



# European rail: more central than ever

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## Network Industries Quarterly, Vol. 23, issue 4, 2021 (December) 'European rail: more central than ever'

This special issue of NIQ concludes the EU's 'year of rail.' Over the past 30 years the EU has driven the transformation of the European rail sector with the aim of making it more efficient and more competitive vis-à-vis road. It has defined and actively pursued a liberalisation agenda through four railway packages. Recent policies to decarbonise the economy and the important role of transport in them have added both pressure and support. This special issue aims to document these efforts by giving the floor to some of the main actors in the process.

The first contribution, co-authored by **Finger** and **Montero**, presents the 30 years of rail reform from technical, financial and institutional perspectives.

**Castelletti** analyses developments in the rail regulatory framework, compares rail infrastructure and air-traffic management, and explains the role of railways in the modal shift.

**Nash, Smith** and **Fitzová** review the progress made by rail towards the modal shift, especially as a means of medium-distance passenger and long-distance freight transport.

**Mazzola, Mussini** and **Pekin** define the main priorities that will have to be set for rail to remain a central element in Europe's mobility in the decades to come.

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## 30 years of rail reform in the EU: a ‘big-picture’ approach

Matthias Finger,\* Juan Montero\*\*

Railway reform in Europe has now been going on for exactly 30 years, as it started in 1991 with the adoption of Directive 1991/440/EEC. It is ongoing. It is worth highlighting that railway reform in Europe began even before the reform of other network industries, but it has progressed much more slowly than in all the others. This is mostly due to the fact that the railway sector turned out to be much more complex than the other network industries owing to technical issues, and also to the costliness of rail and the complexity of its governance. In this article, we address each of these three issues and conclude by offering our personal outlook for the future.

When Directive 91/440/EEC was adopted exactly 30 years ago, most of the key elements for rail reform in Europe were already set for future development: exploitation of infrastructure would be separated from the provision of transport services (unbundling), infrastructure would be managed nationally with exclusive rights, and transport services would be gradually liberalised, starting with cross-border services. The EU would establish a common regulatory framework to ensure that all transport service providers have non-discriminatory access to the infrastructure. A vibrant European competitive rail transport service market, for both freight and passengers, could run on state-owned national infrastructure.

However, after 30 years it is obvious that the obstacles to this reform were more serious than expected. Railways had evolved over more than a century as national systems with their own technical specifications. Making such national systems evolve into a European system proved more challenging than in the other network industries. Legacy infrastructure was extremely expensive to maintain and required massive public investment, not to mention upgrading into a European interoperable system. Furthermore, most rail transport services did not cover their costs and continued to require state subsidies.

### Technicality and technology

From a technical point of view, railways just happen to be complex technology with huge legacy issues. Technical harmonisation is key to railway reform, but it took the Commission five years to realise its importance. The pa-

per by Castelletti in this issue recalls the main steps in the technical harmonisation process which started in 1996, and it was later addressed in all the subsequent legislative packages, and especially with the creation of the technical body ERA in 2004. It culminated in the announcement of the Single European Railway Area (SERA) in 2012 and the Joint Undertaking for Rail Research in 2014. The implementation of all this technical harmonisation is still ongoing and remains challenging, also because of its financial and institutional dimensions and implications.

There is a clear tension between the massive short-term investment necessary to upgrade infrastructure to ensure interoperability and the benefits derived from this investment, which take time to materialise, sometimes quite significant amounts of time. It is already for decades that new infrastructure, such as high-speed lines, has been deployed making use of interoperable European standards, in particular ERTMS. However, new infrastructure represents only a fraction of the hundreds of thousands of kilometres of legacy infrastructure in Europe. Just maintaining such infrastructure is extremely costly, not to mention upgrading it to EU standards.

Significant progress has been made in interoperability matters thanks on the one hand to the role played by ERA but also thanks to rolling stock manufacturers, which have clearly eyed a European market. As a result, cross-border services are growing, although not always because of market-opening as originally wished for, but because of cooperation among railway undertakings using the same harmonised technology.

Given the sheer immensity of the task, the objective of total interoperability across the entire European railway system still seems to be somewhat out of reach. The strategy to overcome this challenge has been to focus both investments and governance innovation on the most relevant segments of infrastructure. On the one hand, EU investment has concentrated on the Trans-European Network, which is not specific to rail but was particularly necessary in rail as only a fraction of the infrastructure could benefit from EU investments. The main cross-border routes have been upgraded to meet interoperability standards and bottlenecks have been eliminated, etc. On the other hand, governance innovations have focused on these very same

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corridors. Infrastructure is always managed by national state-owned entities, but they act in coordination according to the principles established for rail freight transport in Regulation 913/2010. One may suggest that a similar effort could also be made in matters of EU-wide passenger corridors, as was discussed during one of our Florence Forums, especially in night and high-speed transboundary corridors.

The elephant in the room here is of course the question of unbundling, which appears to be much more challenging than in the other network industries owing to the strong technical complementarities between rail infrastructure and rolling stock. Of course, railways were and continue to be national technical and technological legacy systems, in many countries backed by a domestic railway manufacturing industry. One can argue that ‘technological barriers to trade’ are deliberately raised by incumbents, even though this is, in our view, an over-simplistic statement. Once more, unbundling creates short-term inefficiencies for the promise of benefits derived from a European market that will only be effective in the long term. This obstacle can only be overcome through research and development on an EU scale with corresponding substantial investments.

### Money

On the financial side, things appeared to be equally complex, if not even more challenging: by their very nature railways are just expensive technology which has run constant deficits ever since the diffusion of cars and trucks in the late 1950s, notably with the very active support of governments. In other words, developing or simply maintaining railways requires public funds and therefore political will, which has not always been forthcoming in the past. Technical harmonisation and competition (see below) can only get you so far. EU funding can make a difference to the Trans-European network, but investment in the capillary legacy network can only be undertaken by Member States. The Commission, at least, has identified one of the main problems, namely the uneven playing field between road and rail, and between air and rail (on short haul distances). It has tried to tax roads (Eurovignette) but so far has not managed to shift the proceeds to rail. It is also working on internalisation of the taxonomy of externalities and hopefully one day taxing and mobility pricing. But all this will take time and the money is needed now.

Luckily, climate urgency and Covid are now helping: rail will receive 50% of the transport funds earmarked in the

Recovery and Resilience Facility. And rail already had 70% of the funds available from the Connecting Europe Facility between 2014 and 2020, an amount of over 16 billion €, and it will continue to benefit from CEF in the future. But even with all this money further government support at the national level will be necessary if one wants the existing railway system to remain.

Maintaining and especially developing a thriving railway sector in countries, and in Europe for that matter, will require substantial financial support from governments, and in the medium-term a courageous policy to make life more difficult for automobility. Not all will have to be done at the national and EU levels, and many cities have already stepped up to the challenge and invested heavily in urban and metropolitan public transport. In addition, substantial investments have been made in high speed and in removing some bottlenecks along corridors. On the downside, however, regional railway infrastructure (and rolling stock) has been neglected if not deliberately abandoned, considering that priorities have to be set at the national level. Moreover, railway undertakings have incurred huge deficits, which will have to be addressed at some point.

### Governance

Besides technical harmonisation and financing, governance is probably *the* main issue, facing three different interconnected challenges. It is on this institutional side where the biggest challenges lie and where progress has been slowest and is most urgent. Of course, the Commission has developed its four railway packages, with the more technical measures being more successful than the institutional ones. The Commission has always pursued its idea of a single European railway market, renamed in 2012 as the Single European Railway Area. It has approached freight and passengers separately and rightly taken a stepwise approach to liberalising passenger services.

First, while some degree of vertical separation has been introduced in all the Member States, full unbundling is not the general rule. Unbundling was and continues to be seen by the proponents of an EU railway market as *the* main impediment, but this may be an over-simplistic view owing to the technical complementarities in railways. Blame it or not on the lack of unbundling, it is clear that the originally foreseen competition in the market (access competition), a vision that the Commission has still not abandoned, was and continues to be much more difficult to achieve than originally anticipated. Unlike what was

originally wished for, it turned out that competition *for* the market, especially at the regional and local levels, became a much more widespread model. However, institutionally, we are very far from a harmonised, interoperable and competitive European tendering approach and therefore from a single European railway market. And maybe this market is not even necessary given that most railway traffic is local or national, and it would probably be metropolitan if the corresponding investments and technical harmonisations were made decisively. In any case, this lack of progress towards a Single European Railway Area also reflects the limitations of a purely regulatory approach to market creation and sustenance. There is indeed only so much one can do on the regulatory side without technological progress/harmonisation on the one hand and money on the other.

Second, the creation of national regulators was met with less resistance than unbundling but was not necessarily more successful. The role of national regulators as arbiters in access to infrastructure and the tools to make such access effective depend on the degree of competition in the market (and therefore the need for third party access) and the degree of vertical separation between the infrastructure manager and the main railway undertakings. As reality in the different Member States diverges, the roles of national regulators have also been different. The very relevant divergences in track access charges are a symptom of more structural divergences in the organisation of national systems.

Finally, as cross-border services become more relevant, the limits of the current governance system become more evident. Voluntary coordination of national infrastructure managers, even in the framework of freight corridors, is showing its limits. More coordination in traffic management is necessary and there is growing acceptance of a European traffic manager, like Eurocontrol in aviation. As cross-border traffic grows and traffic management is increasingly coordinated, there will be a need at some point for a European economic regulator also in rail, just as it became necessary in electricity.

### **What next?**

So where do we stand? In absolute terms, the European Single Railway Area is growing: both rail freight and passenger services are growing in volume and there are more cross-border services. But if we make the analysis in terms of modal share and modal shift the balance sheet is sobering. While it is progressing, it is only progressing slowly

and in any case not at the pace originally wished for and now required for decarbonisation purposes. Without substantial progress in modal shift, the EU's decarbonisation objectives for transport will simply not be met.

The new challenges of decarbonisation, which now start to override everything else, make a modal shift and therefore the development of railways a must. A quantum leap is therefore now required, and is in any case called for in the railway strategy. Much more needs to be done but paradoxically this will lead to the return of politics in railways, and of course it will also lead to the need for more money (the return of politics always comes with money). It is to be hoped that this will be a European return of politics and not a national one. If it is a European one, we can indeed hope that market elements will continue to be applied, as this is the only way to get a harmonised, interoperable and efficient railway system.

## Rail's role in the age of decarbonisation

Maurizio Castelletti\*

### Rail gains momentum

The rail sector is currently the subject of unprecedented policy attention. Rail offers a concrete opportunity to decarbonise our transport system and should play a prominent role in delivering both the European Commission's Green Deal<sup>1</sup> strategy and its Sustainable and Smart Mobility Strategy<sup>2</sup>. These strategies set ambitious 2030 targets for growth in the use of rail that are justified by rail's green credentials. The targets include a 50% increase in the use of rail freight, and a 100% increase in passenger traffic on high-speed rail lines by 2030. Rail currently only accounts for 2% of energy consumption and generates 0.4% of the greenhouse gas emissions from all transport modes (EU-27, 2018).

We believe that rail has now reached a turning point. The designation of 2021 as European Year of Rail<sup>3</sup> has attracted the interest of policymakers, the rail industry and the public. The public's attitude to rail is increasingly favourable, in particular among young people, who are worried about climate change. Businesses are increasingly seeking rail services to carry their goods and decarbonise their activities.

In July, the European Commission proposed a package of measures to curb carbon emissions in key sectors, including transport. The European institutions reached an agreement to: (i) revise rules on road charging (Eurovignette); (ii) reduce emissions of polluting gases; and (iii) cut infrastructure congestion. These measures should favour a re-balance of demand towards more sustainable mode of transport like rail. These measures should also contribute to two other 2030 goals: (i) for rail to compete with road transport on an equal footing; and (ii) to achieve carbon-neutrality on scheduled public transport journeys of less than 500 km.

In addition, public authorities have rewarded rail with generous spending programmes under the Recovery and Resilience Facility, under which rail will receive 50% of all transport-related investment. Rail has also been the main beneficiary of EU support under the Connecting Europe Facility, which allocated 70% of its funds in 2014–2020 to rail, covering 400 projects with a contribution of approx-

imately EUR 16.5 billion. Rail will continue to benefit from these resources in the next financial cycle.

### 30 years of reforms

The re-structuring of rail markets began in 1991. European regulation has seen many countries shifting from decrepit, state-run rail industries to more open systems, in which the price and quality of rail services are set by competing railway undertakings. During this period, rail transport has been subject to an unprecedented legislative effort, consisting of four packages of European Union laws, a number of key milestones, and a wealth of implementing measures promulgated by the European Commission. Full liberalisation of the market for the carriage of rail freight occurred in three steps: (i) in 1993 for international combined transport; (ii) in 2006 for international rail freight; and (iii) in 2007 for domestic rail freight. Market liberalisation of rail-passenger services followed in 2010 for international traffic and in 2020 for national traffic. In 2023, the liberalisation of the rail market will be complete with the introduction of competitive awards for public-service contracts. The process of technical harmonisation began in 1996 and was strengthened by the advent of the European Union Agency for Railways in 2004. The concept of a Single European Rail Area (SERA) was born in 2012 with the introduction of Directive 2012/34/EU of the European Parliament and of the Council of 21 November 2012 establishing SERA. The Joint Undertaking for Rail Research began work in 2014. Following these milestones, there began a lengthy and complex process of implementation that is still ongoing.

Recent years have seen mixed trends in rail transport. The modal share of rail among inland transport modes remained relatively small in 2018 in absolute terms (7.8% for passengers and 18.7% for freight in the EU-27). There was also little shift in modal share in the EU-27 between 2015 and 2018, with rail transport's modal share growing 0.2% for passengers and falling 0.1% for freight in the period. On volumes, rail-passenger traffic grew by 2.4% a year (2% for international traffic) in the period from 2011 to 2018, while freight traffic increased by 4% over a three-year period (2015–2018)<sup>5</sup>. Furthermore, the COVID-19

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<sup>1</sup> The European Green Deal of 11.12.2019

<sup>2</sup> Sustainable and Smart Mobility Strategy

<sup>3</sup> Decision (EU) 2020/2228 of the European Parliament and the Council of 23 December 2020 on the European Year of Rail

<sup>4</sup> 'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality of 14.7.2021 (COM(2021) 550 final)

<sup>5</sup> Seventh monitoring report on the development of the rail market under Article 15(4) of Directive 2012/34/EU of 13.1.2021 (COM2021) 5 final).



pandemic had a more significant impact on passenger rail traffic than it did on rail freight. Volumes expressed in train-km declined by 6.1% for rail freight but by 11.4% for passenger travel over the period March 2020 to February 2021, while rail traffic loads (pass-km and tonne-km) declined even further: by up to 15% for freight and 75% for passengers.

Pre-pandemic growth rates would not have been sufficient to reach the milestones set in the European Commission's Green Deal and its Sustainable and Smart Mobility Strategy, let alone the more ambitious target set by the industry for rail freight to have 30% of modal share by 2030<sup>6</sup>. This means that the rail sector needs to step up the pace of its modernisation and digital transition. A significant increase in demand would require not only a network capable of accommodating the demand, but also sufficient rolling stock and train drivers to operate additional services.

Rail is still struggling to cope with the new reality of separate infrastructure managers and a rising share of service providers competing with incumbent operators. Meanwhile, the longstanding problems faced by rail have still not been solved. For rail-freight transport, these problems are: (i) the lack of reliability, punctuality and real-time tracking-and-tracing of trains and loads; (ii) the unavailability of routes in normal situation and diversionary routes in cases of disruption and (iii) the complex and costly movements and transfers of loads in terminals; For rail-passenger transport, these problems are different and include: (i) the unavailability of rolling stock at good prices; (ii) booking and ticketing systems that are hard for customers to use and understand; (iii) a dearth of routes for international services; and (iv) the high costs of international services. For rail transport as a whole, the biggest problem is the persistence of technical and operational barriers when moving trains between different rail networks.

Many problems under investigation concern either: (i) the availability of a capable, high-performing and interoperable rail infrastructure and its optimal use through digital systems and tools; and (ii) the independent and impartial provision of that infrastructure to rail undertakings.

### **Two networks for sustainable mobility: rail infrastructure and air-traffic management**

We can draw an interesting parallel between rail infrastructure and air-traffic management. These network

industries have been in a continuous process of transformation since their births in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries respectively. Defence and security policies also clearly marked the development of both these industries in their early stages. These policies led to the creation of national companies operating under the aegis of the State. These national companies often had subsidiaries that were closely tied to the domestic industry that built its systems and components. For both sectors, the progressive integration of transport at European level revealed a lack of cross-border interoperability, a major barrier to the development of the internal market and international traffic. The creation of the Single European Sky (2004)<sup>7</sup> and the SERA (2012)<sup>8</sup> were the solutions the European Commission proposed to end the fragmentation of national networks in both these areas.

Both rail infrastructure and air-traffic management face a similar main challenge: to develop, deploy, maintain, and operate (digital) infrastructures to support traffic operation at European and national levels. These infrastructures are a costly asset that enables the competitive provision of rail and aviation services. They provide the required safety for transport operations by sequencing and distancing trains and flights. They determine the efficiency of operations under normal and congested situations and the resulting performance of these operations, notably the punctuality of transport services. They consist of sophisticated and interconnected systems to monitor operations and real-time communication between control centres and vehicles.

The European Commission proposed two similar concepts to end the fragmentation stemming from national networks in both these areas and move towards more integrated operating networks at European level: rail-freight corridors and functional airspace blocks. Both concepts helped break down the silos of national structures that govern and operate these infrastructures. They forced these structures to cooperate in a more integrated way. Nevertheless, neither of these concepts has led to significant improvements in performance. The lack of tangible results is partly due to: (i) incomplete implementation; (ii) failure to conform to the spirit of legal acts; and (iii) the prevalence of national attitudes over joint international practices.

Despite an overall picture of poor integration in both rail and air-traffic management across Europe, the push to integration is nevertheless somewhat stronger in air-traffic control than in rail. This is due to the more international

<sup>6</sup> Rail Freight Forward – European Rail Freight Vision 2030 of the RFF coalition.

<sup>7</sup> Regulation (EC) No 549/2004 of the European Parliament and of the Council of 10 March 2004 laying down the framework for the creation of the single European sky (OJ L 96,

<sup>8</sup> Directive 2012/34/EU of the European Parliament and of the Council of 21 November 2012 establishing a single European railway area (OJ12 establishing a single European railway area (OJ L 343, 14.12.2012, p. 32).

nature of aviation and the need to ensure interoperability between aircraft and supporting systems for navigation, communication and surveillance. This greater push to integrate aviation has led to new developments in air traffic management that rail still lacks due to its reduced international dimension (52% of rail freight is international, and just 7% of passenger rail transport is international). These new developments in aviation consist of a pan-European network layer of air-traffic control superimposed onto national networks and managed by an independent entity (Eurocontrol). The push for integration in aviation management also led to a developed concept of cooperative decision making (A-CDM) involving all actors in the aviation-management chain (airports, airlines and air-traffic control centres) and based on timely exchange of operational information on the status of the flight. In addition, air-traffic control in Europe benefits from a sophisticated performance scheme that is capable of constantly monitoring performance, setting targets, and formulating measures to improve performance. Finally, air-traffic control is more advanced in its programme of development and deployment of new technologies (helped by the SESAR Joint Undertaking), while rail is only now ending its first cycle of common research activities under the umbrella of the Shift2Rail Joint Undertaking.

Rail should definitely learn from these developments in aviation if it wishes to achieve its ambition of competing with aviation and road transport on international routes.

### Consequences for the rail sector

The strong impetus to decarbonise transport will oblige rail to face up to its responsibilities in this area. With the progressive greening of other transport modes, rail will no longer be able to hide its inefficiencies by pointing to the lack of a level playing field across modes of transport. There is therefore a reputational question that rail must address as a matter of urgency. Failing to address this question will put the confidence of policymakers and public opinion at risk.

Firstly, improvements in rail transport should better respond to customer needs. In the rail-passenger market, passengers are demanding fast, punctual, frequent and comfortable trips to destinations with good interconnections. In the rail-freight market, shippers are looking for reliability, flexibility and responsiveness. In both markets, customers are demanding affordable prices for the services they purchase. Rail should be offering more competitive

prices compared to other modes of transport, but the sector remains highly inefficient, making it difficult to cut prices. It will not be possible to make rail services more attractive without significant improvements in cost-efficiency. There is clearly great room for improvement in this area for infrastructure managers, rail operators, and the rail equipment industry.

Secondly, rail lacks transparency of its operation compared to other modes of transport. Rail operators are often reluctant to analyse their performance in a more public and open manner to measure the quality of their services and potentially take remedial actions. Reviewing and publishing the performance of rail operators (as is the practice for air-traffic control) would be an effective tool to increase awareness, promote best practices and encourage improvement. More and more data on rail performance are becoming available through digital platforms, and an independent entity could be tasked with regularly processing and publishing these data.

These cultural changes do not imply any improvement to the existing regulatory framework. They do not even imply any new investment. The recent adoption of the fourth railway package created the appropriate conditions for the completion of the SERA. It is now time to fully and quickly implement SERA according to the spirit of the law. Furthermore, the period set for reaching the SERA milestones (2030) is too short to embark on new major legislative proposals. The sector needs regulatory stability and reduced administrative burden. The advent of the SERA should help to progressively deregulate the sector, which suffers from too many rules. Obsolete national rules should rapidly disappear, in particular in the fields of safety and interoperability. Instead, we should leave room for a single set of European rules applying throughout the continent under the supervision of national authorities and regulatory bodies. These authorities and bodies should network more to promote the development of cross-border traffic.

The sector also needs continued support for the investments already in progress. The investments needed in rolling stock and rail infrastructure are substantial and much greater than the investments currently being made by public and private players. Due to the lack of resources, there is a need to focus on the few priorities that will bring the highest benefits. The process of decarbonisation will require: (i) rail to accelerate its shift to more comprehensive electrification of the network and use of zero-emission vehicles; (ii) the digitalisation of the network through flagship projects like the European Train Control System; and



(iii) the digitalisation of rail infrastructure-capacity and train information through better data sharing and availability. Other priorities for investment include the upgrade of technical requirements for key lines (weight, speed, train length and loading gauge) and the introduction of digital automatic couplers.

## Conclusions

Decarbonisation is a breakthrough opportunity for rail. However, the green credentials of rail are not sufficient on their own to attract a significant share of customers from other transport modes. A radical shift to rail in the coming years therefore requires a drastic improvement in the performance of rail, including its final price to customers.

State-owned rail companies still dominate rail markets and operate up to 60% of the rail-passenger services procured under public-service obligations. Between 2015 and 2018, the share of rail freight carried by competitors to incumbent state-owned national operators increased from 34% to 42%. Over the same period, the share of rail passengers carried by competitors to incumbent state-owned national operators increased by 2 pps to 14%. These increases are even less significant if we exclude the new operators that are linked to rail incumbents from other countries (i.e. if we exclude market share in one country being taken by a state-owned operator from another country). Without a more transparent and customer-oriented approach to promoting competition from private operators, the modal shift from road to rail risks stalling or increasing much more slowly – despite renewed public interest in rail and an expected recovery in load factors rebound to pre-pandemic levels.

The regulatory framework in force provides for an open and competitive rail environment. The ongoing actions contained in the various plans of the European Commission and statements from the rail sector are appropriate for accelerating the development of rail services. These actions aim at boosting long-distance and cross-border rail-passenger and rail-freight services. The implementation of these actions will determine the attractiveness of rail in the age of decarbonisation. However, the process of decarbonisation will progressively erode the green advantage of rail, as electrified trucking will reduce emissions from road transport. This means that the window of opportunity for rail to increase its share of passenger and freight transport may gradually close. This in turn means that inaction in pro-

moting rail liberalisation could condemn rail to a secondary role in the transport system.

*The views expressed in this article are those of the author, are personal and do not necessarily reflect those of the European Commission*

# Progress in implementing the Commission’s targets for mode split

Chris Nash,\* Andrew Smith\* and Hana Fitzová\*\*

*The 2011 European White Paper on transport foresaw rail becoming the main means of medium-distance passenger transport and of long-distance freight transport. This paper reviews progress in achieving these targets and with implementing the policies the Commission foresaw to influence mode split. It concludes that progress has been slow in implementing these policies. In particular, the pace of innovation in rail must be accelerated in the light of developments in other modes.*

## Introduction

According to the 2011 White Paper (European Commission, 2011), rail was to become the main means of medium-distance passenger transport and long-distance freight transport as part of the EU policy to achieve a 60% reduction in greenhouse gas emissions from transport by 2050. This policy was reiterated as part of the EU Green Deal (European Commission, 2019), which tightened the target for transport to 90%.

It put forward a set of policies to achieve this:

1. Complete reforms to introduce competition within the rail mode;
2. Improving rail infrastructure
3. Internalisation of externalities in all modes;
4. Innovations in rail transport driven by a major research programme.

However, the European Parliament (2018) concluded that “*The modal share of road, rail and inland waterway transport remained substantially unchanged between 1996 and 2016.*”

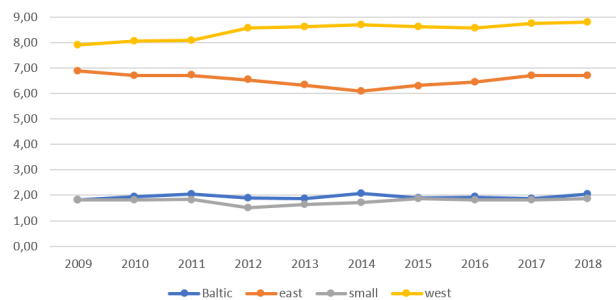
In the following we first discuss what has actually happened to the rail mode split in the last ten years. We then discuss progress on each of the four policies intended to increase the rail mode share. We finally make some concluding comments.

### What has happened to mode split?

In the last 10 years, rail in the EU has achieved some increase in the passenger market share from 7.33% in 2009

to 8.08% in 2018. However, the growth has been far from evenly spread.

Figure 1 shows the rail share of the passenger market in four groups of countries: western Europe, eastern Europe, the Baltic states and the small rail systems in Ireland, Luxembourg and Greece. It is clear that growth is confined to western Europe and (slightly) the Baltic States, with a sharp decline in eastern Europe followed by some recovery and stagnation overall in the small countries.



**Figure 1:** Share of rail in passenger transport in the EU by region (in % of total)

Source: European Commission. *EU transport in Figures: Statistical Pocketbook 2020 + own computations.*

\*Passenger transport includes rail, buses and coaches, and individual cars

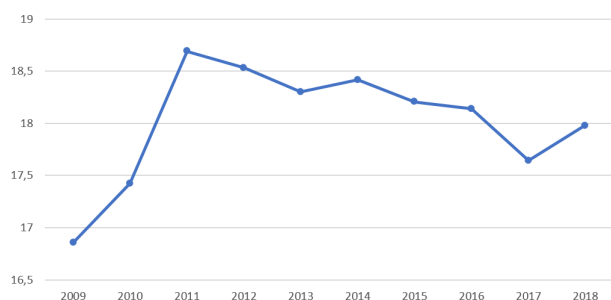
In eastern Europe every country experienced a decline in market share except Poland, the Czech Republic and Slovakia. There are some obvious reasons for these differences. Car ownership in eastern Europe is still climbing from the low level it was at in the communist era. Several western European countries have benefited from investment in high-speed rail. It is interesting that the three countries in eastern Europe with rapid growth in rail demand are

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the three countries which have experienced the most open access competition.

Turning to freight, the rail freight market share recovered sharply from a low of 16.9% in the recession in 2009 before falling back to 17.8% in 2018 (Figure 2).



**Figure 2:** Share of railways in freight transport in the EU 28 (in % of total tonne km)\*

Source: European Commission. *EU transport in Figures: Statistical Pocketbook 2020*.

\*Freight transport includes road, rail and inland waterways.

Only Slovenia and Hungary in eastern Europe have shown growth since 2009, while a handful of countries in Western Europe do (European Commission, 2020).

In the following sections we consider progress in the policies to achieve an increased rail market share.

Complete reforms to introduce competition within the rail mode

In 2007, the rail freight market was completely opened up to competition, and in 2010 international passenger services followed. With the fourth Railway Package, competition for commercial passenger services followed in 2020 and competition for services operated under public service contracts will be opened in 2023.

There is extensive literature reviewing the impacts of the various reforms on costs and productivity. Reducing costs would hopefully ultimately lead to an improvement in rail competitiveness and therefore mode share, but the results of different studies are not consistent. There is a strong finding in a number of papers indicating that horizontal separation of passenger and freight services has reduced costs (see, for example, Mizutani et al., 2015). However,

regarding vertical separation of infrastructure and operations, the results in different papers are contradictory. Some studies conclude that costs have only been reduced on less densely used systems while on densely used systems vertical separation has actually increased costs. On competition, there are also conflicting results, although one recent study, Fitzová (2020), finds that competition improves productivity (suggesting lower costs).

There are only a few econometric studies using panel data to examine the direct impact of European rail reforms on modal split. The most recent (Tomeš, 2017) concludes that “There is no evidence that the principal European reforms (vertical separation and competition entry) increase the modal shares of European railways. The impact of vertical separation was weakly negative and the impact of competition was insignificant. A more promising strategy is horizontal separation, especially when it is followed by privatisation of freight operations”. Although there have been studies of demand in individual countries where strong demand growth has followed reforms (e.g. Britain and Sweden), there were other factors at play and the precise impact of reforms on demand is therefore not clear.

Overall then, while a number of countries have opened up their markets ahead of legislative deadlines, the results so far have been disappointing in terms of both the impact on costs (except perhaps for lightly utilised railways) and modal share.

### Improving rail infrastructure

The European Commission foresaw an important part of the increase in rail mode share coming from improved infrastructure and particularly high-speed rail, where it foresaw a trebling of the length of high speed lines in Europe by 2030. This would not only improve passenger service quality and capacity but, to the extent that it involved building new lines, it would release capacity on existing lines for expanding freight traffic. By 2011, 8790 km of high-speed lines in Europe were open (including conventional lines upgraded to speeds of 200 kmph or more). By 2020 a further 3028 km had opened (UIC, 2021). This suggests a rate of opening falling well short of that needed to achieve the European Commission target (European Court of Auditors, 2018).

High speed rail has been particularly successful in taking medium distance traffic from air (Nash, 2015) but it is very expensive and can only be justified for very dense



flows of traffic. It may be more important to examine further the potential for upgrading existing lines, particularly in central and eastern Europe, where rail speeds are often below those found in Western Europe.

### Internalisation of externalities in all modes

Internalisation of externalities in all modes of transport has been EU policy since 1998 (European Commission, 1998). However, progress has been slow as a result of opposition from member states, which fear that the resulting increases in transport costs will damage their economies. Short-term marginal social cost is required for rail in a series of directives (Nash et al, 2018a) although application has varied and mark ups are permitted where marginal social cost pricing does not meet the revenue requirements of the infrastructure manager. By contrast, legislation on charges for the use of roads stipulates the rules charges must follow if they are introduced but it does not require their introduction. Traditionally, use of roads has been charged with annual licence duty and fuel tax. Some countries have also had tolls on motorways, which may be distance-based or time-based (where the lorry owner pays a fixed charge for the vehicle to use the motorway system for a fixed period of time). There are two circumstances in which these charges typically fall short of covering the full marginal social cost. First, this is the case for congested roads, particularly in big cities, where external congestion costs are not reflected in charges. Second, it is the case for heavy goods vehicles used for long distance traffic, particularly where there are no motorway tolls or such tolls are time based.

The ideal solution to this would be a system of charging per kilometre travelled differentiating the level of charge by the type of vehicle and by where and when the vehicle is used. While developments in GPS are increasingly making this a realistic possibility, no European country has such a system for charging for the use of roads yet. Congestion charging is confined to charging for entering the central area of a few cities. Kilometre based charges for heavy goods vehicles on all roads are confined to Switzerland, but a handful of other countries have such charges on motorways (Nash and Link, forthcoming). Discussion of making such charges compulsory and extending them to all types of vehicles has so far yielded no agreement.

The other area where a failure to charge adequately for externalities is significant in terms of competition with rail is air transport. As a result of international agreements, air transport generally does not pay fuel tax or value added

tax. Although air transport is a part of the European emissions trading scheme and is also subject to specific passenger duties in some countries, it appears that – given the low price of carbon – these fall far short of covering the external cost. A failure to charge water transport for its infrastructure and external cost is also significant in the freight market in some countries.

The European Commission has funded a great deal of research on how to value transport externalities and compiled the results in a handbook. When the most recent update was published (Van Essen et al., 2019a), a parallel exercise was undertaken to establish how far on average externalities are now covered by charges in Europe (Van Essen, 2019b). The conclusion was that rail came closest to doing so. For both road and air transport, less than half the sum of variable infrastructure costs and externalities is covered by charges. For water the margin is even greater. Therefore, had the aim of fully covering external costs by charges been achieved, rail would have been considerably more competitive with other modes.

### Technical change

Finally, the Commission foresaw a substantial contribution to rail's winning market share coming from innovation and technical change. To achieve this, jointly with the industry the Commission established the Shift2Rail programme, a major research programme currently being undertaken as a public-private partnership. Shift2Rail has set ambitious targets of a 50% reduction in system lifecycle costs, a 50% improvement in reliability and a 100% improvement in capacity. A successor programme – Europe's Rail – is expected to start shortly.

There is substantial scope for improving the efficiency of the European rail system through technical change. Full implementation of the European Train Control System removes the need for lineside signals, enables the full potential capacity of the track to be exploited and improves reliability and safety. It opens the way to full automation of main line railways. Virtual coupling would enable trains to join and separate sections while moving and could ultimately massively expand capacity by removing the need for trains to remain a stopping distance apart. Together, these technologies could revolutionise rail service quality and enable frequent services by short trains, each one serving a variety of origins and destinations. Remote monitoring and automated repairs of track and trains could reduce costs and disruptions.

However, these visions of the future face major barriers in their implementation. Rail managers and engineers are naturally risk averse, particularly regarding safety. There are big advantages to standardisation, so that trains can run anywhere on the system rather than being confined to particular routes or countries. This brings economies of scale in manufacturing and flexibility in operating. However, it may hamper the introduction of innovations which do not confirm to current standards. The migration path from existing to new systems is often difficult, with major capital costs and disruption along the way. Moreover, rail asset lives are so long (typically 30–40 years for rolling stock and longer for track and signalling) that if innovations only come when assets are replaced they may be slow to permeate through the system. There are also problems with the structure of the industry as it has evolved over the past 20–30 years (Nash et al, 2018b). Fragmentation has damaged the research capability of the industry and may hamper incentives to undertake innovations which have short-term costs but long-term benefits. It also makes more difficult projects which require investment by a number of different bodies, and where the benefits are not shared in proportion to the costs. The solutions to these issues often require public sector action.

## Conclusion

The 2011 White Paper saw increased rail mode share as an important element in its policy to achieve its target reduction in greenhouse gases. But progress in achieving this has been slow in passenger transport, while after a sharp recovery from recession in 2008 freight has declined.

This is at least partly due to slow progress in the policies designed to influence mode split. While rail freight was totally liberalised in 2007, progress in liberalising the passenger market has been slow and there is no clear evidence of beneficial effects on mode split. Investment in high-speed rail is running substantially below target. Only a few countries have made the necessary moves to internalise externalities. While substantial investment has been made in research into improved rail technology, progress in implementation is slow.

If innovation were able to achieve the objectives of the Shift2rail programme, including doubling capacity and halving life cycle costs, it would make an enormous contribution to the competitiveness of rail transport, although obviously other modes will not stand still. Electrification of road transport, autonomous vehicles and virtually con-

nected convoys of heavy goods vehicles threaten to damage the position of rail unless it moves forward fast to innovate. The approach of Shift2rail seeking to bring the industry together in a concerted programme of research with a mix of government and private sector funding appears to be more promising than previous fragmented efforts, and has already thrown up exciting and innovative possibilities. However, continuing to understand how best to turn these into real projects with a sound business case and a secure path to implementation remains the most important effort needed to secure an improved rail market share.

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# Europe's unavoidable need for ever stronger railways

Alberto Mazzola\*, Matteo Mussini\*\*, Ethem Pekin\*\*\*

*The EU railway sector directly employs more than 1 million people and generated an economic added value of €79 billion in 2018, being at the same time one of the safest, most energy efficient and sustainable modes of transport. These credentials make rail central in the EU Green Deal. Just before concluding the European Year of Rail we look back to 2021 and take stock of the priorities that are required to ensure that rail remains a central element in Europe's mobility in the decades to come.*

*However, the Covid pandemic made 2021 an incredibly hard year for railways and the impact is still felt today with more than €50 billion of cumulated losses. The NextGenerationEU initiative has been most welcomed by the sector, which now looks forward to great policy challenges: a revision of the TEN-T Regulation that can guarantee adequate infrastructure to trigger rail's potential, an approach to ticketing that recognises the steps made by the sector towards better services, adequate resources for and strong governance of ERTMS deployment, and a revision of all the elements of the Fit for 55 package aimed at redressing current intermodal competitive imbalances.*

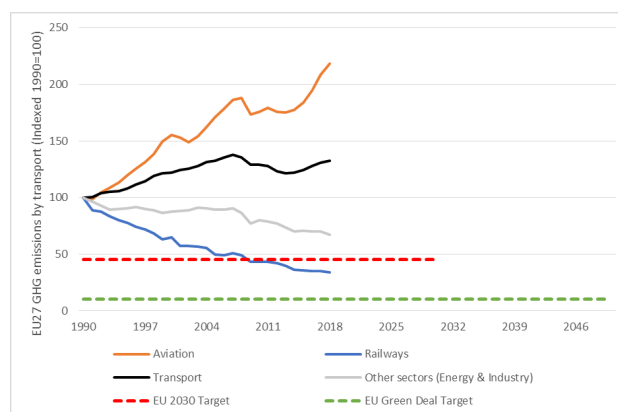
## Why is rail central (in the EU Green Deal, 2030-2050)?

Rail is one of the safest, most energy efficient and most sustainable modes of transport. European railways also contribute to social inclusion by providing affordable and accessible services. The railway sector is an important component of the European economy in terms of economic added value, jobs and innovation. These credentials make it central in the EU Green Deal. The railway sector took the opportunity of the European Year of Rail in 2021 to strengthen its advocacy towards various stakeholders and to reach out to EU citizens to ensure that rail remains a central element in Europe's mobility in the decades to come.

*European railways are the only transport mode that is on track to deliver the EU Green Deal's 2050 target*

Following COP26 in Glasgow it has been acknowledged that immediate action is required in the transport sector – something not new for the EU. Representing 27% of the EU's greenhouse gas emissions, GHG emissions from transport continue to grow while rail's emissions have fallen by 32% in 30 years, as is depicted in Figure 1. Decarbonisation of transport is only possible with more passengers and freight on European rails.

In fact, the EU decided to make a contribution to the Paris Agreement goals with its recent adoption of the EU



**Figure 1:** Only railways are on track to deliver the EU Green Deal's 2050 target.

Source: Eurostat.

Climate Law. And along with the spirit of this unprecedented ambition, the EU Sustainable and Smart Mobility Strategy already in December 2020 put railways at its centre to achieve a 90% reduction in greenhouse gas (GHG) emissions in the transport sector by mid-century.

According to the European Environment Agency (EEA), rail continues to lead in terms of GHG intensity (per passenger and tonne km) and remains closest to zero emission mobility. A modal shift to rail will not only deliver climate change mitigation but also major energy savings in the long run: rail is today 7 times more energy efficient than

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road and due to this efficiency it performs even better than electric vehicles.

In fact, rail is *the* leading electro mobility solution. Already four out of five trains in Europe operate on electricity, a third of which is harvested from renewable sources. According to the International Energy Agency (IEA), diesel propulsion on railways will fall to almost zero in 2050 and it will be replaced by electricity (for 90% of rail traction needs) and by hydrogen (for 10% of rail traction needs).

It must be added as well that the efforts made for the transition towards low-emission mobility cannot make us forget remaining non-CO2 external costs such as noise, air pollution, congestion, accidents, which correspond to the two thirds of the total external costs. According to the Commission [study](#) ‘Sustainable Transport Infrastructure Charging and Internalisation of Transport Externalities’, rail internalises its external costs already much more than any other motorised mode of transport. ETH SBB [study](#) estimated for the electric trucks a reduction of about 35% of the total externalities associated with conventional trucks but their externalities (5.9 € cents/tkm) are almost 50% higher than electric trains (4€ cents/tkm).

*Railways contribute to the EU's green recovery by providing social inclusion and clean mobility for all*

The EU railway sector directly employs more than 1 million people and generated an economic added value of €79 billion in 2018. When taking indirect economic effects into account, the railway transport sector represents 2.3 million jobs and generates a total of €170 billion. This corresponds to 1.3% of EU GDP.

While providing secure jobs, the railway sector adapts to technological developments and digitalisation by developing various initiatives. An increasing share of employees close to retirement age indicates that the rail sector is offering opportunities to hire young people. In particular, apprenticeship programmes offered by railway companies are able to create significant job opportunities. Employers and employees of railways benefit from the productive exchanges established by EU Sectoral Social Dialogue for Railways. As in the case of the overall transport sector, rail remains a male-dominated sector, especially in technical positions such as drivers and technicians and management, but there are important actions underway to increase the 21% share of women in the EU railway workforce.

### What did 2021 bring to railways?

The Covid pandemic made 2021 an incredibly hard year for railways and the impact is still felt today. The cumulative losses suffered by the whole rail sector from the beginning of the pandemic have surpassed the threshold of €50 billion.

Extraordinary measures taken at the EU level in support of the EU economy to help Europe recover from the pandemic saw rail investments playing a major role in attracting resources.

The Recovery and Resilience Facility (RRF) – the biggest budget line ever seen in a Multiannual Financial Framework – requires that at least 37% of each national allocation must target measures with climate-change objectives and that at least 20% of these target measures must favour the digital transition. The Commission has approved 22 plans so far for a total €446 billion of investments by 2026. This looks like a very positive sign that Member States are planning to go beyond the 37% requirement for green projects, with a combined climate-related investment of around €177 billion, representing 40% of the total RRF funds (grants and loans) allocated. Italy is the biggest investor in green projects and reforms (€77 billion) and is followed by Spain (€32.3 billion) and France (€18.8 billion).

So far, three main categories account for the majority of funds allocated to the green transition: sustainable mobility (€62 billion), energy efficiency (€50 billion) and clean power (€26 billion). In the RRFs, investments in railway infrastructure account for the biggest share (55-56%), followed by urban transport infrastructure (15%).

On the policymaking side, 2021 has provided mixed, sometimes contradictory, results. If on the one hand a very weak agreement has been concluded on road charging in the context of the revision of the Eurovignette Directive, at the same time the European Commission followed the high expectations raised by the Green Deal with a series of important legislative proposals packaged into what is known as *Fit for 55*. The legislators' work has just started but it is clear that this represents a major occasion to redress intermodal competitiveness by revising rules on energy taxation (including for aviation), putting forward provisions for alternative fuel infrastructure for all modes and bringing major changes to the EU Emission Trading System (ETS). CER certainly hopes that the Council and

Parliament will be capable of ensuring that this chance is not missed.

2021 has also seen the historic adoption of the Women in Rail Agreement in November, signed by CER and the European Transport Workers' Federation (ETF). This agreement is the first autonomous agreement at the European level on gender equality. And from the recruitment process, female employee retention and promotion enabling women to access management levels, the agreement will soon lead to concrete changes for the benefit of all.

At the same time 2021 has been the European Year of Rail, and railways made their best use of this opportunity to reach out to EU citizens outside Brussels institutions and promote what is at the basis of any possible future progress in modal shift: behavioural change. With Connecting Europe Express (CEE), a sector-promoted special train that for one whole month travelled across Europe leaving from Lisbon in early September and arriving in Paris in early October bringing EU messages on sustainability and digitalisation beyond the strict EU policymaking scene, railways managed to involve people in many major European cities and raise awareness of the competitive advantages of railways, rail's current challenges and rail plans for future innovative services, both for passengers and freight.

### **What is required to make rail more central than ever? The way forward.**

In 2021 CER adopted key position papers that outline the unavoidable priorities for EU policymaking in the years to come.

#### *TEN-T*

CER adopted a position paper on the revision of the TEN-T Regulation:

- TEN-T should be revised bearing in mind that it is an integral part of the wider Green Mobility Package.
- Current projects must be completed with high priority.
- Cooperation between the governing bodies of rail freight corridors and core network corridors must improve.
- The completion of a European high-speed network linking European major cities must be promoted,

with international passenger corridors to better coordinate train paths and investments.

- Urban nodes and freight terminals must be fully integrated in the TEN-T network, in addition to ports and airports.
- Operation of trains with a P/C 400 loading gauge must become possible, with exceptions only based on market needs and economic viability.
- A general 160km/h minimum speed for passenger trains should not be the way forward. Instead, trains must run as fast as required to fit the timetable.

#### *Ticketing*

In the next couple of years, the main focus of railway undertakings will be on improving the booking experience for passengers. Railway undertakings commit to improving the passenger journey in the following ways:

- Timetables will have to be more up to date, and it will have to be possible to buy train tickets 6 to 12 months in advance. Tariff exchange systems will also have to be more up to date, eventually enabling through ticketing.
- We will have to be able to count on a European-wide standardised API for selling train tickets and increased harmonisation of ticketing conditions to guarantee more clarity to passengers on the conditions of use of tickets.
- Tickets will have to be fully digitalised, with real time information during the journey and better support during disruptions and delays.

Railways will use the period until 2030 to focus on multimodal travel information and ticketing. Railway undertakings commit in fact to provide multimodal travel information, to veil on the pan-European roll-out of OSDM-online, extending to the whole sector including smaller railways, to deploy multimodal ticketing solutions and multimodal travel information.

This will have to be done in a policy context that recognises how data exchange must continue to rely on voluntary contractual agreements and how the rights of data generators should be explicitly recognised in the EU framework on data governance. Data sharing should be based on a



level playing field and the principle of reciprocity while respecting the protection of trade secrets and intellectual property rights.

### ERTMS

CER has also adopted clear words on ERTMS deployment and industrialisation. The incredible financial efforts that railways are ready to manage (it is estimated that the capital investment for trackside ERTMS deployment on the entire TEN-T core network amounts to €80 billion including digital interlockings plus €11 billion for onboard retrofitting of the entire fleet) must go hand in hand with clear positive initiatives:

- New governance is needed to ensure financial and political commitment to further improve the attractiveness of investing in the ERTMS, and to guarantee legal certainty for private investors.
- 2030 must be kept as the deadline for ERTMS deployment on the TEN-T core network and 2050 for the comprehensive network. Support must be given when acceleration is desired to equip the comprehensive network by 2040.
- A revision of the state aid guidelines increasing the limit of eligible costs to 100% is necessary.
- CEF co-financing rates for ERTMS should be set at 100%.
- For on-board units, the current lump sum approach is not efficient.
- The decommissioning of class B in parallel with ERTMS deployment shall be funded accordingly.
- In the context of RRF spending and its methodology for climate tracking, ERTMS investments must be considered to be 100% contributing to combating climate change.
- The Rail Operating Community must be involved in the work of the EC Expert Group Industrial Forum to design the right mobility transition pathways (in the context of the EU industrialisation strategy) and ensure ERTMS industrialisation.

### Fit for 55

Last but not least, the Fit for 55 package must recognise the role of rail as the most energy-efficient transport mode and the existing solution that reconciles economic growth and job creation with the need to effectively decarbonise transport through a modal shift in Europe. CER's key proposals are:

- 25% of the expected revenue from the new Emission Trading System (ETS) should be allocated to the further development of the railway system, as per the objectives of EUSSMS. Electric rail is fully paying the carbon price under the ETS and revenues would contribute to a low-emission multimodal infrastructure and fleet for passengers and freight.
- The Regulation on Alternative Fuels Infrastructure should address decarbonisation of transport as a whole, promoting zero-emission door-to-door mobility with railway stations as multimodal hubs.
- The update of the Energy Taxation Directive should allow Member States to set tax exemptions for rail freight as long as carbon-only flights are exempted from energy taxation.
- An ambitious Effort Sharing Regulation (ESR) target at the EU level must be complemented with interim GHG targets for 2030 and 2040, which in turn should be reflected in national energy and climate plans. Both the ETS and ESR are needed to decarbonise transport in the mid-term and deliver a 90% reduction in transport emissions by 2050.

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