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The Governance of Rail Freight Corridors

Matthias Finger, Juan Montero and Teodora Serafimova, EUI

Highlights

The European Green Deal calls for a substantial part of the 75% of inland freight carried today by road to be shifted onto rail and inland waterways. As part of the Commission's policy to boost rail freight, the Regulation concerning a European Rail Network for Competitive Freight (Regulation (EU) 913/2010) requests Member States to establish international market-oriented Rail Freight Corridors (RFCs) to meet three sets of challenges. These include the strengthening of cooperation between infrastructure managers on path allocation, deployment of interoperable systems and infrastructure development; striking the right balance between freight and passenger traffic along the RFCs, while securing adequate capacity and priority for freight in line with market needs and ensuring that common punctuality targets for freight trains are met; and lastly, promoting inter-modality by integrating terminals into corridor management and development. A decade after the Regulation's entry into force, however, the results achieved in the Member States remain insufficient, and the share of rail freight stagnates at around 18%.

The ongoing evaluation of Regulation (EU) 913/2010 is an opportunity to move away from a single corridor towards a European RFC Network approach. In order to facilitate this shift, the governance of RFCs should be reconsidered. In reality, the interaction between different stakeholders within one corridor is not always coordinated, not to mention the coordination among corridors. Digitalisation has the potential to overcome some of the inefficiencies derived from the fragmentation of European rail freight: it can facilitate the monitoring of performance in each RFC, improve the management of capacity by better coordinating the allocation of existing capacity, and empower RFCs to manage traffic, both under regular conditions but also when disruptions emerge. In addition to improving the regulatory and strategic framework, enhancing rail freight's competitiveness calls for a rail network adapted to specific rail freight needs, which entails making the most efficient use of available funding. Against this backdrop, the 20th Florence Rail Forum, co-hosted by the Transport Area of the Florence School of Regulation and the Commission's DG MOVE, discussed the next steps for the evaluation of Regulation (EU) 913/2010, including the role of a supranational entity in improving the performance of RFCs, and that of digitalisation in the management and operation of RFCs. Not the least, the forum sought to identify how the financing needs for the development of RFCs can be met.

From National Railway Infrastructures to a Pan-European Freight Network

A comment by Juan Montero and Matthias Finger, Florence School of Regulation – Transport Area

Building a European network for competitive freight from the fragmented national railway infrastructures is not only the most urgent, but also the most effective measure to meet the Green Deal objectives in land transportation.

The Green Deal requires a modal shift from road to railways in freight transportation, as rail emissions account for less than 1%[1] of the EU's total transport emissions, whereas road constitutes the highest contributor, making up 71% of overall emissions (European Environment Agency, 2020). Modal shift is very challenging over short distances, as road transport is more flexible and capillary. Railways, however, are very competitive in long distance routes, where the fixed additional costs related to the first and last mile (e.g., loading and unloading in terminals) tend to be more evenly spread (European Court of Auditors, 2016)[2]. Thus, the longer the route, the more competitive rail is. This is why the largest countries have heavily invested in rail freight, with Russia, the US and China leading.

Use of rail lines for freight transport

Country	Ton-km	Ton-km per rail line km
Russia	2.596,880	30
United States	2,445,132	16
China	2.238,435	33
European Union	250,372	1.2

Source: UIC Statistics, 2019 Edition

The European Union has an ideal size for rail freight services; it also has the densest rail infrastructure in the world and a dynamic economy. Yet, rail freight modal share is today substantially lower than in Russia, the US and China,[3] even though in the 1950s it was still comparable with the US, i.e., around 60%. But in the year 2000 rail freight modal share in Europe had declined to 8% in terms of ton-km, while it was 38% in the US.[4] (Vasallo & Fagan, 2007). There is, therefore, an obviously untapped potential for long-distance freight transport, with massive emissions reductions to be realised. But why is freight not migrating from road to rail?

Despite the many efforts of the EU to support investments into cross-border rail infrastructures, and despite the EU's efforts to further the Single European Railway Area (SERA), shippers continue to complain about the lack of reliability, especially when it comes to cross-border rail services. Services are said to be unnecessarily slow, and often unreliable. As a consequence, shipping volumes are also low, which in turn, leads to scarce frequencies. On the other hand, shippers are also under pressure to reduce their emissions, and they would certainly be eager to make use rail freight transport services, if only they were faster, more frequent, and more reliable.

But then, why are cross-border services slow and unreliable? Uncoordinated access to infrastructure seems to be one of the leading reasons. A railway undertaking is forced to ask for track access to different national infrastructure managers. Tracks are often congested (particularly around large cities), time-sensitive passenger services are given priority, track access rights granted in the different countries are not always coordinated, and any incident can have a major impact, as all the track access rights have to be reconfigured. As a consequence, freight trains are often delayed because they are waiting for track access rights. In other words, the densest railway infrastructure in the world is unable to meet the demand because it does not work as a single network. Fragmentation is an obstacle to coordination in planning and maintenance of infrastructure, capacity allocation coordination, traffic management coordination, and not to mention, the coordination of track access charges.

In 2010, nine Rail Freight Corridors were created to improve coordination in cross-border rail services. The

1. This figure is based on EEA estimates for 2018, which only includes emissions from diesel trains because the electricity used in rail transport is accounted for in the power sector; https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-greenhouse-gases-7/assessment
2. European Court of Auditors (2016): Rail freight transport in the EU: still not on the right track,; https://www.eca.europa.eu/Lists/ECADocuments/SR16_08/SR_RAIL_FREIGHT_EN.pdf
3. Montero, J. & M. Finger (2020). Railway Regulation: a comparative analysis of a divergent reality. In: Finger, M. & J. Montero (eds.). *Handbook on Railway Regulation. Theory and practice.* Cheltenham: Edward Elgar, pp. 1-20.
4. Vassallo, J. & M. Fagan (2007). Nature or nurture: why do railroads carry greater freight share in the United States than in Europe? *Transportation,* 34, p. 177.

relevant institutions from the Member States along the corridor, led by the national infrastructure managers and capacity allocation entities should take decisions to improve coordination, always by mutual consent. Coordination should be introduced in investment planning as well as in the planning of maintenance works restricting traffic. A one-stop shop should be introduced to manage applications for infrastructure capacity. Common traffic management rules should be defined.

Coordination would not be imposed from the top, but would gradually emerge from the bottom, in an organic way. Investment should be focused in these corridors to ensure interoperability. Access to capacity should be coordinated along the corridor. So was the plan.

Despite this effort, fragmentation has not been overcome. National infrastructure managers are still in charge of the coordination of their national railway systems. Rail Freight Corridors are creating new coordination rules, but the rules are different across corridors, creating further complexity. The Rail Freight Corridors are not fully coordinated with the Trans-European Transport Network (TEN-T) policy, as they are under different pieces of legislation. Furthermore, as international passenger services are increasing in popularity, passenger corridors are being proposed, introducing yet another layer of complexity.

As a result, calls for a more centralised European network above and beyond the corridors have emerged. At the least, the nine corridors should be better coordinated. This is, for example, the position of the large shippers, which are themselves pressured to 'shift to rail'. This is also the position of freight railway undertakings active in cross-border services, eager to grow their business.

There would be different ways to govern such a European railway network. A more active cooperation among national infrastructure managers, in the form of an association (ENTSO-E) is the model in the electricity sector. A centralised institution coordinating the national infrastructure managers, Eurocontrol,[5] is the model in aviation.

Both the governance of the existing Rail Freight Corridors and of a centralised European rail freight network have high transaction costs. Coordination requires the participation of a high number of organisations and stakeholders. Agreements are reached slowly; implementation takes years. Incentives are missing for a bold approach to dramatically increase coordination in capacity allocation and traffic management.

Digital technology provides a valuable tool to improve coordination in fragmented systems. Digital platforms in multi-sided markets have demonstrated how technology can reduce transaction costs in complex ecosystems. Massive data and machine learning algorithms can identify and exploit new complementarities and ensure the most efficient coordination of assets and services, as platforms are creating virtual networks on top of pre-existing fragmented physical realities. Consequently, digital technologies can create a new form of coordination of the European railway infrastructure. In other words, a new virtual network, a truly European network, can be built on top of the preexisting national infrastructure.

Digital technologies can also improve coordination with other transport modes to provide shippers a seamless door-to-door experience. It is increasingly clear that multimodality is the way forward for modal shift. Such a complex ecosystem can only be managed with technology-intensive solutions.

Still, technology is only a tool to increase coordination in a fragmented system. The fragmented assets will only be better coordinated if there is a conscientious decision to use technology to improve such coordination. Technology cannot overcome the refusal to be coordinated. The right financial incentives can accelerate coordination and the European railway network. Substantial financial resources are necessary to maintain a European-wide interoperable railway infrastructure with the necessary capacity to meet the expected growth in freight traffic. However, such an investment will not deliver the expected results if infrastructure is not efficiently coordinated to form a single European network. Investment in technology is necessary, as well as the incentives to make efficient use of the technology by improving coordination.

5. Eurocontrol also includes non-EU countries, such as Turkey, Ukraine and Russia, something that could also be envisaged in rail freight.

Main Takeaways from the Discussion

By Teodora Serafimova, Florence School of Regulation – Transport Area

Objectives and Gaps in the Implementation of Regulation (EU) 913/2010 (the 'Rail Freight Corridors Regulation')

The 20th Florence Rail Forum took place against the backdrop of the ongoing evaluation of Regulation (EU) 913/2010 concerning a European Rail Network for Competitive Freight (also referred to as the 'Rail Freight Corridors Regulation'), and provided a unique opportunity for a first presentation of the preliminary results of the evaluation. The evaluation process has spanned over three years: starting in 2019, with the final study expected in early 2021. Adopted ten years ago, the Regulation was tailor-made for rail freight. As such, it represented an innovative approach to regulating the rail sector, given that, at the time, the regulatory framework consisted of a set of directives. The initial purpose of the Regulation was to establish and organise international rail corridors with a view to making rail freight more competitive vis-à-vis other modes of transport. To this end, the Regulation sought to establish a governance of Rail Freight Corridors (RFCs) at supranational level, while improving the coordination between the main actors involved in the management and operation of these corridors, including infrastructure managers (IMs), Member States, rail undertakings (RUs), terminals and regulatory bodies. Moreover, it aimed to coordinate investment planning, guarantee capacity for international rail freight, facilitate the use of infrastructure, improve operational conditions, and, not the least, foster inter-modality.

The evaluation concludes that the Regulation is still relevant and connected to the current realities, perhaps even more so today than ten years ago. Achieving net zero carbon emissions by 2050, which is the objective at the heart of the European Green Deal, will necessitate the transport sector to collectively deliver a 90% reduction in CO_2 emissions by mid-century, as compared to 1990 levels. This, in turn, calls for a significant shift of EU land transport from road to cleaner modes, such as rail and inland waterways. The Commission's recently published Strategy for Sustainable and Smart Mobility reiterates the EU's modal shift objectives, namely, rail freight traffic should increase by 50% by 2030 and double by 2050. What is more, the COVID-19 pandemic, has demonstrated the decisive nature of infrastructure capacity for the performance of rail freight. Rail freight punctuality immediately thrived as a result of the increased available capacity.

The conclusions of the evaluation are mixed as regards the Regulation's effectiveness in delivering the expected results. When it comes to the objective of 'improving cooperation', for instance, while more dialogue and cooperation were observed, collective decision-making has not succeeded in overcoming national approaches and the involvement of end customers remains insufficient. As regards the 'coordination of investments' objective, bottlenecks in freight remain, whereas the link to the trans-European transport network (TEN-T) is still insufficient. The objective of 'guaranteeing capacity', which is a core element of the Regulation linked to the capacity allocation process, was found to be one of the less successful elements of the Regulation. The approach has been piecemeal, resulting in a persistence of poor quantity and quality of capacity for rail freight. Flexibility and responsiveness have been limited, rendering the management of freight capacity on mixed-use lines difficult. Similarly, the overall effect has been marginal when it comes to the objective of 'facilitating the use of rail infrastructure'. Though some tools have been put to use, there has been an incomplete coverage of processes and the performance of supra-national IT tools has been lacking. On the objective of 'improving operational conditions', while there were some improvements on the contingency management front, technical and operational interoperability issues continue to hinder cross-border rail freight services. Lastly, there were limited tangible results in respect of the objective of 'strengthening inter-modality', given that no concrete measures were implemented in this field.

With regards to the Regulation's overall efficiency, the costs of implementation were not found to be excessive and were sustained by EU funding. Though the interplay between the Regulation and other legal instruments can be improved, it was concluded that it is still fully consistent with EU policy objectives. Finally, the evaluation results indicate an EU added value of intervention, as voluntary

action by stakeholders was found to be insufficiently productive. The sum of actions at national level is, in other words, not delivering an optimal output, and a network-centric approach is still lacking.

Is There a Need for a Supranational Entity to Improve the Performance of RFCs (Network Manager)? Which Functions Should Such a Network Manager Assume?

To best address these questions it is helpful to draw on the experience of other sectors, such as air traffic control and energy, where a higher degree of pan-European coordination can be observed today. Forum participants took inspiration, in particular, from the model of the European Network of Transmission System Operators (ENTSO-E), an association representing electricity transmission system operators (TSOs) from 36 countries across Europe. Similar to the rail sector, TSOs are faced with the challenge of decarbonising the electricity grid with a view to achieving carbon neutrality by 2035 and net zero carbon emissions across the entire energy sector by 2050. As an association of grid operators, ENTSO-E has relied on the competencies of the grid operators, by pooling together their resources to reach common goals.

80% of ENTSO-E's activities are driven by legal mandates imposed by regulators or the European Commission. Here, stakeholders stressed the importance of a clear legal direction and overarching mandates established by the Commission (in the energy sector, these are referred to as 'network codes' as well as methodologies, which lay out how the mandates are to be achieved). As in the rail freight sector, one priority area for ENTSO-E has been the coordination of investment planning. The association has gone a step further though, by elaborating a 20-year network development plan, which outlines projections as to how the European energy grid should look like in the years 2030 and 2040. The modelling behind this tool is instrumental in guiding the selection of critical Transport-European Networks for Energy (TEN-E) projects and investments. Jointly with regulators and the Commission, ENTSO-E has defined the methodologies and cost-benefit analyses of these projects, which, in turn, enable them to rank and evaluate the relevance of interconnection projects from a pan-European system perspective. This pan-European network view guides the coordination of investment planning in the energy sector today, though achieving it has been a lengthy process, which has necessitated the development of a complex set of tools and models.

Another important activity of ENTSO-E has been the building up of joint digital platforms related to congestion management in corridors, which in turn, can become heavily congested due to renewable energy. There is a growing complexity of rules governing the allocation of these congested corridors in terms of auctions to market participants. Because electrons travel at the speed of light, capacity allocation and congestion management in the energy sector rely on forecasts and anticipation (on the basis of network modelling and joint calculations of corridor capacity), which obviously differs from the approach in the RFCs. Regional security coordination, on the other hand, is more closely linked to the topic of contingency and crisis management in the rail freight sector. In electricity, this entails the anticipation of incidents and avoidance of system blackouts.

A rather complex governance scheme has had to be put into place to ensure an adequate balance between the supranational level and existing national stakeholders. One key takeaway from the energy sector's experience has been the need to ensure that the national TSOs perceive themselves as being in control and, thus, take ownership of the strategic direction provided by the European regulator and the Commission. The Treaty of Lisbon sets out that the security of electricity supply is the responsibility of the Member States, whereas the energy market is the responsibility of the EU institutions. The management of congestion and contingency, however, falls at the interface of these two processes. In view of this, significant efforts have had to be undertaken in regards to data interoperability and data modelling, so as to guarantee that the calculations done by one operator can be fully replicated by another. Thanks to these efforts, each grid operator has a comprehensive view of his own grid, as well as of his neighbors' grids, and if need be, of the entire pan-European system. Securing trust among the community has been a crucial precondition for enabling the contingency analysis from a pan-European perspective.

One of the main challenges from the TSOs' perspective has been to strike the right balance between the national regulations and the pan-European mandates. National regulators' expectations have had to be aligned with the pan-European regulator, ACER, in transposing rules to

complex regulatory environments. The clear ownership and commitment of operational stakeholders, such as the TSOs (which, in rail jargon, would be the equivalent to IMs), has helped to overcome these hurdles. The energy sector's solution has been to allow TSOs to remain in power within the umbrella association, which in the rail context would be the RFCs. While RFCs are already providing a partial solution today, it is clear that on their own, they do not suffice and thus need to be reinforced.

All in all, drawing on the experience of the energy sector, it emerged that a more robust integration of the network was achieved thanks to a combination of factors, including the existence of a clear legal mandate, the extensive use of digital tools (i.e., modelling, joint digital platforms), the adoption of common tools and plans, as well as the 'intention to share' expressed in the form of clear deliverables. The main challenges faced by the rail and energy sectors appear to be similar in regards to securing an adequate balance between the supranational and national levels.

A 'top-down' approach to the governance of RFCs resonated with participants, whereby a permanent supranational entity would be entrusted with facilitating information exchange and coordination among freight trains, which are primarily cross-border in nature. The supranational railway network coordinator would be tasked with ensuring an integrated and holistic traffic coordination at higher level, and the improvement of capacity and connectivity with terminals, which are part of the infrastructure.

In the face of different national rules and priorities, an approach based on top-down strategic decisions from such a supranational entity, which at the same time, relies on the competences of the different operational stakeholders, could help to address market needs, capacity allocation and investment planning. More specifically, it was proposed that the European coordinator conducts a so-called 'market study' for the RFCs, in order to scope out the needs of the market and the RUs. A second concrete function would relate to the improvement of capacity allocation and of service quality. The COVID-19 pandemic has clearly demonstrated that an improvement in the allocation of capacity can lead to an improvement in the quality of the service. In other words, the European coordinator would ensure that the amount of capacity dedicated to each concerned IM to freight transport is sufficient for the market requirements set out in the above-mentioned market study. Furthermore, a bottleneck analysis would be carried out by the European RFCs coordinator to illustrate the infrastructure gap for further market development. The coordinator would also make sure that the investment plan defined by the Core Network Corridor (CNC) coordinator in agreement with the Member States considers the closure of the gaps pointed out above. What is more, the supranational entity, it was suggested, would take charge of punctuality monitoring and performance facilitation. The better integration across borders, in particular at operational level, should not be limited to international crisis management. Some stakeholders, however, expressed reservations as regards the creation of a supranational entity per se, and instead, favored an approach that relies on enhanced international cooperation among IMs.

The Brenner Axis Task Force was presented as a concrete case striving towards greater coordination at supranational level throughout the RFC. The Brenner Axis Task Force seeks to enhance visibility along the entire axis in order to better anticipate shortages and bottlenecks, and thereby improve quality. While there are similar initiatives ongoing in other corridors, the Brenner Axis initiative is among the more concrete ones when it comes to coordination, supervision, and the creation of an integrated and holistic traffic management along the axis. The initiative has adopted an end-to-end approach to capacity offers, processes harmonisation and performance measurement.

Today there are two EU regulations, namely Regulation (EU) 913/2010 (the 'RFCs Regulation') and Regulation (EU) 1315/2013 on the Union guidelines for the development of a trans-European transport network (the 'TEN-T Regulation'), which share the almost identical objective of establishing a trans-European corridor network. The TEN-T Regulation already foresees the role of a European coordinator for the corridors. More specifically, according to the TEN-T Regulation, the coordinator should be neutral actor, directly linked to the European Commission. In view of this, some stakeholders put forward the idea of strengthening the link between the RFCs and TEN-T Regulations. In practical terms, it was suggested that the European coordinator, foreseen in the TEN-T Regulation, takes on the role of European RFCs coordinator and shares the executive board of the

RFCs, so as to ensure a proper link between the two regulations. As regards the interplay between the RFCs Regulation and the TEN-T Regulation, three main areas needing improvement were identified. These include the governance (there is currently a dual governance), the question of the geographical definition of the corridors in relation to the core network, and lastly, the question of the tools (e.g., investment coordination on the side of RFCs but also on the side of TEN-T).

What Role Can Digitalisation Play in the Management and Operation of RFCs?

One way of increasing railway capacity and efficiency is through building new railway tracks, stations and tunnels, among others. While this is a key step in alleviating capacity issues, it entails long-term planning and development with high financial needs. On the other hand, the optimisation of processes and digital solutions can also offer important potential to boost railway capacity and efficiency, while necessitating much shorter-term development (i.e., two to three years) and fewer financial resources. Digitalisation is, in fact, one of the main enablers for a more competitive railway sector and harmonised EU-wide processes. It does so by fostering cooperation and collaboration between the various actors in the sector, including the IMs, RUs, wagon keepers, station managers, and intermodal operators, among others. By improving communication and cooperation between IMs, it was argued that digitalisation could also address the challenges linked to the Corridor One-Stop-Shops (C-OSS). The current C-OSSs are lacking ad-hoc products and flexibility, due to their limited competence in capacity allocation, which makes them dependent upon IMs' support and acceptance. Suboptimal cooperation between C-OSSs and IMs today, lowers the quality of RFCs and European rail freight traffic overall suffers. Some stakeholders held that digitalisation could help to resolve the mentioned problems by redesigning the C-OSS.

Digitalisation has a number of dimensions. Firstly, there is the digital infrastructure information provided by one common digital rail infrastructure platform on aspects of planning, operation, building and maintenance. The digital train information, on the other hand, provides real-time and reliable information on the position of the train, locomotion and wagon, thereby enabling the tracking and tracing of trains over the different networks, and under the responsibility of different RUs. Thanks to the RFCs, today there is also the possibility to include first and last mile information. The railway sector is evidently lagging behind when it comes to tracking and tracing, especially when compared to the geo-visibility offered in the aviation sector. There was firm agreement among participants that tracking and tracing in rail needs to be drastically accelerated. The most challenging issue, however, is the digitalisation of capacity management. Here, a Europe-wide capacity strategy and a digital capacity model including temporary capacity restrictions (TCRs) will be key.

Digitalisation can enable the aggregation of demand, which in turn, can help to reduce costs and make inter-modal transport services competitive with road transport solutions. Systems are already being developed and tested, with the notable example of electronic platforms on road transport, which allow for full visibility of demand and supply, and thereby cost reductions and optimised services. In addition to demand aggregation, digitalisation can facilitate the disaggregation of offerings. '*The industry needs steaks not cows*' was the phrase used to express the fact that most companies today require alternative solutions to overcoming their inability to purchase an entire train. Digitalisation can enable greater flexibility in the planning and ordering of the trains. Visibility is key to ensuring that rail and inter-modal transport can compete with air, maritime and road transport. Intermodal rail is the only mode where no visibility solution exists today. Dynamic rerouting will be needed, in particular during peak seasons, to guarantee business continuity and planning, and to avoid a repetition of the Rastatt accident of 2017.

Four key levers were identified in regards to the digital transformation, namely digital data (which enable better predictions and decisions), automation (i.e., systems that work autonomously to cut operating costs, reduce error rates and increase speed), enhanced connectivity (interconnecting the whole value chain), and digital customer access (providing full transparency to the customers). To illustrate these, participants drew on the experience of the Belgian rail network, whose national IM, Infrabel, has developed the so-called 'Smart Railway', which aims at full digitalisation of the rail infrastructure by 2022. As part of these efforts, data analysis has been used to predict maintenance needs of the infrastructure,

whereas drones have been used for the inspection of bridges.

There are facilitators and barriers to digital innovation. When considering the facilitators, it is important that all the different actors are involved, so as to ensure these are equipped with the necessary capabilities to pursue digital innovations. Important preconditions for innovation are market demand, competition, and the existence of an 'innovation champion', in order to facilitate the further adoption of digitalisation in the sector. On the side of the barriers, it was argued that game theoretical approaches (i.e., the existence of different, and at times, conflicting objectives across the various actors) may act to inhibit the willingness of the sector to cooperate and share data. The associated benefits tend to be less visible than the costs, thus lowering the actors' willingness to pay and cooperate. A cultural and mental shift will thus be imperative.

Standardisation and regulation, on the other hand, would fall somewhere in between the facilitators and the barriers. Drawing on research conducted on the maritime sector, it was found that the role of standardisation and regulation could not be strictly classified as either a facilitator or as a strong barrier for the sector. Notwithstanding, it is unclear whether these conclusions are fully replicable to the railway sector. Furthermore, studies based on the maritime sector have found that IT innovations were primarily profit-driven, whereby the most important driver was to optimise operations, to integrate with other actors, and only in third place in terms of importance came the driver of minimising costs. Another takeaway from this research has been that only a limited number of the IT innovations were driven by regulation, whereas most of them were a response to external factors and competition. Participants agreed that competition is an important precondition for the sector to grow, attract newcomers and the private sector, and not the least, to make rail the backbone of the transport system.

The same research, furthermore, provided some interesting insights into the type of data deemed most relevant by maritime stakeholders. The sharing of data on tracking and tracing of goods ranked most relevant, followed by the actual and estimated time of arrival of the ships, and third came data on the supply chain visibility. The most important data for actors in the maritime sector, thus, relates to visibility, transparency and reliability in the supply chain. Given that customers demand greater visibility and reliability, the role of digitalisation in RFCs should be to offer these qualities to the customers so as to induce them to choose rail over road and other transport modes. In other words, consumers should be incentivised to make an active choice in favor of rail, as opposed to being forced into it.

As in the maritime sector, rail is merely one part of the whole transport ecosystem and has important linkages to other transport modes. In view of this, the future governance of RFCs will have to ensure the corridors fit into the rest of the transport eco-system. A top-down governance architecture was favored by stakeholders, but it was also agreed that it will have to be driven, through a bottom-up approach, by the railway industry. For instance, a European-wide governance and rollout of digital solutions will necessitate common standards (e.g., to enable tracking and tracing of trains across borders), though these will have to be developed with the technical expertise of the railways. Lastly, as a bridge to the third session of the forum, it was noted that the railway sector is underfunded as regards the implementation of digital solutions. While a number of EU funding schemes are already in place for the rail sector, 2021 as the European year of railways, will be decisive in accelerating the uptake of digitalisation in the sector.

How to Finance the Development of RFCs, in Particular Infrastructure Services? What Investments Are Necessary? How Much Is The Industry Ready to Support These Investments? Do We Need More Public Investments?

While investment into digital innovation in the rail sector is essential to dramatically increase infrastructure capacity and improve efficiency, stakeholders cautioned against approaching digitalisation as a replacement of infrastructure investments. Taking into account the EU's modal shift objectives, while considering the congestion levels in large parts of the EU network today, one cannot realistically expect that digitalisation alone will be the 'silver bullet' for congestion issues and that volumes will increase sufficiently. Investments into the maintenance of the existing rail network, especially on RFCs, will thus continue to be necessary. It was argued that new digitalisation and expansion projects will not increase the performance and competitiveness of rail to the greatest

extent possible, if the existing infrastructure is left to crumble. Adequate maintenance will have to be backed by investments into the typical technical parameters (e.g., loading gauge, weight, train length, speed etc.), which, in turn, are indispensable for the TEN-T. In view of this, there was firm agreement that digital investments and infrastructure investments should not be perceived as being in competition, but should instead be pursued in parallel.

Capacity is the most expensive resource in rail freight, which in turn, highlights the need to ensure it is used efficiently. Capacity alignment is only a first step towards fostering international rail freight. To ensure European rail freight gains the needed market share, the sector will have to work towards a European capacity model defining required freight transport capacity along the vision of modal shift. New capacity allocation rules will be needed on routes with capacity shortages according to defined capacity needs. Participants also argued that replacing physical infrastructure with digital infrastructure can offer significant cost savings. This is because when train paths are created digitally, as opposed to manually, the entire network can be optimised, while delivering a higher degree of transparency. Study results were presented, which showed that digital capacity management can result in a 4% higher usage of capacity, and up to 6% savings in travelling time with positive effects for both IMs and RUs. Automatic timetabling and train path assignment, on the other hand, could enhance efficiency, and lead to a 15% better utilisation of locomotives due to optimised round trips, and reduced synchronisation times at borders. The implementation of TAF technical specifications for interoperability, however, will be a precondition for ensuring that infrastructures can inter-communicate and, furthermore, for eliminating wasted capacity.

The Connecting Europe Facility (CEF) is the EU funding instrument for strategic investment in transport, with a total budget of €30 billion, whereas €55 million have been dedicated to rail freight in the past seven years. CEF funding is targeted towards completing missing links at border crossings or on other parts of the network, enacting upgrading measures to reach infrastructure standards (e.g., TSI on infrastructure, full line electrification, ERTMS deployment, 22.5 tons axle load, 740 meter train length, and availability of 'clean fuel' charging infrastructure for all modes, among others) or higher capacity standards, the construction or upgrading of multi-modal connecting points, and ITS equipment for all transport modes (including, where relevant, certain on-board components).

The European Investment Bank (EIB), on the other hand, lends to CEF corridor projects, and so far over 130 projects along the CEF corridors have benefited from EIB loans. Since the CEF budget funding will remain limited, RFCs development will also need to attract alternative public and private investment, when it comes to digital-automatic coupling and European Train Control System (ECTS), for instance. On the infrastructure side, the EIB grants support for the rehabilitation and upgrading of existing lines (including electrification), the construction of new lines, electric and signaling systems, as well as stations and intermodal terminals. As a result of the ongoing market deregulation and competitive tendering of services in recent years, there has been an increased share of lending going to rolling stock purchasing, where financial support goes towards the acquisition and retrofitting of rolling stock, passenger trains, freight locomotives and railcars, as well as manufacturing and RDI.

It was highlighted that today there is a shortage of well-prepared projects with a solid business case. In view of this, a suggestion was put forward for a European coordinator to play a role in deciding, or at least pre-approving, which projects and initiatives are to benefit from EU funding. In other words, if the European coordinator or entity with a systemic view endorses a project, this may act to increase the project's chances of success for funding. Others, argued that technical digital solutions should be included as a component in future funding. All in all, major flagship digital initiatives (e.g., digital-automatic coupling, ERTMS, digital capacity management, automatic train operations and digital train information) will need to be further pursued and financially supported. New funding opportunities will be unveiled within the EU's Multi-Annual Financial Framework (MFF) and Resilience and Recovery Fund.

In addition to financing and investments, however, growing the modal share of rail freight will have to be stimulated by inducing behavioral change through the setting of cost-reflective price signals (i.e., ensuring that prices reflect their true impact on the environment).

This call for fair and efficient pricing is not new on the EU agenda. In fact, already back in its 1992 White Paper on Common Transport Policy, the Commission acknowledged that prices need to be cost-reflective, otherwise, there will be imbalances and inefficiencies and thus the absence of a level playing field. Ever since, it can be said that, the level playing field has degraded even further.

In sum, this session clearly demonstrated that digital platforms can lead to additional capacity while lowering costs in the short to medium term. Rail investment today relies on two main sources, namely infrastructure charges and State subsidies. Stakeholders urged the need for studying the extent to which this funding provides sufficient incentives for the construction of physical infrastructure and digital networks. In the future, a more coordinated effort will need to be seen on the TEN-T and in the investment areas.

Conclusion

Whereas railway *infrastructure* is abundant in Europe, a European railway *network* is still missing. This distinction between infrastructure and network was underlined as particularly relevant to the debate. A network can be defined as a system of coordinated infrastructures, whereby these infrastructures need to be interoperable, and the entire system coordinated in order to allocate capacity and react to accidents. The building up of the national networks has been a lengthy process, which took decades to complete, whereby separate infrastructures have had to be integrated into a national network. In many countries, this has only been possible through nationalisation and thanks to a hierarchical structure. In the absence of a European entity, entrusted with the coordination of these networks, this has been done primarily through voluntary collaboration till now. RFCs offered an important instrument to increase coordination among these national networks and infrastructures, and constituted a first step towards the creation of a European network. The discussions at the 20th Florence Rail Forum echoed the urgency of progressing towards the creation of a European coordinated network with a view to increasing capacity and coordination.

The European Green Deal and the more recent Sustainable and Smart Mobility Strategy reaffirm the importance of boosting the modal share of rail in order to reach the EU's mid-century climate neutrality objectives. As regards freight transport, modal shift will be needed from road to rail, whereas for passenger transport, short-haul flights will have to increasingly be replaced by rail. Both of these elements will require an improvement in long-distance cross-border rail services. In view of their 'international' nature, a coordinated network approach will be inevitable in achieving this. What is more, if modal shift objectives are to be achieved, measures will be needed to ensure that improvements in capacity delivery translate into improvements in performance for the benefit of the final user, in terms of reliability, punctuality, ease of use and reasonable journey times, among others.

Participants were largely in favor of a top-down approach, given that the limitations of a bottom-up approach and the reliance on voluntary coordination among IMs have proven insufficient. The RFCs were framed as 'demonstrators' or an interim step towards greater coordination within the sector. As interfaces for all stakeholders in the rail freight sector, from RUs to terminals, shippers, operators, freight forwarders and regulators, RFCs are in a unique position to reinforce the network level and bring about a stronger cooperation at the European level. While there was consensus about the need for a network approach, the question of the precise shape this higher degree of coordination should take (e.g., supranational entity) remained open and this calls for further discussion. Inspiration and lessons learnt can certainly be drawn from the EUROCONTROL and ENTSO-E models, though the governance model for RFCs will need to be tailored specifically to the sector's needs. Noting the existing tensions between the national and EU levels, stakeholders highlighted that the governance will have to be developed from within the industry.

Stakeholders, furthermore, acknowledged the key role of digitalisation in coordinating the currently fragmented systems, and in creating a European railway network. Notwithstanding, technology, on its own, only provides a tool to solve problems, as opposed to directly solving them. The fragmented pieces of the system will require the political will, or alternatively the legal obligation, to be coordinated, otherwise the digital tools will fail to deliver the desired results. Another important distinction to be made in this discussion is the one between digital

tools, which help to coordinate infrastructure, and infrastructure management (e.g., the use of technology to improve capacity allocation in a fragmented system). While technology as a Business-to-Business (B2B) solution formed the main scope of the Forum, the Business-to-Customer (B2C) approach seeks to address the relationship with the shippers and final customers (e.g., shippers' demands with regards to access to data on train location), once a higher degree of coordination has been achieved.

EU financing tools have been primarily targeted at infrastructure to date. While, infrastructure will certainly continue to be the main building block of any kind of network, financial resources will also become increasingly important for the coordination of the infrastructure, in particular through technology and digitalisation. Though comparatively low, this kind of investment has the potential to translate into considerable results as long as the right governance structure has been put into place. Digitalisation will have to be managed and financed at the European level with a supranational entity entrusted with coordinating it, in order to avoid a proliferation of different digital tools within each corridor. Lastly, while the end result may not necessary be one single digital system, but rather a combination of systems, these will have to function in a coordinated way.

An RU Perspective on European Digital Capacity Management

A comment by Ulla Kempf, SBB Cargo International AG, Member of the Railfreight Forward Initiative

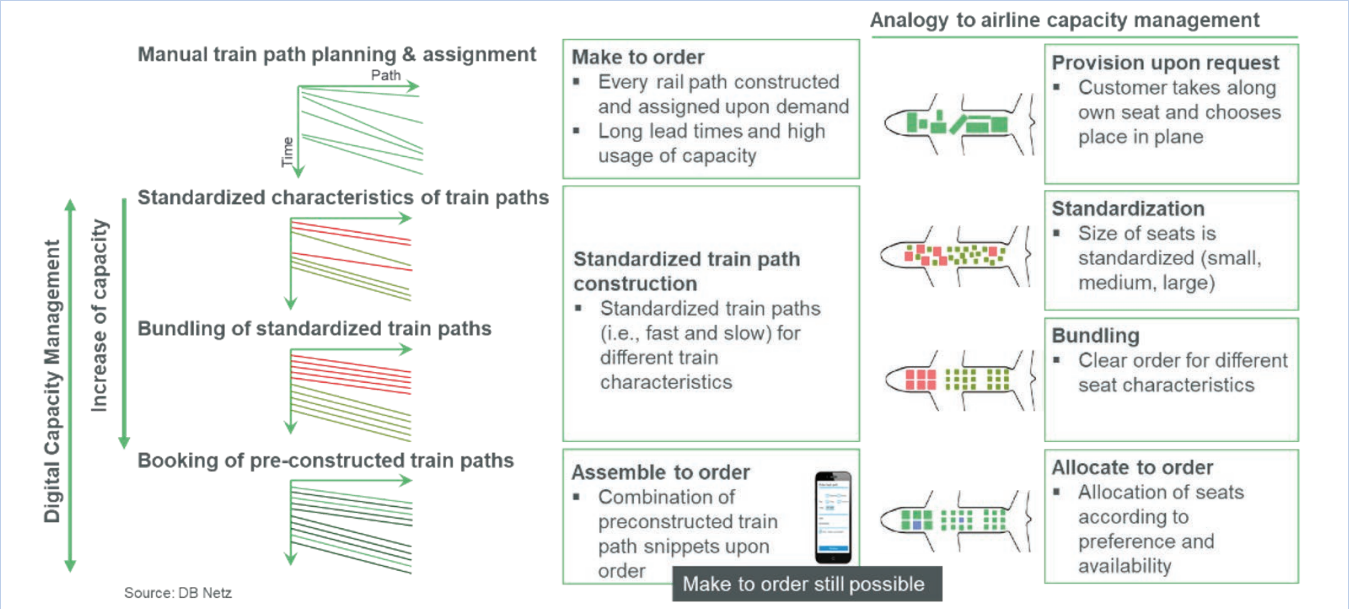
Increasing modal shift from road to rail will be one of the crucial cornerstones to transform Europe into the first carbon-neutral continent by 2050 - the European Commission's objective in the Green Deal[1]. Achieving 30% of rail modal share in freight would contribute to these targets with 25 million tons of avoided emissions of CO_2 equivalents and approximately €25 billion in avoided external costs from 2030 onwards[2].

To boost this growth, Railway Undertakings (RU) need to offer competitive services to the market, which requires to make running international trains 'as easy as running trucks'. Infrastructure Managers (IM) need to provide sufficient infrastructure capacity in quantity and quality to create space for growth.

Transparency and access to capacity, in particular infrastructure capacity, need to be simple, digital and without time delay. In this regard, today's management of capacity is outdated. Heterogeneous and dispersed systems[3] as well as traditional processes for capacity management in Europe are not matching up with short term and flexible market needs any more. Instead, they lead to 'a' technically possible solution for 'a' timetable by manually constructed 'make to order' train paths, which cannot yet be optimised due to technical and timely restrictions. Often these offers are therefore suboptimal (cross-border international) train paths for freight with long and non-synchronised lead times for booking.

In general, capacity is the most expensive and not infinitely extendable resource we have in the rail sector and therefore it has to be used most efficiently.

Digital Capacity Management (DCM) will address those challenges. It industrialises the process of rail path planning and assignment by standardising, automating and optimising small capacity units. Transparency and access to capacity will become digital. Planning and dispatching systems / organisations can communicate digitally and without time delay allowing seamless offers across national and organisational borders. Finally yet importantly, optimisation of infrastructure capacity and asset utilisation will become possible.



Through digital representation of infrastructure, including daily construction activity, train path capacity

1. European Commission, "Handbook on the external costs of transport", (Version 2019 – 1.1)
2. Green Book, Rail Freight Forward Initiative
3. 28+ legacy infrastructure management systems in Europe

and quality can be maximised with optimisation algorithms in the perspective of National or European Networks. The use of adaptors allows to keep existing legacy IT-systems for timetabling and therefore keep investment costs low[4].

The effects are promising. DB Netz' best practice example resulted in a higher supply of capacity on current infrastructure: ~ + 4% [4,5]. On average, less travel time is required: ~ - 6% due to optimised train paths saving resources on the IM and RU side[4]. The replacement of slow made-to-order processes with digitised, industrialised processes allows path offering times of approx. 1 hour instead of 30 working days as well as a step-change in process quality in terms of conflict elimination (e.g., infrastructure works), speed, etc. Overall more transparency on available capacity is possible and therefore enables the implementation of long-term as well as multi-annual timetables as required for TTR (Time Table Redesign project of RailNetEurope). In addition, DCM is providing a means for more efficient investment planning of physical infrastructure investments through a comprehensive digital representation of infrastructure for SERA (Single European Railway Area). Coming into full effect RUs estimate a better utilisation of drivers and locomotives through DCM, due to optimised round trips and reduced synchronisation times at borders of up to 15% and possible energy savings of up to 10% due to less consuming stops for rail freight[6].

DCM offers the facility for a hierarchical, international, cross-border capacity planning within Europe. To ensure seamless European rail freight flows it is an absolute necessity that the overall process of dimensioning – planning – and safeguarding capacity will be aligned accordingly. A European capacity model defining required freight transport capacity along the vision of modal shift is needed and to be coordinated between Member States, IMs and Allocation Bodies to guarantee harmonised capacity[7]. Through DCM our sector will receive the means to do so and act accordingly.

To make this happen, IMs, RUs and Authorities need to act now. The current structures in rail are neither incentivising investments in digital measures nor in cross-border optimisation. A possible way to overcome this predicament is by treating investment in DCM as equivalent to investment in new physical capacity and by financing it through corresponding means. Elevating digital investments to level playing field with physical investments, lower investment needs and shorter lead times will incentivise governments and IMs to invest with high returns in capacity. This could serve as an unlocked opportunity to remove or at least reduce significant bottlenecks on Europe's most exploited network parts until physical infrastructure is built.

4. Source DB Netz project NEXT, click & ride
5. 4% on 50% of the European Railway Network equivalents into approx. €16 bn of physical investment saved
6. Green Book, Railfreight Forward Initiative
7. New capacity allocation rules on routes with capacity shortage according to defined capacity needs are additionally necessary to sustainably ensure the international rail freight capacity needed

Is there a Need for a Supranational Entity to Improve the Performance of RFCs (Network Manager)? Which Functions Should a Network Manager Assume?

A comment by Emanuele Mastrodonato, European RFC Scandinavian Mediterranean

The European economy is facing the difficult challenge of exiting the pandemic emergency, and launching a recovery and re-start plan. One of the most important pillars to make a substantial contribution to a long-term competitiveness, sustainable growth and market development is the transport sector. The European Council, last July 2020, reached an agreement to have 30% of the next European budget (Multiannual Financial Framework plus EU Next Generation) allocated to climate action, corresponding to approximately €1.8 billion, whereby clean mobility is indicated as one of the elements with the greatest potential.

In November, the European Commission published its annual report on monitoring European climate action, reporting satisfactory results for 2020 and towards the European Green Deal goals. However, it is clear that all modes of transport need to become more sustainable, and the right incentives are needed to drive the transition. Rail transport will play a key role in this transition to a sustainable transport system, and this will start in 2021, which is declared as the European Year of Railways. As far as freight is concerned, rail traffic will have to double to make freight transport greener, and in order to achieve these objectives, concrete actions must be identified and implemented. The single market needs to be strengthened with investments to complete the trans-European transport network (TEN-T) by 2030, but also with short and medium term actions, to pave the way for an optimal management of future resources, while contributing to a better use of the current resources. The policy tools for freight transport competitiveness used in the last 10 years (e.g., Regulation 913-2020) are now under assessment and important questions on if/how they can be improved, are asked. In this framework, at the 20th Florence Rail Forum, the participants discussed, among other topics, if a supranational entity to improve the performance of RFCs is needed and which functions a network manager could assume.

Most of the RFCs became operational between 2013 and 2015, and the RFCs' results are recognised as being positive and encouraging. However, the need for a network approach is becoming prominent among the operators, and this can be attributed to some international freight transport functions being developed, natively, across not only several countries but several Corridors. This aspect should not be seen as an RFC limit but, instead, as a clear index that what has to be done at European regional level has been partially done or set up already, and the processes and systems established by the RFCs and their stakeholders in some European regional areas, are now in a more mature stage.

The RFCs allowed the International Contingency Management process to become a reality and to be applied in several real cases. The European market trends have been studied to better meet the market needs. The cooperation among the IMs has been reinforced on several matters, improving operational conditions and intermodality. The Capacity One Stop Shop has provided with access to the infrastructure capacity in a transparent and non-discriminatory way, showing great potential in some regions (e.g., ScanMed North sold 87% of the offered capacity, +28% across the last four years) even if with an overall not fully satisfactory result in Europe. The coordination among IMs, Member States, RUs, Terminals, RBs, has been improved and some of these players are addressing the RFCs to solve specific cross-border issues, and considering the RFCs as being the ideal platform for this (e.g., TCRs Temporary Capacity Restrictions management).

The discussion at the Florence Forum was on how the development of processes and the deployment of systems can enable a network approach for capacity management (e.g., with a future TTR Timetable Redesign Project including TCRs), traffic coordination (e.g., with RNE TIS, and not only in case of international disruption), and End-to-End performance monitoring (from ramp to ramp, A to B, as done in Road Transport). Some RFCs are embarking on the exercise of a closer cooperation between their members as far as traffic, capacity, and performance are concerned. At ScanMed RFC, a feasibility check on a Joint Coordination of Traffic and Capacity was carried out in 2020 and a Pilot Project 2021 is starting on the Brenner axis. One of the aims is to generalise some new processes that can be applied in other European regions

and other RFCs. It is not, of course, a viable solution to fragment these processes defining standards and procedures for each RFC. Digitalisation can facilitate this work, to ensure the quality of the data and to create the necessary interfaces with the existing standardised systems, specifications and registers (ERTMS level 3, RINF, TAF TSI and Rail Facility Portal). Today the vision of a future Eurocontrol for railways could show how the European network level (with the coordination of some functions) could work in parallel with the National level (where, among others, the safety aspects are managed). At this stage, therefore, starting a discussion on a concept of a future Eurocontrol for Railways is something more 'natural', and even this, can be seen as a RFCs' result.

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Florence School of Regulation, Transport Area
Robert Schuman Centre for Advanced Studies

European University Institute
Via Boccaccio, 121
50133 Florence
Italy

Contact:
FSR-Transport:
fsr.transport@eui.eu

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