European Commission

The Performing Rail Infrastructure Manager

Transport

FOREWORD:

The development of a Single European Railway Area with an internal railway market, based on an integrated infrastructure network and interoperable equipment, is a fundamental aim of European rail policy.

An important milestone was reached with the recent adoption of Directive 2012/34/EU which will considerably change the way the rail market works, stimulating investment, improving market access conditions and reinforcing the role of national rail regulators. Although respectable progress has been made, there are still many challenges to face, to enable the trans-European rail sector to achieve its full potential and to compete effectively with other modes. For this reason, we need to break down barriers, attract more operators to the market, remove tendencies for protectionism and raise efficiency, service quality, punctuality and reliability.

Despite regulatory developments in recent years, the current governance of railway infrastructure in the EU still fosters network inefficiencies and difficulties in cross-border operations, preventing the smooth functioning of the Single European Railway Area. In order to foster the performance of the railway sector and its competitiveness, it is therefore indispensable to adopt appropriate arrangements improving network efficiency. Against this background, in 2013 the Commission put forward ambitious legislative proposals concerning the performance of the rail infrastructure manager in its 4th Railway Package.

Network efficiency can be improved by encouraging appropriate cross-border cooperation between infrastructure managers and by ensuring that infrastructure managers perform all the functions needed to run the infrastructure in an optimised, efficient and non-discriminatory manner.

Therefore, the Commission proposes to create a forum for the cooperation of infrastructure managers across borders with a view to developing the European rail network. Strong cooperation between infrastructure managers is vital for the development of the Rail Freight Corridors and the implementation of the European Rail Traffic Management System (ERTMS) deployment plan. Rail infrastructure managers also need to cooperate with airports and ports, which are the gateways to the EU transport network. Coordinating investments in ERTMS and linking them with infrastructure managers' key performance indicators such as safety, would significantly contribute to ERTMS development. In this context, it is important to monitor the performance of infrastructure managers in order to improve the quality of services.

Furthermore, infrastructure management becomes more efficient when all functions necessary for the sustainable operation, maintenance, and development of the rail infrastructure are managed in a consistent manner by a single entity. This also means that the options set out in the existing legal text allowing functions of the infrastructure manager on a network or part of a network to be allocated to different bodies or firms should be abolished. At the same time it is important to ensure that all these essential functions continue to be performed independently, in order to ensure non-discriminatory access. This is why the Commission proposes in its 4th Railway Package not only to bring together all the functions of an infrastructure manager, but also to foresee appropriate safeguards to make it independent from railway operators.

Fostering cooperation among infrastructure managers across borders and improving contacts and exchange of best practice between them is the best way to improve the efficiency of infrastructure management.

I am confident that infrastructure managers operating efficiently and responding to the needs of rail companies can make rail transport attractive for new operators and customers.

Vice-President of
the European Commission


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WHY DO WE NEED COOPERATION BETWEEN INFRASTRUCTURE MANAGERS?

Management of traffic disruptions and temporary traffic restrictions

Infrastructure managers not cooperating across borders may neglect the impact of their decisions on international traffic and traffic beyond their network. This leads to mismanagement of traffic disruptions and temporary traffic restrictions due to maintenance and renewal of tracks, especially when more than two infrastructure managers are concerned. A better cooperation can help to avoid too severe capacity restrictions that may result from simultaneous heavy maintenance works on different routes in different Member States.

Neglect of interoperability and cross-border infrastructure

As regards investment, national infrastructure managers often neglect interoperability and cross-border infrastructure (in particular cross-border hinterland connections of the major ports) when they prioritise the needs of domestic traffic. Where the investment decisions of infrastructure managers are biased towards the needs of the national incumbent, international trains suffer most because they have to be configured and/or routed according to the "weakest link" in the infrastructure chain (in terms of ERTMS deployment, axle loads, loading gauge, electric supply, train length, train mass etc.).

Too often, poor railway connectivity impinges the economic development and performance of other transport sectors, like sea-ports and inland navigation waterways. Developments in maritime transport logistics demand much more flexible and integrated inter-modality solutions for hinterland freight distribution. The external trade of land-locked Member States and regions relies more and more on reliable transport connections that, in terms of capacity, environmental performance and external costs, can only be provided by a modern, well integrated railway system.

Lack of international infrastructure funding

A further problem is a lack of international infrastructure funding accompanying the lack of cooperation between infrastructure managers. National infrastructure funding priorities may not necessarily consider future pan-European demand. The long lifetime of assets, conservatism of the sector and a preference to maintain national or regional specifications limit the attractiveness of international funding projects for infrastructure investment.

For instance, infrastructure managers along the corridor Rotterdam-Genoa made substantial investments to enhance capacity and establish the interoperability of train control and command systems on the basis of ERTMS. In doing so, they expected that all participants would stick to the agreed timescales for deployment. However, Germany and Italy reported in early 2013 that corresponding investments on the German stretches of this corridor will only be made three years later and on the Italian stretches five years later, which means that benefits will be delayed for other infrastructure managers as well as for the users.

WHY DO WE NEED COOPERATION BETWEEN INFRASTRUCTURE MANAGERS?

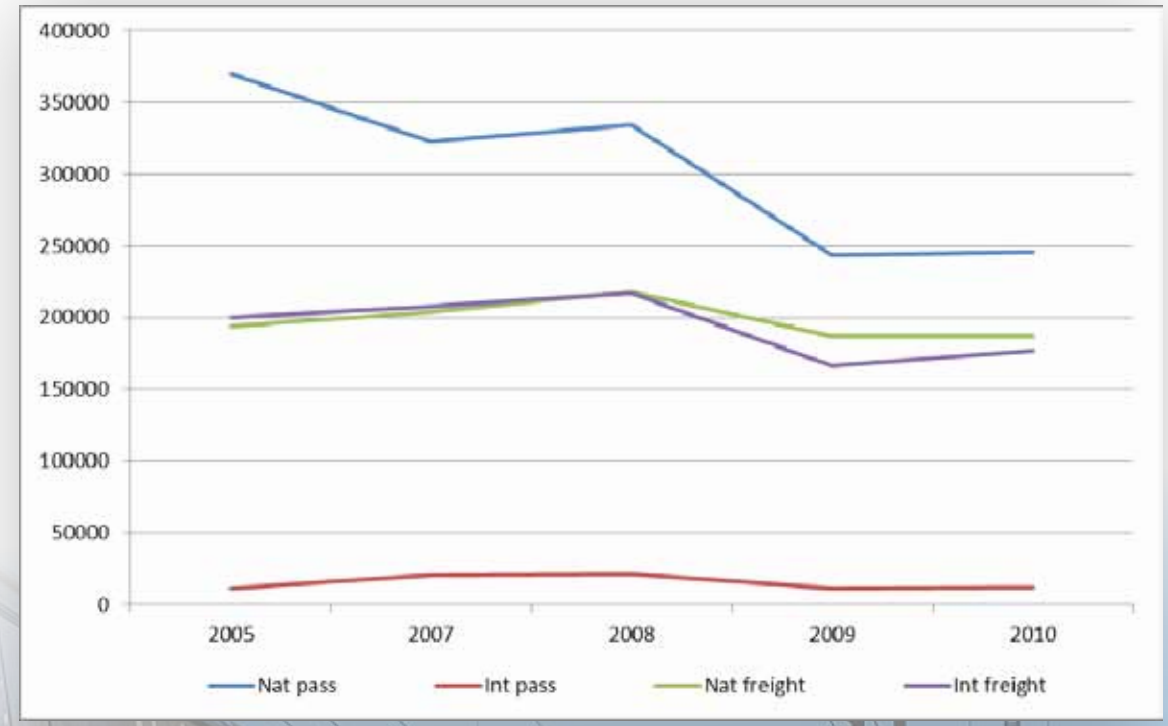
Low train speeds on international routes

Freight trains are still hampered on many international routes. This results from time-consuming operations still necessary at many border crossings. Operations at borders have not yet been streamlined to exploit the advantages of the internal market and the Schengen rules. As a result, rail is losing time-critical shipments to road transport. A better cooperation among infrastructure managers would help to make border procedures more efficient.

Lack of coordination of charging policy

Finally, the fact that the charging policies of the different infrastructure managers across borders are not matched to each other, can either lead to a misbalanced use of capacity and delays as a result, or cause road to be preferred as a transport mode by the shippers.

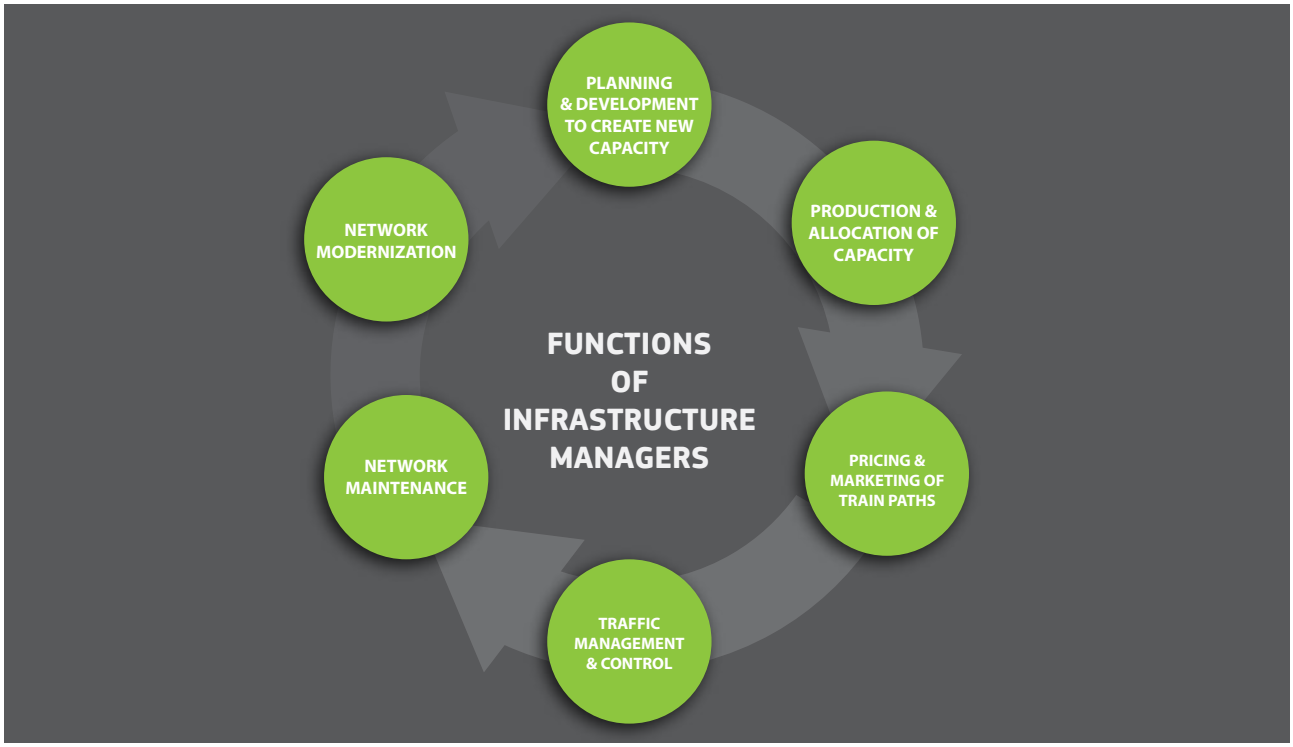
Rail freight undertakings operating in France, the United Kingdom and Sweden for instance enjoy moderate levels of infrastructure charges that are by and large competitive with road. This has allowed rail freight to grow for example within the UK, however, the number of international freight trains through the Channel Tunnel to and from London did not grow or has even dropped, though the link accommodates trains with the main continental track gauge and has capacity available. This appears to be due to charging issues and operational barriers in the tunnel and on its main links in the UK and France. A better coordination of charging policy between the four different IMs involved might open the opportunity to attract more trains and at the same time safeguard the financial interest of all companies involved.



Evolution of domestic and international traffic in the EU (in Mton/km for freight traffic and Mpassenger/km for passenger traffic)

A FULLY-FLEDGED INFRASTRUCTURE MANAGER

> *Infrastructure managers should be able to perform all relevant functions of infrastructure management in order to ensure that all these functions are fulfilled in a consistent manner. This is essential to increase performance as the development, operation and maintenance of railway infrastructure are very much inter-related for a well-functioning network.*



A FULLY-FLEDGED INFRASTRUCTURE MANAGER

Risk of inconsistencies when responsibilities are split

The capacity of an infrastructure manager to develop and optimise transport infrastructure and ensure quality, reliability, flexibility and customer orientation, depends on his actual control over all key infrastructure functions. The current legislation provides that the two essential functions of path allocation and track access must be performed by an independent undertaking, whilst all other functions may be performed by an infrastructure manager. However, there are substantial interactions between these essential functions and other key functions of the infrastructure manager, in particular traffic management, infrastructure maintenance and development. Their distribution among different market players can lead to inconsistencies in management and increased coordination costs. With unified national infrastructure management, it is possible that a more specialised infrastructure manager will have a greater interest in the better use and correct maintenance of the current infrastructure and the right dimensioning of the future one.

3 sets of competences for infrastructure management

Development: network planning, financial and investment planning as well as building and upgrades of the infrastructure

Operation: i) all elements of the process of train path allocation, including both the definition and the assessment of availability and the allocation of individual paths, traffic management and ii) infrastructure charging, including determination and collection of the charges

Maintenance: daily maintenance (including tracks, energy and signalling systems), infrastructure renewals and the other asset management activities

BENCHMARKING THE EFFICIENCY OF INFRASTRUCTURE MANAGERS

"The efficiency of infrastructure managers can be measured on the basis of common indicators and quality criteria. Cooperation between infrastructure managers on these indicators and criteria can help improve the functioning of the whole EU rail network. Here are some examples of existing difficulties or best practice which make the case for greater exchange of experience.

BENCHMARKING THE EFFICIENCY OF INFRASTRUCTURE MANAGERS

Reliability & punctuality

As predictable reliability will tempt potential customers to utilise public transport, working on improvements of public transport reliability has a high priority.

In a stakeholder consultation carried out for the Commission for its 4th Railway Package, respondents commented that there are still problems with reliability and punctuality of freight services all across Europe. These problems can partly be related to infrastructure management. Some said that cross-border operations suffer from a lack of interoperability which requires operators to purchase complex technology. One freight operator complained that the infrastructure manager prioritises passenger traffic, often because of priority rules determined by the national legislator.

The lack of punctuality and predictability of services affects rail competitiveness relative to other transport modes, that is, road, sea and air transport, due to the inconveniences this lack of punctuality causes to the customers, but also due to the costs imposed on other stakeholders. On densely used railway lines, a small delay to one train might cause further delays to other trains.

Punctuality appears satisfactory in a significant number of Member States, but is considered insufficient by more than 40% of those surveyed in Poland, Germany, Sweden, Romania and France.

A study by OECD found that railway traffic in Germany is very reliable. Nevertheless the infrastructure company DB Netz AG seeks to further improve reliability and punctuality. Amongst others they undertake – within their framework of the successful program for the future "Pro Netz" – substantial building and prevention measures. This means for example an elimination to a large extent of the speed restricted sections of the network.

The punctuality of railway traffic is subject to many influences. These influences range from willful tampering with the railway, trespasses on the network, extreme weather conditions, failures of infrastructure and vehicles to construction works in the rail network. Experience shows that disruptions are caused by railway undertakings and their carriages, infrastructure failures and external influences by an equal share.

For example, in Germany 39 000 trains are running every day on the network of about 34 000 km of lines. Of these are 33 000 passenger trains which are running daily on the nationwide network, many of them integrated into tight regular interval timetables. They are used by more than five million passengers a day.

Disruptions on individual lines can be translated immediately within the close meshed and regular interval timetabled system and also by domino effect into the whole network.

BENCHMARKING THE EFFICIENCY OF INFRASTRUCTURE MANAGERS

Capacity & availability

The EU has a total of approximately 212 000 km of railway lines, a level which has seen for a slight decrease over the last decade. The European high speed network, however, has continued to grow, reaching 6 600 kilometres in 2010, corresponding to a two-fold increase in eight years. Spain now has the biggest network ahead of France.

Not all the EU network is used with the same intensity. Some Member States are closing of some lines due to particularly difficult budgetary situations, (for instance Greece, Romania and Portugal) as their networks may appear oversized. Some other parts of the EU network are on the contrary congested and infrastructure management is then key to make capacity available to rail operators.

Safety

Around 2 400 significant accidents occur each year on the railways of the EU Member States, according to European Rail Agency's intermediate report (2013). In these accidents, around 1 200 persons are killed and a similar number of persons seriously injured. Most of the fatalities involved people who were on tracks in prohibited areas. In 2011, railway safety continued to improve across Europe, with 2 342 significant accidents resulting in 1 183 fatalities and 1 032 seriously injured. Accident figures have been decreasing considerably over the past five years; the casualties' numbers have seen slight, close to uniform reductions over the same period. Rail safety is an absolute requirement for all rail actors including infrastructure managers. Indeed, the maintenance of the network or the coordination between the infrastructure manager and the various operators on its network are determinant factors to ensure a safe rail system.

Best practices may be found in the UK where accident levels have fallen at a faster rate after market opening and separation rather than before it. Two consultants, Steer Davies Gleave (2011) and Thompson (2004), have come to the conclusion that safety in the UK did not suffer from the reform process, on the contrary.

BENCHMARKING THE EFFICIENCY OF INFRASTRUCTURE MANAGERS

Asset management

Fewer and higher quality inspections and a coherent, flexible asset management system are best practices in asset management. Track assets are best managed by an effective, efficient but simple process consisting of the following elements: track inspection processes including foot and mechanised inspection, effective analysis of the data received and the correct decision being made to intervene with maintenance or renewal work. Such practice entails lower inspection costs and higher inspection quality, reduction in the level of incorrect or sub-optimal work, regular proactive interventions reducing the proportion of more extensive reactive work and improved safety, as hazards such as broken rails and track irregularities would be identified and dealt with more rapidly. It is estimated that it would take three years to fully reach the maximum benefits of this asset management system but productivity gains could already materialise before this.

In the Netherlands ProRail expects 20% potential savings per year by reducing train inspections thank to the use of SAP Asset Management Module.

BENCHMARKING THE EFFICIENCY OF INFRASTRUCTURE MANAGERS

Maintenance

Metre for metre, line for line – the quality of the entire rail network and all the related equipment and systems is absolutely essential for ensuring that passenger and freight services run smoothly at all times.

Infrastructure Managers in Europe are spending a total of some €15 to 25 billion annually for railway infrastructure maintenance and renewal.

Against the background of increasing performance requirements set by government and operators related to railway safety, labour safety and noise levels, the task of maintenance represents a major challenge for infrastructure manager. In order to facilitate more diverse transport services (e.g. light rail and high-speed trains), more trains per hour, longer operating hours and an improved punctuality, the operational conditions on many railway lines are increasingly strict. These conditions conflict with the efficient scheduling and execution of maintenance works and can, in the long run, lead to an increase in maintenance and renewal as well. Moreover, infrastructure managers are increasingly confronted with worn-out assets, backlogs in maintenance and track possession claims for construction and upgrading (e.g. for increasing the track capacity and the installation of new technology).

In order to deal with the short-term cost and performance demands and to guarantee the RAMS (Reliability, Availability, Safety and Maintainability) in the long run, systematic 'maintenance management' of the railway assets is needed. For a long time, maintenance was mostly based on individual, subjective experience from local track supervisors and was considered "something that just needed to be done". However, as the infrastructure components have long life spans, decisions in design and maintenance have a long-lasting impact. If for instance preventive maintenance is reduced, the assets can become worn-out quickly and this can result in disproportionately high maintenance costs. Therefore, infrastructure managers need maintenance analysis and planning tools that enable them to systematically analyse and optimise budget needs, minimise the total costs for the required RAMS level, and guarantee the quality of the railway assets in the long run.

Most European Infrastructure Managers are making efforts to develop and implement the tools required for professional maintenance management.

In some countries, such as Austria, France, Germany and the Netherlands, computer models for estimating life cycle costs have been developed and applied to track maintenance decisions.

BENCHMARKING THE EFFICIENCY OF INFRASTRUCTURE MANAGERS

Renewals

The ultimate goal of all renewal and upgrade projects is to make environment and climate-friendly rail services even more energy efficient and to reduce journey times even further for passengers and freight. This involves the development of an appropriate strategy that focuses on the transport needs of the future, the completion of the engineering work and putting the new system into operation. Such projects require vision and foresight, and each individual phase must be seamlessly integrated into a perfectly coordinated whole.

On 3 November 2008 the French government and infrastructure manager Réseau Ferré de France signed a performance contract which defines the infrastructure modernisation objectives. In this contract, network renewal has priority place: over the 2008-2012 period, RFF planned to renew 3,940 km of track and 1,430 sets of switches at a cost of €7.3 billion. The industrial target for 2008-2015, which stands at €13 billion for 6,420 km of track and 2,420 sets of switches, could be raised to €14 billion depending on the extent to which RFF and the railway industry reach their productivity targets.

INFRASTRUCTURE MANAGERS ASSUMING A KEY-ROLE IN TEN-T DEVELOPMENT

"Infrastructure managers are expected to play an increasing role in the development and the functioning of the EU transport network. The new EU infrastructure policy represents an opportunity for greater cooperation across borders, in particular through Core Network Corridors which are closely aligned with the Rail Freight Corridors, for ERTMS deployment and for the promotion of innovative solutions in rail transport.

INFRASTRUCTURE MANAGERS ASSUMING A KEY-ROLE IN TEN-T DEVELOPMENT

Development of the European Rail Network

In 2013, the Commission, the Council and the Parliament reached an agreement on a new framework for EU infrastructure policy that will transform the existing patchwork of European roads, railways, airports and inland waterways into a unified transport network (TEN-T).

A core transport network will be established by 2030 to act as the backbone for transport within the Single Market. Transport financing under the Connecting Europe Facility (for the period 2014–2020) will also focus on this core transport network, filling in cross-border missing links, removing bottlenecks and making the network smarter.

The new core TEN-T network will be supported by a comprehensive network of routes, feeding into the core network at regional and national level. This will largely be financed by Member States, with some EU transport and regional funding possibilities, including with new innovative financing instruments. The aim is to ensure that progressively, and by 2050, the great majority of Europe's citizens and businesses will be no more than 30 minutes' travel time from this comprehensive network.

Taken as a whole, the new transport network will deliver:

- **safer and less congested travel**
- **smoother and quicker journeys**
- **more efficient freight transport**

The new EU infrastructure policy aims at creating a real network and no longer focuses on isolated projects. It contains precise maps of the network which have been identified on the basis of an objective methodology and provides for deadlines to make sure that all projects contributing to the core transport network are implemented as a priority. It sets standards to ensure that trains, ships, planes, trucks and cars can use the transport infrastructure safely and without any technical problem.

For instance, by 2030 the core railway network will have to be equipped with the European ERTMS signalling system, allowing for easy and safe cross-border train operations. Member States will have to provide sufficient parking space along core network roads for commercial users. Alternative clean fuels have to be available at the key nodes of the network.

Rail infrastructure managers also need to cooperate with ports which are the gateways to the EU transport network, both in terms of providing adequate hinterland cargo capacity (90% of the EU external freight trade transit through ports) and also in terms of intermodal platform connections inside the port. An integrated vision linking ports with distribution and consumption centres by means of railway connections is at the core of the new TEN-T concept.

Core network corridors will be created as a way to promote the coordinated development of infrastructure and resource-efficient ways of using it. Rail infrastructure managers will need to fully take part in their development. The new policy focuses the most critical elements: cross-border projects, interoperability and inter-modality between different means of transport. European coordinators will support Member States and project promoters so as to reap optimal benefit from all investments.

INFRASTRUCTURE MANAGERS ASSUMING A KEY-ROLE IN TEN-T DEVELOPMENT

The Rail Freight Corridors – promoting high quality freight services

Along nine international Rail Freight Corridors (RFC), Member States and rail infrastructure managers cooperate in the fields of traffic and infrastructure management and coordinate investments with the objective to improve the quality and reliability of international rail freight services. Six of the Rail Freight Corridors become operational by November 2013, the remaining three by November 2015; together they form the European Rail Network for Competitive Freight and the rail backbone of the Core Network Corridors.

Each Rail Freight Corridor sets up common punctuality targets for freight trains, defines and applies joint traffic management and priority rules in order to ensure that these targets are met, coordinates investments and maintenance works along the corridors to reduce traffic disruptions and monitors traffic performance and customer satisfaction.

Best serving users' needs

The users of the Rail Freight Corridors, railway undertakings and authorised applicants, benefit from the provision of dedicated pre-arranged train paths of high quality and of ad-hoc reserve capacity, better information and simpler procedures for handling of capacity requests through the establishment of One-Stop-Shops (OSS) as the single contact points for applicants, better cooperation among Regulatory Bodies along the corridors in case of complaints and in the medium term improved quality and capacity on the corridors.

The role of the users is also strengthened through the Advisory Groups for railway undertakings and terminals, giving these actors platforms to raise any issues with the infrastructure managers and Member States in common fora and underlining the customer and market orientation of the Rail Freight Corridor concept.

Improved coordination

The functioning of the Rail Freight Corridors requires innovative procedures and IT-tools. Here RailNetEurope plays an important role. The Commission is financially supporting these tasks.

The phase until 2013/2015, when the corridors become operational, will be marked by the establishment of the governance structures, the elaboration of the Implementation Plans of the RFC and the development of the necessary IT-tools. A Transport Market Study forms the central element of the Implementation Plan of each corridor.

A more permanent task will be to develop the RFC in terms of capacity and technical standards, for example by improving and harmonising infrastructure parameters like train-length, axle-load, loading gauge etc. across borders. The Core Network Corridors are closely aligned with the Rail Freight Corridors. There will be close cooperation between the governance bodies of the RFC and those of the Core Network Corridors, leading to strong synergy effects while avoiding duplication of work.

INFRASTRUCTURE MANAGERS ASSUMING A KEY-ROLE IN TEN-T DEVELOPMENT

ERTMS - Deploying a European signalling system

What is ERTMS?

ERTMS is the signalling and traffic management system, which will enable interoperability on the European rail network. It integrates a new control-command system with a new radio system for voice and data communication.

ERTMS is composed of ETCS (an automatic train control system) and of GSM-R (the railway communication system). It is split in two subsystems: trackside and onboard.

Infrastructure managers are directly involved with the installation of ERTMS equipment along railway tracks, notably special transceivers (Eurobalises) installed at regular intervals between the rails to provide track information to the ETCS system in the locomotive.

The new European standard

The ERTMS initiative was to create a single Europe-wide standard for train control and command systems to enhance cross-border interoperability and therefore contribute to completing the Single European Rail Area, improving the competitive position of rail transport and stimulating the single market of signalling equipment.

The ERTMS standard is one of the European railway technical standards and is prescribed in a Technical Specification for Interoperability ("TSI").

In 2009, Member States agreed to deploy ERTMS (including GSM-R) on 6 key rail freight corridors with completion dates for either 2015 or 2020:

- by 2015, 10,000 km are due to be completed;

- by 2020, a total of 25,000 km to be completed.

19 Member States are involved in these corridors. This European deployment plan is mandatory following the adoption of Commission Decision 2009/561/EC.

Why choose a mandatory corridor approach? As long as a few lines are equipped with ETCS, railway undertakings have no incentive to equip their trains. The same apply for infrastructure managers: they have no incentives to invest in a system not used. This is why a corridor approach was chosen, based on freight traffic potential.

INFRASTRUCTURE MANAGERS ASSUMING A KEY-ROLE IN TEN-T DEVELOPMENT

Why do we need ERTMS?

Today, the operational state of the rail network is not very satisfactory – different signalling systems increase costs, prevent economies of scale, and make international flows difficult and expensive to implement. For trains to run on other networks not using ERTMS, they must be equipped with different on-board systems compatible with the different networks. This entails costs, creates distortions to the single market and impedes the free movement of goods. These technical inefficiencies are a major barrier to the rapidly growing market in rail freight, where the greatest potential comes from cross-border traffic, not to mention the heavy losses caused to productivity and competitiveness. And last but not least ERTMS enhances safety on the network.

Beside its safety and cross-border interoperability advantages, ERTMS provides better performances (capacity, speed, reliability). It means faster and more efficient travel by rail, including cross-border. Reducing travelling time has a positive mobility/social effect which contributes to reduce CO2 emission as well. ERTMS contribute to boosting Europe's competitiveness and to a balanced and sustainable development of the European wider economy.

Rail Infrastructure Managers need to play a determining role for the deployment of ERTMS over the EU rail network. In addition, ERTMS deployment could also be linked to key performance indicators of the infrastructure manager, such as safety and punctuality. This is a further reason why we need the cooperation of infrastructure managers as foreseen in the Commission's 4th Railway Package.

INFRASTRUCTURE MANAGERS ASSUMING A KEY-ROLE IN TEN-T DEVELOPMENT

SHIFT2RAIL – Promoting innovation and technologies

Shift2Rail is foreseen a broad-scale European research initiative within Horizon 2020 to massively enhance the efficiency, reliability, capacity and interoperability of the European rail system. The aim of this future research instrument will be to deliver focused Research and Innovation (R&I) and market-driven solutions in order to meet the changing EU transport needs, attract passengers and businesses to use rail transport and thereby help promote the competitiveness of the European Rail Industry vis-à-vis emerging Asian competition.

A full range of new technologies

Rolling stock: trains will be even more energy-efficient than today and make use of intelligent equipment and innovative traction and braking systems. They will be capable of monitoring themselves and the track. The railway will be highly automated. Real-time traffic management and monitoring of the trains will optimize the performance of the network.

Advanced traffic management and control systems: trains will run with a safety zone that is not fixed with track side signals but moves with the train. Trains will inform the traffic control systems of their location and the control systems instruct them what to do. This avoids stop-start-operation, saves energy, allows trains to travel closer together and thereby increase capacity and safety. Every stage of every journey sees the train in the right place, at the right time, at the right speed, ultimately getting the customers to their destination on time.

Seamless attractive rail transport system: communication technologies will allow sharing data across the transport network. Smart devices deliver customized real-time information to passengers and the responsive rail system will redirect passengers in case of network disruptions. As a result, there is less need for ticket offices, which will lead to reduced congestion at stations and overall reduced journey time.

Cost-efficient high capacity infrastructure: most of the network will be electrified, giving access to secure low carbon and energy. Trains using less power and causing less wear to the tracks will lead to an affordable and sustainable system.

Freight: innovative technologies will allow freight trains to run smoothly through the network, providing EU industry with a reliable, efficient and competitive service. This is enabled by a control system that reconciles the different needs of passenger and freight trains by balancing demands on speed, capacity and energy. Improved rolling stock and infrastructure technology means significantly less vibration and noise, reducing the environmental impact of night running. Assets monitor themselves and each other. Sensors on trains send information on track conditions back to data centres, leading to preventive maintenance.

With a dedicated long-term Research and Innovation support and investment from both the European Union and the rail industry, the technologies to be developed in Shift2Rail will meet customers' needs by delivering an efficient, affordable, safe and sustainable railway, which provides both high capacity and reliability.

TEN-T CORE NETWORK INCLUDING CORE NETWORK CORRIDORS

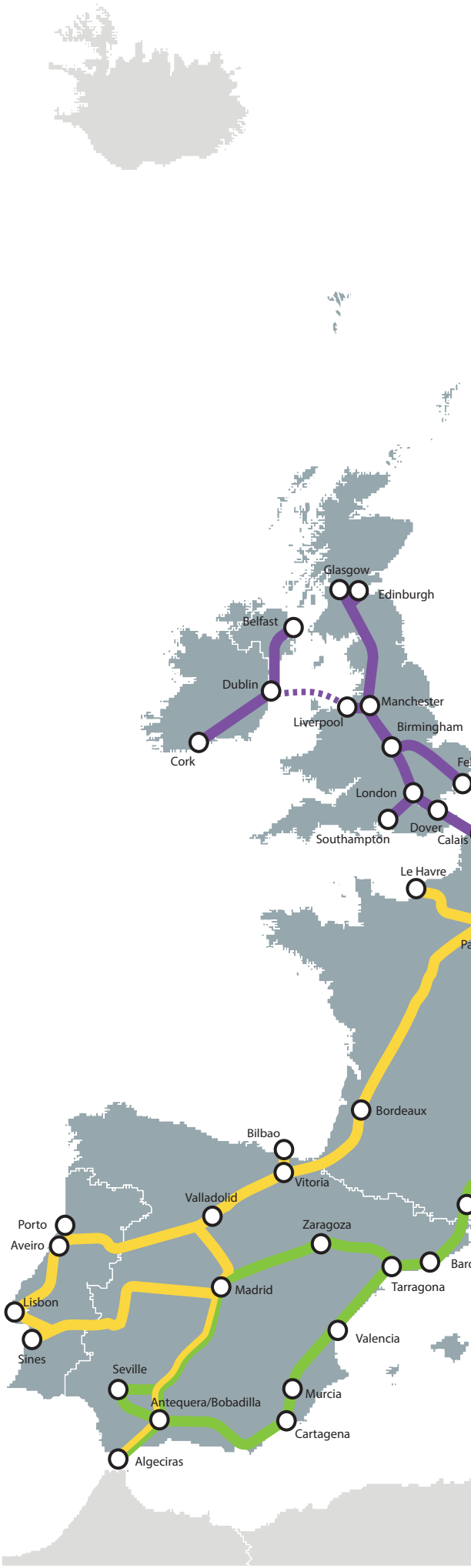
Legend

- BALTIC - ADRIATIC
- NORTH SEA - BALTIC
- MEDITERRANEAN
- ORIENT / EAST-MED
- SCANDINAVIAN - MEDITERRANEAN
- RHINE - ALPINE
- ATLANTIC
- NORTH SEA - MEDITERRANEAN
- RHINE - DANUBE

DG MOVE, TENtec Information System 2013

Based on the outcome of the informal trilogue on June 27th 2013

Core Network Corridors are closely aligned with the Rail Freight Corridors

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