in some cases their positive impact on customer acceptance, train utilisation and cost reductions. This fact should be tested in other cases as well. There seems a dependency between in this chain of thinking: ease-of-booking of a train transport service –> ease-of-access –> ease-of-service, leading to: acceptance-of-service and use-of-service. Higher use-of-service leads to higher train utilisation and more services per time; this allows operating more services per time (day, week, etc.) at lower costs per service.
This logic should be made available easily as a generic IT solution.

3.1.4 Logistic and Multi/Co-modal Services

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<tr><td>Horizontal collaboration between shippers of same modality</td><td>Piloting standard compatible multimodal solutions for niche markets i.e. air-rail goods transportation</td><td></td></tr>
</table>

Reduction of empty running and repositioning of equipment are cost drivers that have to be mitigated. Examples are:

- Timely provision of single empty wagons to consignors and full single wagon to consignee are highly cost sensitive operations and require intense time-critical efforts across large parts of the rail infrastructure and across rail operators.
- Maintenance on site for most operations should generalize to reduce time lost to go to and from workshops

An enabler to reduce empty running is the development of a common e-platform for fleet management. This would allow fleet owners to offer empty capacity to other logistics providers in win-win agreements.

Cost differences for customs deposits and transport insurance guaranties over the complete supply chain must be eliminated. Today, they differ among rail operators. This type of costs must be taken out from market regimes; they must be regulated.

New types of rail-based transport and logistics services will become feasible within the framework of the new TEN-T policy. This new service will take advantage of a cost efficient (LWL = less than wagon load) rail transport service within the complete (rail and road) transport network with the option of managing main haul and first and last mile according to service requirements. The TEN-T policy calls for two types of transport networks: the core network and the comprehensive network. The networks are interconnected by different types of nodes. Especially dry ports and freight villages will have the capability providing that type of service. When developing co-modality further, this new type of rail-based

transport services become feasible, serving customers needs in a new dimension. No examples are in operation yet. However, Railports of DB Schenker Rail can be viewed as an early version of urban nodes. [Railports are rail operator owned facilities granting consignors and consignees access to rail transport plus some last miles transports by trucks].

Real time node management is needed in order to respond to manifold client requests towards the rail transport operation required by advanced supply chain transport organisations. There is no example at hand which is capable to handle rail-based transport processes adequately.

It is expected that co-modal logistics service via “Green Nodes” will become feasible within an industrialised container transport and logistics concept. This load unit-based logistic at load unit level will become reality over time. This is when more environmental, cost and service pressure is applied by the clients. The transfer of load units between the modes and within the modes will be performed in cost competitive “Green nodes”, which are based on Dry ports and feature more service capabilities, in particular relative to their focus on rail as their main mode. No examples are available today.

Collaborative efforts are needed for strategic development of multi and co-modal transport and logistics services. Examples for that new strategic markets are numerous and listed in chapter 3.5. The market for these services is there, mostly in a mono modal form. Therefore, new process elements are needed for providing the services in multi/co-modal form.

Horizontal collaboration between shippers of the same modality could be the starting point for a change in mind and mode. In particular, potential high growth markets (i.e. sea port hinterland transport) are subject of that kind of new thinking.
In this field, demonstration and piloting in niche markets counts and paves the way for more inroads into the same and similar service markets.

There are some basic requirements to consider whenever developing, planning and implementing logistics services for rail transport and co-modal services in particular.

1. Taking into account sunken investments.
2. Respecting standardisation.
3. Enhancing the main strength of the most valuable asset.
4. Taking care that any modification is saleable to the end user.
5. The RoI of any investment must be competitive at the time of the decision and take into account foreseeable evolutions.
6. The present communication capabilities can impact your customer relations .

3.2 Cross Border Gaps

The European interoperability legislation and ERA has made big progress towards creating a single European railway area. There are still many technical, operational and administrative barriers between the EU member states and between EU and the Asian land mass that need to be removed.

3.2.1 Interoperability and Europe to Asia Transport

<table>
<tr><th rowspan="2">Cross border gaps</th><th>Milestone 1</th><th>Milestone 2</th><th>Milestone 3</th></tr>
<tr><th>2015</th><th>2020</th><th>2030</th></tr>
<tr><td rowspan="8">Interoperability</td><td>Coordination between the path allocation of the countries crossed by the Rail Path</td><td>Coordination of path characteristics across borders</td><td></td></tr>
<tr><td colspan="2">Coordination of path characteristics across borders</td><td>Interoperability of equipments to an acceptable economic level</td></tr>
<tr><td>Acceptability of driving licenses - regional</td><td>Acceptability of driving licences – pan European</td><td></td></tr>
<tr><td>Acceptability of basic set of rules governing the personnel</td><td></td><td></td></tr>
<tr><td>Seamless Rail cross border transport TAF-TSI ICT</td><td>Open standard rail freight management of ICT packages compatible with other operators – enabler of train planning and collaborative approach</td><td></td></tr>
<tr><td>Acceptability and standardisation of a minimum language protocol. Harmonisation of regulations</td><td></td><td></td></tr>
<tr><td colspan="2">ERTMS level 2</td><td>ERTMS level 3</td></tr>
<tr><td>Europe to Asia Transport</td><td colspan="2">Develop and implementing strategic European technology options and co-operations</td><td></td></tr>
</table>

Coordination across member state networks of path allocations, cross border acceptance of train driving licenses and language protocols are problems for rail but not for road.

The drive to harmonise the technical systems must be done at an acceptable economic level and in the end lead to lower costs and not vice versa.

An open standard ICT standard for rail would facilitate the development of collaborative approaches where shippers can inform each others of available spare capacity that can be sold.

Implementation of ERTMS 2 and 3 on the European trunk network will improve interoperability and create capacity but the migration has to be done without jeopardizing the competitiveness of rail freight.

Economic growth, shifting trade patterns and localisations of production within Europe and between Europe and Asia will lead to a possibility of more freight on rail across the Eurasian land mass instead of ocean shipping. It is necessary with a foresight to accommodate this anticipated development and to develop and implement strategies and Technology options for this expected scenario.

3.3 System performance Gaps

It is relevant to use the terminology “System Performance”. Since the Rail mode is a European Transport System and it is a “closed” one due to the characteristic of its infrastructure unlike the road, the sea and also the air, few bottlenecks can make the system very vulnerable. Inadequate performance of only one actor in the total system chain creates problems for the others. This is today’s the state of the art. Hence innovative corridors management practices should be introduced.

3.3.1 New Traffic Management

<table>
<tr><th rowspan="2">System performance gaps</th><th>Milestone 1</th><th>Milestone 2</th><th>Milestone 3</th></tr>
<tr><th>2015</th><th>2020</th><th>2030</th></tr>
<tr><td rowspan="4">New Traffic Management</td><td>Mixed traffic traffic management to enhance freight path preservation - adopting of common operational rules</td><td>Innovative corridor management practices</td><td></td></tr>
<tr><td>Timetabling for proper ETA and ETP (execution to promise)</td><td>Introduction of new intelligent management systems capable of optimizing the use of the existing infrastructure</td><td></td></tr>
<tr><td colspan="2">Economically viable ERTMS</td><td></td></tr>
<tr><td>Capacity generation without new infrastructure improvements</td><td></td><td></td></tr>
</table>

Traffic management is essential for optimizing existing network capacity especially on mixed traffic lines which constitute the majority of the European trunk network. This requires the development of mixed traffic management methods to preserve and enhance freight paths. Freight customers need reliable Estimated Time of Arrivals and Execution to Promise in order to plan their subsequent supply chain in case of incidents. New intelligent management systems are necessary for “smoother end energy saving” train operation which leads to a better use of the capacity.
A new Traffic Management is a key factor for capacity generation without costly new infrastructure improvements. Here, new and creative methods for monitoring, influencing and increasing the network utilization are required.

3.3.2 Freight oriented-dedicated network, TEN-T Core and Comprehensive Network

System performance gaps	Milestone 1	Milestone 2	Milestone 3
	2015	2020	2030
Freight oriented network	Competitive innovative marshalling techniques in support of SWL		
Freight dedicated network	Development of TEN-T missing cross border links with "Green (multimode) Nodes". Benchmark with US railroads for best practice		Some tracks dedicated to freight
TEN-T Core and Comprehensive Network planning and evolving strategies	Green nodes enabling co-modal network design	Development of TEN-T missing core, comprehensive and cross border links interconnected by with efficient Green (co-modal) Nodes	Merging TEN-T Core and Comprehensive network via Green Nodes of primary, secondary and tertiary type.

Single Wagon Load is a significant part of freight traffic and will continue to play an important role in the future.
In order to stay competitive in serving customer needs various aspects have to be addressed:

1. Costs of shunting process and its pre (i.e. planning the composition) and post processes (i.e. brake test) as core function of SWL

Here, the core process remained unchanged since decades although the conditions for transport services have changed radically. The main issues to be reviewed are cost, operational flexibility , operational restrictions as well as quasi standards, which inhibits selective applications of innovations, like automated coupling and ep-braking systems, as listed in Chapter 3.1.

2. Traction concepts for main haul and first/last mile traction

In this field, cost reduction and increased flexibility are the main concerns. This could be reached on the transport network by a better planning involving the local actors. New traction concepts should be reviewed.

3. Loading and unloading techniques for non standard load units

Loading wagons is also a long standing process in SWL. Some progress (i.e. specific wagon for cars, dedicated liquid wagons) however points the direction of more dedicated wagons for integrating rail wagons into logistics processes – a route which should get a massive support.

4. Transport planning from siding to siding, organised as a service along the complete transport chain and enhanced by management functions as described in Chapter 3.4.1 and 3.4.2

To prepare an efficient transport planning for sidings to siding traffics it is important to have the visibility of all transport resources. This involves the nature of the cargo (volume, handling methods and processes) and the eventual automation of the transport between the marshalling yard and the siding.
In this field some research was done in Germany in 2005 as a reaction to the MORA-C project of DB.
The results which were promising should be reviewed again and deployment across Europe scrutinized.

5. Total cost concepts, separated according to:
    a. Commercial costs, to be carried by the transport service clients
    b. Socio-ecological costs, as a value to be covered by the community (as a proposition)

One of the main disadvantages of SWL is their high fixed costs of assets which are largely un-used every day. The big advantage of SWL is their potential of collecting different goods from different consignors and to transport them with the least energy consumption possible. The first is a commercial disadvantage, the latter a socio-ecological advantage. An accounting method is needed to bring about a fair pricing and cost structure.

An official implementation of Freight orientated networks could become a way to take off the pressure from infrastructure managers and in combination with some progress in the previous listed hurdles and issues secure the future for these basic services at acceptable costs.

Freight dedicated networks (on an intelligently managed basis, i.e. with slot management) should be part of the philosophy with the gradual closing of missing TEN-T core network, comprehensive network and cross border links and strategically located efficient green multimode nodes. The ultimate objective should be a railway network with some tracks dedicated to freight and a TEN-T core network which is interconnected by green co-modal nodes to the comprehensive network through secondary and tertiary nodes.

3.4 Service performance Gaps

The service performance is the satisfactory compromise between the customers' expectations and the final product of the system which is a combination of the technical product with all the other components of the service (commercialisation, information, billing…). To enhance the reliability and reduce the cost, major requirements from the customers, it has already been said that the path quality is a fundamental parameter.
Finding any technique allowing transporting more cargo with fewer resources is a strategic axis. As the network capacity in certain parts of the network is directly linked to the number of train paths used of different characteristics it is a natural way to search how to reduce the number of the slowest trains while transporting at least the same amount of cargo.

3.4.1 Volume flexibility, Reliability and Punctuality

Service performance gaps	Milestone 1	Milestone 2	Milestone 3
	2015	2020	2030
Volume flexibility		Adaption of wagon fleet to modern market needs including financial and contractual innovations	
Reliability	Information for organization of transport chain in case of incidents		
	Premium high price services and low cost low quality services		
	Cargo security for protection of high value cargo – 95% on time in full and without damage		
Punctuality	Path quality – preservation of slots for scheduled rail freight		

Flexibility, reliability, punctuality and cargo security are key service quality requirement parameters that rail freight has to adequately deliver to its customer. This means better information systems for efficient organisation of the transport chain in case of incidents, price differentiation of transport services according to service quality, ensuring path quality which is directly connected to the punctuality and protection of valuable cargo.
Financial and contractual innovations for the development and deployment of new wagons which meet customer demands are also necessary.

In any high through put systems (like train transport within a network is one of them), traffic jams are part of the systems characteristics and have to managed properly. In order to meet the service requirements of a given client as part of that system, control systems must be able to manage the complete process for that client according to the agreed and promised levels of service. This kind of possible differentiation is only very limited today with rail transport, mainly for the reason of non-visibility of date and the limited reaction options. But any future and successful rail transport system must be able to comply with that basic logistics requirement. Failing there would prove that rail is an un-flexible transport system fitted for carrying coal and ore as cheaply as possible and nothing else.

3.4.2 ETA, Shipment position, order response and billing

Service performance gaps	Milestone 1	Milestone 2	Milestone 3
	2015	2020	2030
ETA		ETA implemented on certain axis	
Information on the shipment position		RFID and GNSS technologies at an affordable cost	
Adaptable invoicing	Billing systems clear and adapted to customer computer system		
Rapid reactions to queries deliveries	Increase of service quality	Single rail undertaking offer across Europe – 1-2 logistics companies managing rail freight	

By 2020 a fully operational ETA should be established on certain strategic axis which together with shipment position technologies such as affordable (standardised) RFID or GNSS technologies will enable tracking and tracing of shipments.
Over and above that, ETA and ETP (execution to promise) are fundamental parameters of performance of any logistics system and new methods and new technologies should be studied in order to achieve more satisfactory results. Also here, regional and national research should mark the starting point and trans-European application of the results should remain a scientific subject for an adequate period of time.

The shipment position is a must of any new freight management system. Here, functionality ranks first and standardisation second.

Special invoicing for rail services is a relict from traditional rail business and should be replaced as soon as possible by modern billing rules with seamless interfaces with customer computer systems.

Service quality to rail customers would significantly improve with the implementation of billing systems adapted to the customer's computer as a service which comprises contracting, booking to exception, management and billing. The possibility to give a quick response to customer queries coupled with a single rail undertaking across Europe would be a big step forward.

3.5 Competitiveness gaps

This part of the roadmap ties together much of the previous sections into a complete and coherent picture with the overall objective to reduce costs, increase service quality and maximize network utilization by introducing the concept of transport industrialization. This means fully loaded long trains moving on corridors between mega hubs where freight is consolidated. Collaborative business models, spatial planning and TEN-T network integration are ingredients for the exploitation of this philosophy, in which the communication of different actors with the public plays a further main role.

3.5.1 New Commercial Approach, Freight villages and Traffic Bundling

Competitiveness gaps	Milestone 1	Milestone 2	Milestone 3
	2015	2020	2030
New commercial and cooperative approach	Capturing of new market segments such as durable goods, fast consumer goods, reefer products, returned cargo and reverse logistics etc.		
	Business models for collaborative approach for fleet renewal		
Freight villages (logistics spaces + intermodal terminals + marshalling yards + conventional terminals	Spatial planning for logistics approach in a borderless union	Spatial planning for mega hubs, freight villages, necessary for development of co-modality and long distance transportation, new designs and layout	
		Urban platform associated to the mega hubs and freight villages with suitable cargo exchange terminals	
Industrialize production and traffic bundling	longer heavier trains	Traffic bundling and mixed trains	
High Value Low Density Freight Trains	Fast and flexible trains with alternative length embedded in logistics concepts to supply mega hubs		
Multifunctional staff, training and education		Staff to be able to perform more tasks than today e.g. drivers handling shunting and loading. International freight train managers, drivers &service staff	

New Commercial and Co-operative approaches are necessary for capturing more freight and for accessing new mass market transport segments. A new rail based distribution network includes:

- Reverse logistics at any stage from the production to the distribution of goods at national or regional level offering new functionalities to all actors

- Rail Transport connections between all type of nodes, freight villages, urban nodes or distribution centres and even end customers collection/distribution points

Examples of market segments where rail can capture more freight are:

- All products necessary for construction activities from raw materials to equipments necessary to deliver finished houses or offices. Those products could be available in distribution

- Semi products for heavy industry, chemical and plastic industry, or raw materials for ceramic industry including equipment to store and distribute the products

- Agricultural products and food industry including transport of temperature controlled container.

- Consumer electronics products

Rail should tackle the booming waste logistics transport, including the last mile transport and develop research on new concepts, new business models and new marketing for this segment in order to reduce the necessary investments and find the best way to make attractive proposals on selected corridors.. Treating urban waste as a mass product provider for power plant stations gives block trains good opportunities.

Spatial planning for logistics freight villages and mega hubs, taking into account the last mile into urban centres issue, in a borderless union is necessary for traffic bundling and deployment of longer train. It is also necessary to develop collaborative business approaches to fill the longer and heavier trains in order to realise the potential efficiencies and synergies of transport industrialisation. New flexible trains that runs like passenger trains with characteristics that attract low density high value goods is a complementary approach to the longer trains. This service can be used for feeding the mega hubs with freight or service customer supply chains on their own. Multifunctional staff, education and training are essential for development of the human resources necessary for managing efficiently the supply chain.

3.6 The complete scorecard -Customer driven approach

Co-modality, vehicle and logistics gaps	Milestone 1	Milestone 2	Milestone 3	
	2015	2020	2030	
General wagon issues	Light weight rail cars for increased payload and energy effiency	Modern wagon concepts with low noise, track friendly bogies		
	Improving Freight wagon designs for better usage of infrastructure conditions - at least in selected corridors	Implementing high efficiency trains in selected corridors	Minimum 15% of all goods transport with high efficiency wagons.	
	Preventive axle bearing condition monitoring, improved braking and common data exchange protocols			
Single wagon	Tagging standardisation (RFID) of wagons	Automatic coupling and decoupling, improved braking	Introduction of competitive cross border SWL transport	
	System integration to improve efficiency and competitiveness of single wagon load traffic	Wagons addressing last mile issue - autonomous/remote driving		
Block Trains	Lengthening the trains			
Combined Transport	Optimizing use of the existing gauge	Adaption of wagon fleet to modern market needs	Trains simultaneously carrying containers, swap bodies and conventional cargo	
Rolling motorways and semi trailer transport in Combined Transport	Optimizing existing gauge	New transfer technologies for cheap terminals		
	Better pocket wagons reducing wheel ware and optimizing existing gauge	Special booking system		
Logistic services	Reduction of empty running and repositioning of equipment. Common e-platform for fleet management	Continuity of insurance guarantees all along the supply chain		
	Development of transport services within single or multiple dry ports in a TEN-T node concept	Real time node management and reorganization of road collection in combined transport at node level	Real time network management at load unit level	
		Co-modal logistics services via Green Nodes		
Multi/Co-modal services	Collaborative efforts with other modes addressing strategic issues i.e. separation of goods in their specific containments and type of transport mode			
	Horizontal collaboration between shippers of same modality	Piloting standard compatible multimodal solutions for niche markets i.e. air-rail goods transportation		

Various type of services

Cross border gaps	Milestone 1	Milestone 2	Milestone 3	
	2015	2020	2030	
Interoperability	Coordination between the path allocation of the countries crossed by the Rail Path	Coordination of path characteristics across borders		European Services
	Coordination of path characteristics across borders		Interoperability of equipments to an acceptable economic level	
	Acceptability of driving licenses - regional	Acceptability of driving licenses – pan European		
	Acceptability of basic set of rules governing the personnel			
	Seamless cross border rail transport TAF-TSI ICT	Open standard rail freight management of ICT packages compatible with other operators enabler of train planning and collaborative approach		
	Acceptability and standardisation of a minimum language protocol Harmonisation of regulations			
	ERTMS level 2		ERTMS level 3	
Europe to Asia Transport	Develop and implementing strategic European technology options and co-operations			
System performance gaps	Milestone 1	Milestone 2	Milestone 3	Capacity of the services
	2015	2020	2030	
New Traffic Management	Mixed traffic management to enhance freight path preservation - adopting of common operational rules	Innovative corridor management practices		
	Timetabling for proper ETA and ETP (execution to promise)	Introduction of new intelligent management systems capable of optimizing the use of the existing infrastructure		
	Economically viable ERTMS			
	Capacity generation without new infrastructure improvements			
Freight oriented network	Competitive innovative marshalling techniques in support of SWL			
Freight dedicated network	Development of TEN-T missing cross border links with green multimode efficient nodes. Benchmark with US railroads for best practice		Some tracks dedicated to freights	
TEN-T Core and Comprehensive Network planning and evolving strategies	Green nodes enabling co-modal network design	Development of TEN-T missing cross border links with efficient green co-modal nodes	Merging TEN-T Core and Comprehensive network via Green type of primary, secondary and tertiary Nodes	

Service performance gaps	Milestone 1	Milestone 2	Milestone 3	
	2015	2020	2030	
Volume flexibility		Adaption of wagon fleet to modern market needs including financial and contractual innovations		Service quality
Reliability	Information for organization of transport chain in case of incidents			
	Premium high price services and low cost low quality services			
	Cargo security for protection of high value cargo – 95 % on time, in full and without damage			
Punctuality	Path quality – preservation of slots for scheduled freight train			
ETA		ETA implemented on certain axis		
Information on the shipment position		RFID and GNSS technologies at an affordable cost		
Adaptable invoicing	Billing systems clear and adapted to customer computer system			
Rapid reactions to queries for deliveries	Increase of service quality	Single rail undertaking offer across Europe – 1-2 logistics companies managing rail freight		
Competitiveness gaps	Milestone 1	Milestone 2	Milestone 3	
	2015	2020	2030	
New commercial and cooperative approach	Capturing of new market segments such as durable goods, fast consumer goods, refer products, returned cargo and urban waste, reverse logistics etc			Competitiveness
	Business models for collaborative approach for fleet renewal			
Freight villages (logistics spaces+intermodal terminals+marshalling yards+ conventional terminals	Spatial planning for logistics approach in a borderless union	Spatial planning for mega hubs, freight villages, necessary for development of co-modality and long distance transportation, new designs and layout		
		Urban platform associated to the mega hubs and freight villages with suitable cargo exhange terminals		
Industrialize production and traffic bundling	longer heavier trains	Traffic bundling and mixed trains		
High Value Low Density Freight Trains	Fast and flexible trains with alternative length embedded in logistics concepts to supply mega hubs			
Multifunctional staff, training and education		Staff able to perform more tasks than today e.g. drivers handling shunting and loading. International freight train managers, drivers & service staff		

3.7 Prioritization

The various actions to be taken within the next 5-10-20 years in order to significantly strengthen the position and market share of rail freight in Europe are found in the left part of the roadmap. The prioritization is shown by the date of achievement of these actions. A mind map is also given where these actions are further explained and how they interrelate with each other. In short 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) on important corridors (compare container vessels).

4. Vision 2030 and Beyond

The future challenge for Rail Freight is the Capacity generation on the European rail Freight Network. This objective must be achieved through a better use of the existing infrastructures increasing substantially their productivity as clearly indicated in the directive of the European Rail Network for competitive Freight approved by the EU Parliament in November 2010, and the recently published White paper on Transport. The Key words capable of addressing this paradigm of Transporting more on Rail at an inferior cost are: Longer Commercially faster and heavier trains, Transport Industrialisation processes , Hinterland mega hubs and Freight villages as traffic bundlers/multiplicators connected between themselves and the Sea Ports, Spatial logistic planning introducing the space dimension in addition to time, the cooperative approach between the key actors of the transport chain through the sharing of the achieved benefits, elimination of infrastructure gaps - bottlenecks combined with innovative ITC equipments and Management technologies through new investments.

The new European freight mobility vision must rely on a new logistics concept where Rail freight has a central role to play. Such logistics 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 Light Rail 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 becoming 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 are being 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.

Rail Freight has made an important increase in the market share and is a key actor in the New European Freight mobility scenario.

The ERRAC Strategic Research Agenda (update 2007) predicted that the overall European transport demand would grow by 40 per cent for passengers and 70 per cent for freight by

2020 compared with 2000. The starting point of the railway business model for 2020 was that the railways would capture a market share of 15 per cent for freight and 12 per cent for passengers (including urban rail transit). 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 service for freight customers in medium and long distance freight transport – the area where rail has an evident comparative advantage compared to other modes.

5. The Freight Roadmap

5.1 Road map elaboration methodology

The purpose of the roadmap is to define what are the factors enabling to reach the target defined in the vision, what are the steps and, for each step, what are the various gaps to be bridged by research. This starts by analyzing the state of art, followed by analyzing of the existing projects and then proposing topics of research to progress towards the target.

It is proposed a first step to be achieved within 5 years (2015), a second one within ten years (2010) before reaching the target in 2030.

Realistic steps are proposed with clear effects on the parameters of decision for switching to the rail mode. The proposal is 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.

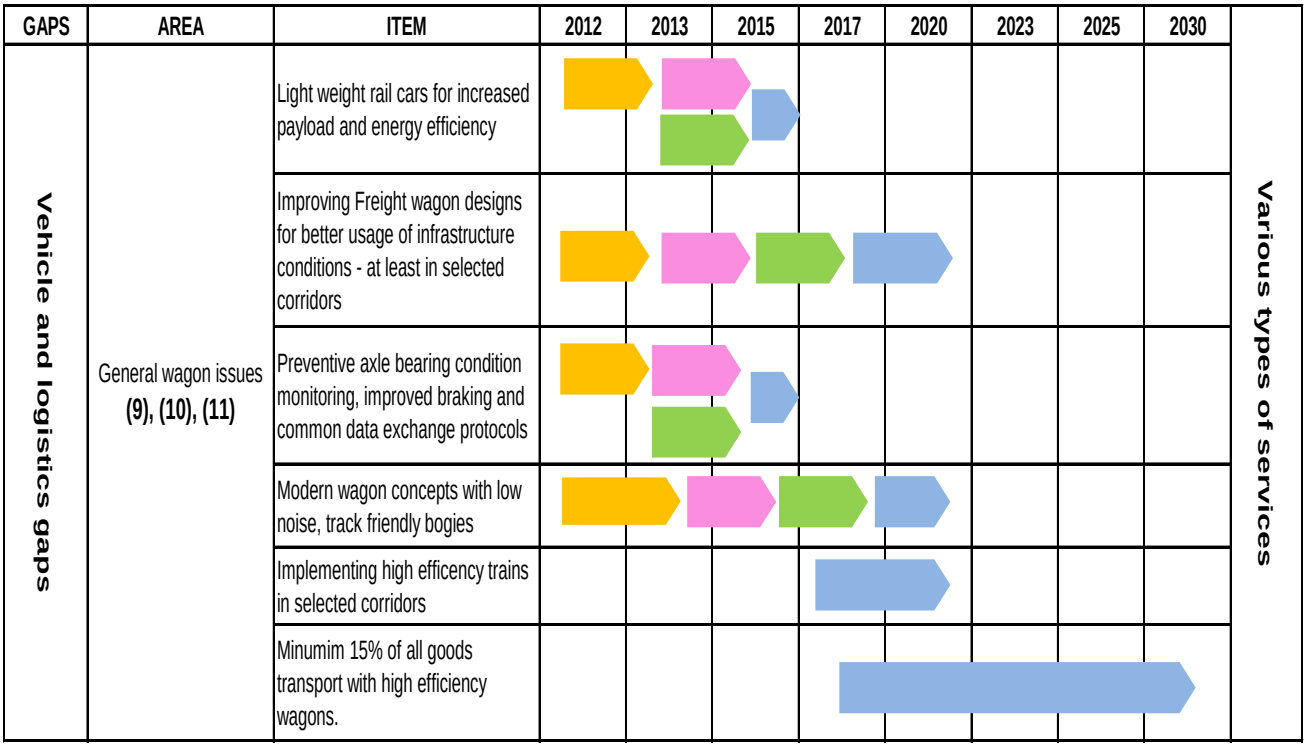
From this survey, having identified the most important factors of decision, it is suggested to study the factors components and research on those which will have the highest and quickest effect on the factors improvement.

As regards the competitiveness there are quite a lot of factors impacting on it and the survey was used to rank them. This enables to identify the topics and research priorities.

To reach the very ambitious targets of the ERRAC strategic agenda it is necessary to create a new business model for rail freight with a reliable, competitive service based on an industrialized production aimed at regaining market share segments from which rail had disappeared. New commercial cooperative approach between the cargo owners/ cargo managers/ optimisers/ logistics operators/ intermodal companies/ conventional cargo operators/ integrators/ forwarding agents will enable to achieve an efficient a multi channel service products distribution organisation. These services will use longer, heavier and faster trains, only way to boost the network capacity with seamless interoperable services between major European Mega Hubs involving freight villages, marshalling yards, conventional terminals, intermodal terminals and logistics zones. The efficiency of the connections will be optimized by bundling all types of traffics (conventional and combined) on these long trains which will have to be disaggregated very cheaply. This would be, for the future, the new rail freight business model economically viable. It will be supported by short sea shipping, inland waterways and road transports in a co-modal approach where they are more efficient in a vision of an optimized European freight mobility scenario.

5.2 Roadmap

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.



EURNEX comments in italics

Light weight rail cars for increased payload and energy efficiency

- *Innovative material and design concepts for wagons*
- *Assessment of advantages of reduced weight into various operational contexts from RU and collective viewpoints*

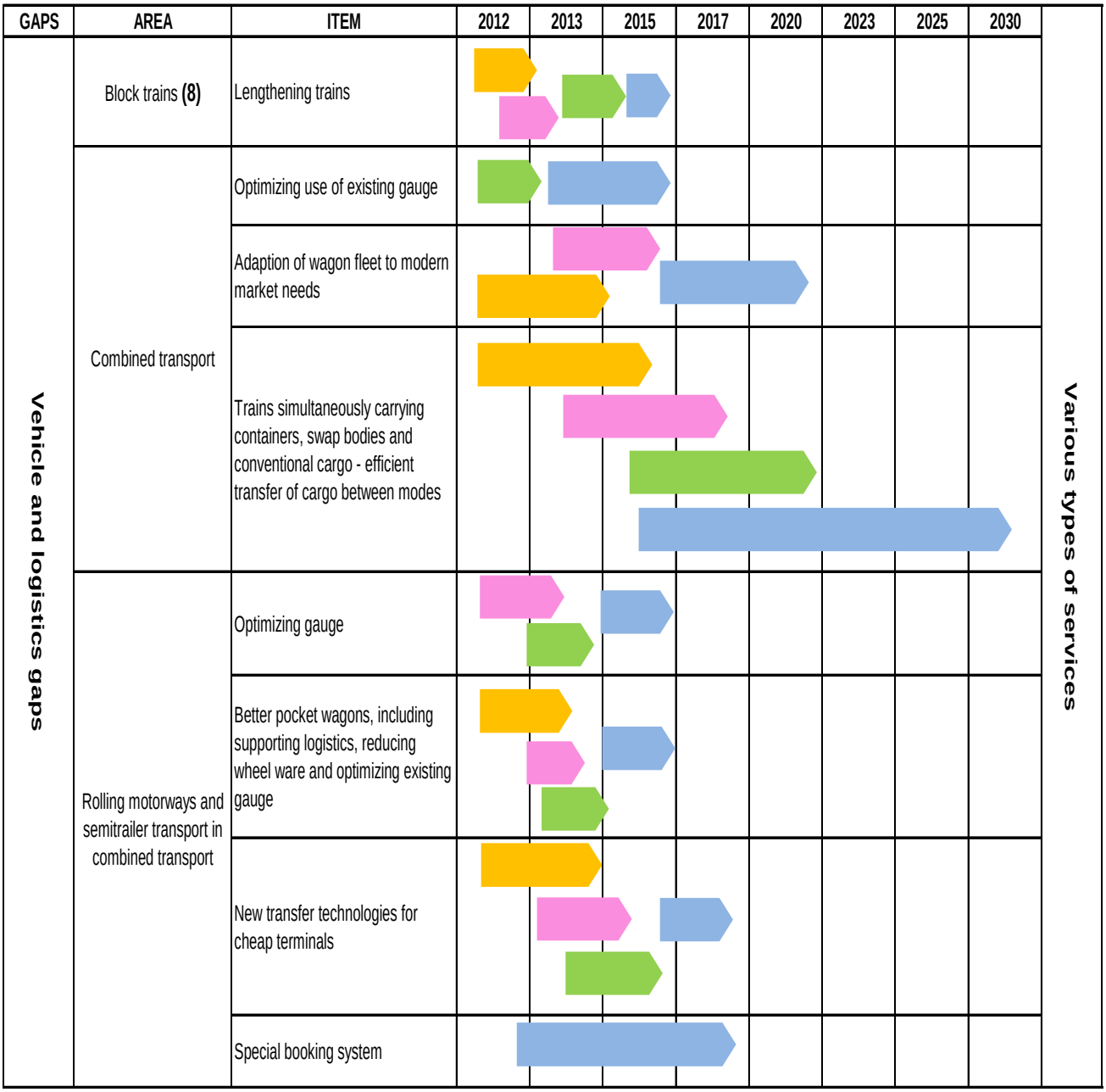
Preventive axle bearing condition monitoring, improved braking and common data exchange protocols

- *On-board and fixed installations for low cost axle bearing monitoring*
- *Optimisation of braking system design and operation oriented to axle bearing saving*
- *Effective management of collected monitoring information in view of on-condition maintenance planning and safety running control*

GAPS	AREA	ITEM	2012	2013	2015	2017	2020	2023	2025	2030	
Vehicle and logistics gaps	Single wagons **(9), (10), (11)**	Tagging standardisation (RFID) of wagons									Various types of services
		System integration to improve efficiency and competetiveness of single wagon load traffic									
		Automatic coupling and decoupling, improved braking									
		Wagons addressing last mile issue - autonomous/remote driving									
		Introduction of a competetive crossborder SWL transport									

System integration to improve efficiency and competitiveness of single wagon load traffic

- *Market investigation in the perspectives to prevent traffic migration towards road transport and address specific market niches*
- *Identification of low cost manoeuvres technological and operational needs (e.g. partial/full automation in marshalling yards)*
- *Implementation of integrated logistics services in a customer attractive door-to-door service*

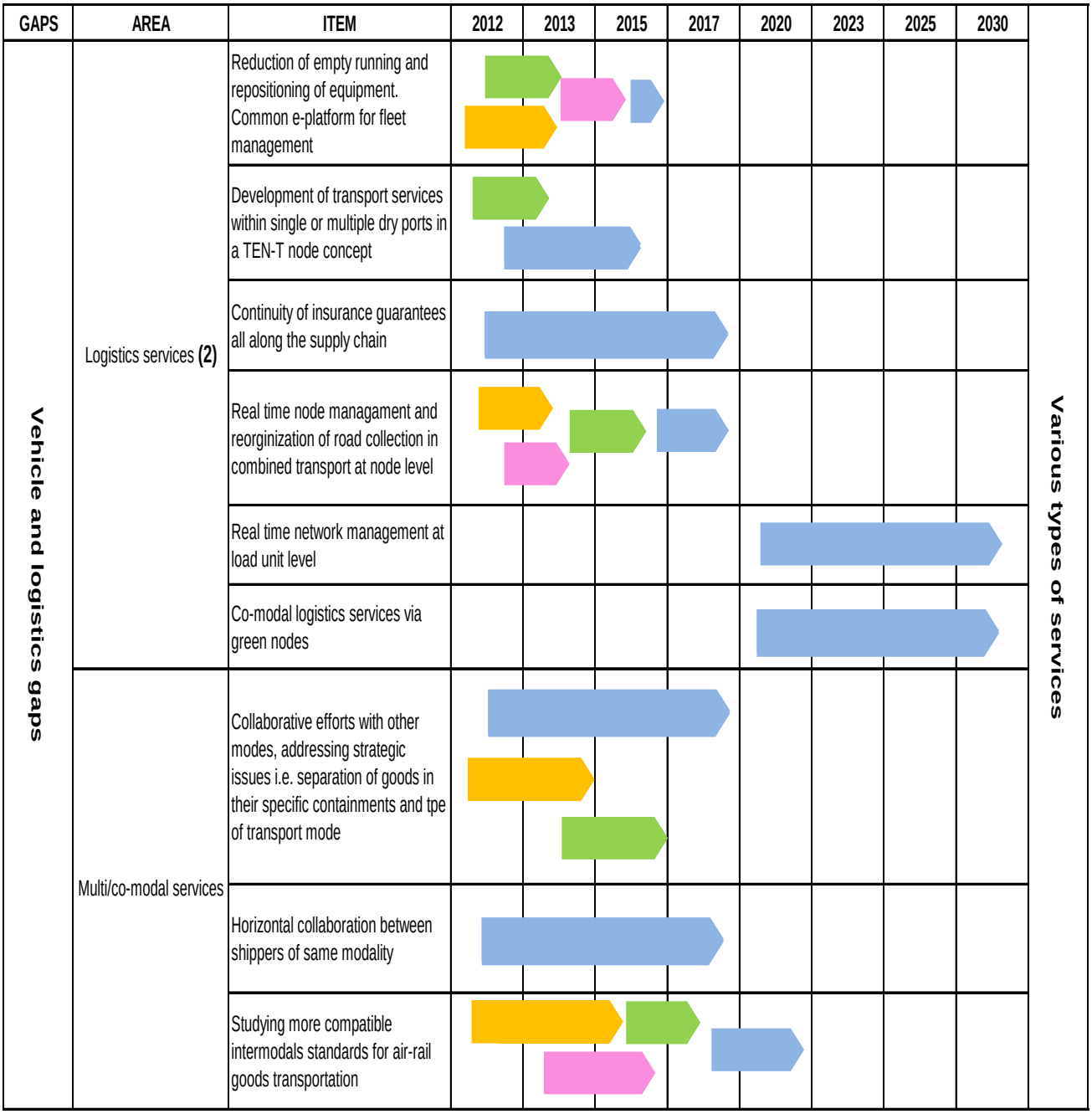


Lengthening trains

- *Investigation on economic convenience of trains lengthening from collective and operators points of views*
- *Framework study on technological and operational constraints to trains lengthening*
- *Vehicle implications for trains design and operation (braking systems, coupling components, etc.)*

New transfer technologies for cheap terminals

- *Optimised embarkation and disembarkation of trailers (rolling motorways) and semi-trailers (unaccompanied combined transport)*
- *Use of ITS and simplified procedures for easy reservation, check-in and accessibility of road vehicles*



Reduction of empty running and repositioning of equipment. Common e-platform for fleet management

- *Technical and commercial investigations on the feasibility of an intercompany (RU) management of wagons fleets to minimize empty running based on a common e-platform*
- *Technical and commercial investigations on the feasibility of an intercompany (terminals) management of fixed equipment to minimize unnecessary trains movements based on a common e-platform*

Real time node management and reorganization of road collection in combined transport at node level

- *Use of ITS and simplified procedures for preventive approach, check-in and accessibility of road vehicles*
- *Use of ITS for real time optimisation of the equipment use in the terminals*

GAP	AREA	ITEM	2012	2013	2015	2017	2020	2021	2025	2030	
Cross border gaps	Interoperability (1),(3)	Coordination between the path allocation of the countries crossed by the Rail Path									European services
		Coordination of path characteristics across borders									
		Acceptability of driving licenses - regional (2015) and pan European (2020)									
		Acceptability of basic set of rules governing the personnel									
		Acceptability and standardisation of a minimum language protocol. Harmonisation of regulations									
		Seamless cross border rail, TAF-TSI ICT									
		Open standard rail freight management of ICT packages compatible with other operators – enabler of train planning and collaborative approach									
		Interoperability of equipments to an acceptable economic level									
		ERTMS level 2									
		ERTMS level 3									
	Europe to Asia transport (4), (5)	Developing and implementing European technology options and cooperations									

Interoperability of equipment to an acceptable economic level

- *Identification of possible simplified procedures and on-board equipment for the management of not ERTMS equipped cross border operation*
- *Definition of possible signalling simplification (low cost ERTMS) for freight traffic dedicated lines and freight trains locomotives*

GAP	AREA	ITEM	2012	2013	2015	2017	2020	2021	2025	2030	
System performance gaps	New Traffic Management **(12)**	Mixed traffic traffic management to enhance freight path preservation - adopting of common operational rules									Capacity of the services
		Timetabling for proper ETA									
		Capacity gerneration without new infrastructure improvements									
		Innovative corridor management practices									
		Introduction of new intelligent management systems capable of optimizing the use of the existing infrastructure									
		Economically viable ERTMS									
	Freight oriented network **(2),(4),(5)**	Competetive innovative marshalling techniques in support of SWL									
	Freight dedicated network **(2),(4),(5)**	Some tracks dedicated to freights									
		Development of TEN-T missing cross border links with green multimode efficient nodes. Benchmark with US railroads for best practice									
	TEN-T Core and Comprehensive Network planning and evolving strategies	Green Nodes enabling co-modal network design									
		Development of TEN-T missing cross border links with green multimode efficient nodes									
		Merging TEN-T Core and Comprehensive network via Green type of primary, secondary and tertiary Nodes									

Timetabling for proper ETA

- *Timetabling planning methodologies to increase the reliability of ETA*
- *Methods and tools for on line operation management (dispatching criteria) aiming to maximize the reliability of ETA*

Capacity generation without new infrastructure improvements

- *Analysis of capacity assessment methodologies and comparison with actual operation contexts*
- *Selection of capacity methods to identify capacity margins to be used*
- *Identification of operational (e.g. timetabling) and technological (e.g. signalling) needs to maximise the use of marginal capacity*

Introduction of new intelligent management systems capable of optimizing the use of the existing infrastructure

- *Methods and tools (e.g. ITS based) for on line operation management (dispatching criteria) aiming to maximize the use of marginal capacity*
- *Green Nodes enabling co-modal network design*
- *Identification of freight terminals location (mega-hubs and freight villages) capable to maximise the modal transfer towards rail and ships in a co-modal network*
- *Identification of freight terminals design requirements capable to maximise the modal transfer efficiency (e.g. length and reliability of transit time within the terminals)*

GAP	AREA	ITEM	2012	2013	2015	2017	2020	2021	2025	2030	
Service performance gaps	Volume flexibility	Adaption of wagon fleet to modern market needs including financial and contractual innovations									Service quality
	Reliability	Information for organization of transport chain in case of incidents									
		Premium high price services and low cost low quality services									
		Cargo security for protection of high value cargo - 95% on time, in full and without damage									
	Punctuality	Path quality									
	ETA **(12)**	ETA implemented on certain axis									
	Information on the shipment position	RFID and GNSS technologies at an affordable cost									
	Adaptable invoicing **(7)**	Billing systems clear and adapted to customer computer system									
	Increase of service quality **(7)**	Rapid reaction to queries for freight deliveries									
		Single rail undertaking offer across Europé- 1-2 logistics companies managing rail freight									

Information for organization of transport chain in case of incidents

- *Setup of ITS based systems (common e-platform) to grant the permanent and accessible availability of information concerning freight location along the transport chain*
- *Definition and practical implementation of dispatching criteria based on common e-platform information and virtual reality simulation tools*

Path quality

- *Setup of quality chart requirements for freight paths, including monitoring procedures and bonus-penalties systems to be managed between customers and RU*

GAP	AREA	ITEM	2012	2013	2015	2017	2020	2021	2025	2030	
Competetiveness gaps	New commercial and cooperative approach	Capturing of new market segments such as durable goods, fast consumer goods, refer products, returned cargo and reverse logistics etc									Competetiveness
		Business models for collaborative approach for fleet renewal									
	Freight villages (logistics spaces+inter-modal terminals+ marshalling yards+ conventional terminals **(2),(5)**	Spatial planning for logistics approach in a borderless union									
		Spatial planning for mega hubs, freight villages, necessary for development of co-modality and long distance transportation									
		Urban platform associated to the mega hubs and freight villages									
	Industrialize production and traffic bundling **(8),(13)**	Traffic bundling and mixed trains									
		Longer heavier trains									
	High Value Low Density Freigth Trains **(9)**	Fast and flexible trains with alternative lenght embedded in logistics systems									
	Multifunctional staff, education & training	Staff able to perform more tasks than today e.g. drivers handling shunting and loading. International freight train managers, drivers & service staff									

Traffic bundling and mixed trains

- *Market analysis to identify potential attractive power of lower cost/price services managed with mixed trains operated by multipurpose undertakings*
- *Technological and operational constraints to be faced to effectively manage mixed traffic operation*

Fast and flexible trains with alternative length embedded in logistics systems

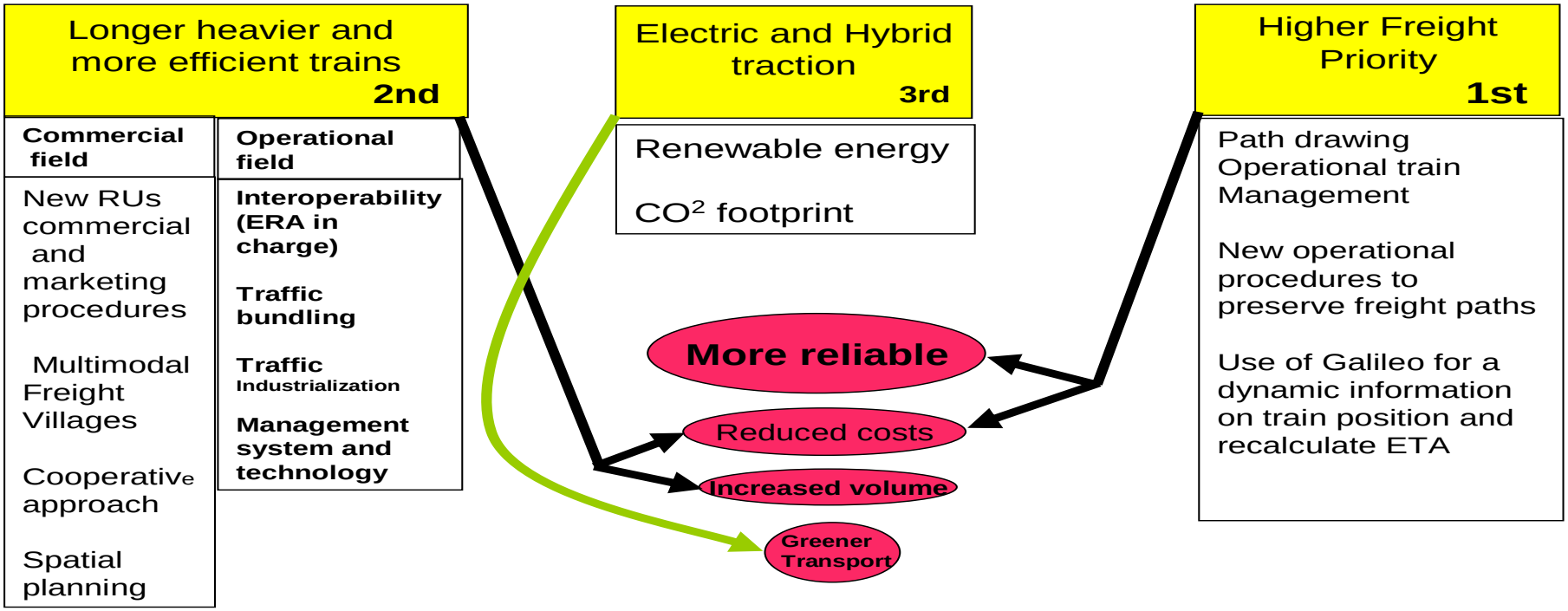
- *Market analysis to identify potential attractive power of lower cost/price and logistic integrated services managed by longer trains, possibly operated by multiple RU*
- *Identification of market uptake requirements to design logistic systems including fast and flexible railway services*
- *Design requirements for trains capable to easily modify compositions (e.g. wagons and locomotives performances)*

5.3 The Mindmap

Maximizing existing rail network efficiency

Fundamental customers needs prioritized according to the size of the letters

Reliability; Competitiveness; Capacity; Information; Green transport



This mind-map is a first five year step in the long term roadmap

Annex

ERRACs Roadmap in the policy and legislative perspective

EC COM(200) 279 final COMMUNICATION FROM THE COMMISSION A sustainable future for transport: Towards an integrated, technology-led and user friendly system.

In 2001, the Commission issued a White Paper[4] setting an agenda for the European transport policy throughout 2010. This programme was updated in the mid-term review of 2006[5]. After an extensive consultation process 2008-2010 a new Transport Policy White Paper[6] was published in 2011.

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[7]) and traffic management systems for rail (ERTMS[8])
- 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

4 COM(2001) 370.
5 COM(2006) 314.
6 COM(2011) 144.
7 COM(2008) 886 and COM(2008) 886/2.
8 COM(2005) 903.

right to submit a new proposal for a Regulation if the development of rail freight so requires.

EC Proposal for a Regulation… concerning a European rail network for competitive freight COM(2008) 852 final.

This Proposal points at the need for the Community to meet its commitments in terms of reducing greenhouse gases … energy resources are very important features of Community transport policy.

Research does not primarily figure in the Proposal but the development of combined traffic, the development of interoperability and ERTMS, the development and management of the intermodal terminals used for the railways and the quality and reliability of the infrastructure capacities allocated to freight are mentioned. These and other related matters such as the selection of corridors, capacity allocation, traffic management will need R&D if the of the objectives of the Proposal shall be met.

This Proposal has met with opposition in some Member States but this is outside the scope of this memo.

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[9] obliges the EC to monitor developments thorugh a Rail Market Monitoring Scheme (RMMS).

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.

[9] 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.

References

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).

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 still ongoing (Feb 2010).

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.

6. FASTRCARGO

FASTRCARGO was an EU project under the FP 6 that about faster and more efficient transhipment technologies. The project was to set up a full scale demonstrator but this was not achieved. In the end a partial demonstrator was designed which together with animations showed the principles of a new way to shift containers between rail and road. A similar system called Metro Cargo has a full scale prototype running in Italy.

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 :

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 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:

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

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::…

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

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%