

TOWARDS A SMART AND SUSTAINABLE SINGLE EUROPEAN TRANSPORT AREA

An Assessment of the Past 10 Years
of EU Regulation

Editors: Matthias Finger, Juan Montero and Teodora Serafimova



© European University Institute, 2022

Editorial matter and selection © Matthias Finger, Juan Montero, Teodora Serafimova, 2022

This work is licensed under the [Creative Commons Attribution 4.0 \(CC-BY 4.0\) International license](https://creativecommons.org/licenses/by/4.0/) which governs the terms of access and reuse for this work. If cited or quoted, reference should be made to the full name of the author(s), editor(s), the title, the series and number, the year and the publisher.

Views expressed in this publication reflect the opinion of individual authors and not those of the European University Institute.

Published by
European University Institute (EUI)
Via dei Roccettini 9, I-50014
San Domenico di Fiesole (FI)
Italy

(PDF)

ISBN:978-92-9466-325-2

doi:10.2870/340084

QM-07-22-637-EN-N

(Print)

ISBN:978-92-9466-324-5

doi:10.2870/888368

QM-07-22-637-EN-C



With the support of the
Erasmus+ Programme
of the European Union

TOWARDS A SMART AND SUSTAINABLE SINGLE EUROPEAN TRANSPORT AREA

An Assessment of the Past 10 Years
of EU Regulation

Editors:

Matthias Finger
Juan Montero
Teodora Serafimova

Table of Contents

Foreword	vi
Introduction	ix
PART I - Towards a Smart and Sustainable Single European Transport Area	1
Manifesto for the Next Five Years of EU Regulation of Transport	2
Manifesto for a post-COVID-19 Recovery Towards Smarter and More Sustainable Transport	35
PART II - Railways as the Backbone of the European Transport System	61
Modal Shift: The Moment of Truth. Main Takeaways and Lessons Learnt from the European Year of Rail	62
Building a European Railway Network for Long-Distance Passenger Services	75
State Aid in a Sustainable and Smart Railway Ecosystem	83
From National Railway Infrastructures to a Pan-European Freight Network	88
How to Revitalise Rail Freight with Digitalisation?	94
Green Finance and Sustainability: Is there a Space for Railways?	101
What is Wrong with European Rail Freight?	106
Private Financing of European Railway Infrastructure?	111
Competition in the Passenger Railways in Europe	115
Railways in the Age of Digitalisation?	119
Competition in the Railway Passenger Market	123
Security: Rail is NOT Air!	141
Regulating the Performance of European Railways: What can we learn from Air Transport?	145
The Digital Single European Railway Area: How to Think it?	150

Rail Freight Corridors: The Challenges Ahead	155
The 4th Railway Package: Further Challenges for the Regulator	159
Financing Railways: What Role for Regulation?	163
PART III - Aviation: Facing the Dual Challenges of Decarbonisation and Competitiveness	167
A Resilient European Aviation Market: Lessons Learnt	168
What Role for Competition Rules when Restarting Aviation?	172
Decarbonising Aviation...but how?	177
Airports as 'Enablers' for the Aviation Sector's Take-Off Towards Net-Zero Carbon Emissions	182
Air Services Regulation: Some Need for Review	187
Navigating Towards a More Efficient Airport Slots Allocation Regime in Europe	191
PART IV - Modernising European Air Traffic Management	197
The European Economic Regulator, a Catalyst for an overdue Change in ATM Governance	198
Context and History of Air Traffic Management Data Services	202
What can Air Traffic Management Learn From Electricity?	217
Incentivising the Evolution Towards Interoperability	235
How to Better Align the Performance Scheme?	240
Air Traffic Management: Why a Technological Disruption is needed – and why it is coming	244
Regulating Drones: What is the Right Approach?	248
Which Governance for SESAR Deployment?	253
From Single European Sky Gridlock to Air Traffic Control Markets to Evolving the Role of EUROCONTROL	257

PART V - When the Modes Come Together:	
Towards Increasingly Intermodal Transport Regulation	261
Multimodal Ticketing: What Kind of Regulation is Necessary?	262
How to Think the Greening of European Cargo Operations?	267
Placing Governance Considerations at the Core of the Sustainable Urban Mobility Indicators' Design Process	272
COVID-19: An Opportunity to Redesign Mobility Towards Greater Sustainability and Resilience?	278
Integrated Multimodal Ticketing Will Not Happen Without Clear Rules About Data Sharing	293
Pricing, Regulation and Rethinking of Mobility Needs is Required for Transport to Fully Account for its External Costs	300
Obstacles on the Road to the European Single Market for Road Transport	304
In the Era of Digitalisation and in Order to Achieve an Intermodal Level Playing Field, do we Need to Regulate?	307
Mobility-As-A-Service: From the Regulation of Transport as a Sector to the Regulation of Transport as a Service?	311
Low-Cost Air and High-Speed Rail: An Untapped Potential for Complementarity?	314

Foreword

Henrik Hololei

This book achieves two major objectives. First, it reminds us of the decades-long journey to build a Single European Transport Area, like Rome this was not built in a day but is a constant process. Second, more importantly, it reminds us of how much remains to be done to reach this goal fully and how much commitment it still requires from all of us.

It would perhaps not be appropriate for me to assess the past 10 years of EU regulation, as I have been in my current position for almost seven of those years. Yet I am pleased to share my views on what it takes to enhance the functioning of the Single European Transport Area and, given the circumstances, to preserve its integrity.

What needs to be done – and in large part what we are already doing – is outlined in our Sustainable and Smart Mobility Strategy from December 2020. The success of this strategy depends on a solid and well-functioning Single Market, where competition is the norm and bottlenecks, missing links and unsubstantiated barriers are removed.

The Strategy has three key objectives: making transport sustainable, smart and resilient.

The last objective - resilience - could not be more relevant in the context of the ongoing Russian aggression in Ukraine. We have a variety of policy instruments at our disposal at EU, national and local level. These range from research funding to technical standards to EU Directives to investment support. We need to “pull all levers” in order to make the transformation happen.

We are currently focused on implementing the comprehensive action plan of 82 concrete EU policy measures announced in the strategy, which are structured around 10 flagships”. Our intention is to reduce emissions not mobility. Greening mobility must be the new licence for the transport sector to grow.

The past two years have been extremely busy, with two major policy packages that drive further sustainable and smart mobility in the EU.

The Fit for 55 policy package of July 2021 comes with a dozen policy initiatives. As part of the package, the Commission proposes an ambitious revision of the CO₂ standards for cars and vans. There is also a review of the CO₂ standards for heavy-duty vehicles foreseen in the near future. This is complemented by our proposal for the Alternative Fuels Infrastructure where we proposed a set of binding targets for Member States ensure that sufficient publicly accessible infrastructure is in place for zero-emission vehicle uptake. Equally ambitious proposals have been put forward in the area of sustainable aviation and maritime fuels.

Following up in December 2021, we have published another major transport policy package, including among other our proposal for the revision of the regulation supporting the development of the trans-European transport network.

We also need to take full advantage of smart digital solutions and intelligent transport systems (ITS) and make connected and automated multi-modality a reality. Cooperative and automated systems have enormous potential to fundamentally improve the

functioning of the whole transport system and contribute to our sustainability and safety goals. But the key to get there is data. Therefore, we tabled our proposal to revise the ITS Directive in order to increase the deployment and operational use of ITS services and to create better conditions for the collection and use of crucial data.

While we have already delivered on many key actions from the Mobility Strategy under the leadership of Commissioner Vălean, several other actions are scheduled for the coming years and multiple proposals are still with the co-legislators. Once adopted, we will collectively need to ensure a smooth entry into force and effective and consistent implementation.

As I look back at what has been done, I could not miss the opportunity to thank the Florence School of Regulation (FSR) Transport for being a much appreciated, trusted and constructive partner of DG MOVE throughout this process, particularly in helping to facilitate consensus among stakeholders. FSR Transport contributed decisively to shaping the direction of EU transport policy and regulation.

The next years of EU regulation will be very important in determining the path the transport sector takes towards the aspired economy-wide climate neutrality by 2050. I am therefore convinced that sound policy-relevant research as well as close dialogue between academics and regulators are of crucial importance. This is precisely what FSR Transport has sought to deliver to the EU regulatory agenda through its series of Florence Policy Forums and the follow-up 'Observer' policy briefs, to which, in turn, this book is dedicated.



Henrik Hololei

Director-General of the European Commission's department for Mobility and Transport (DG MOVE)

Introduction

Matthias Finger, Juan Montero and
Teodora Serafimova

For more than a decade, hundreds of experts have gathered at the hills overlooking Florence to analyse the evolution of European transport policy and regulation at the call of the Florence School of Regulation. This book reflects the discussions in Florence, and more broadly, it documents the evolution of transport regulation in the European Union.

The Florence School of Regulation was created in 2004 as part of the European University Institute's (EUI) effort to reinforce the applied sciences and to make academic research even more useful for the Member States and EU institutions. It started with energy regulation later on expanding to telecommunications and media (2009), and in 2010 Professor Matthias Finger founded the transport area.

The Florence School of Regulation, and in particular the Transport Area, aims to connect academic researchers, transport companies and public officials at the EU as well as at the national and even local levels. In our different activities (academic conferences, forums, seminars, etc.), we host practically

oriented academics and academically oriented practitioners.

The Florence Forums are the most valuable of our activities. For each forum, we invite to Florence a small and heterogeneous group of experts from companies, academia, and government/regulators. In doing so, we make sure that all the various positions and interests are well represented. We use a methodology created and refined over the years by Prof. Finger, which consists of a series of short presentations followed by roundtable discussions under Chatham House rules. The result is a constructive discussion, which makes it possible to advance the policy definition process. This is what many of our participants have called the “Florence magic”.

The European Commission has played a very fundamental role in the success of the Florence Forums. Many of them are co-organised by the Florence School of Regulation and the European Commission around the legislative agenda of the Commission. Commission officials come to Florence, and they actively participate in the discussions, thanks to the continuous support provided by the Director-General of DG MOVE, Henrik Hololei.

Over the years, we have hosted more than 50 Florence Forums. We had more than 20 rail forums, 18 air forums, forums on maritime and road regulation, and increasingly, intermodal forums. A wide range of topics has been discussed. Whereas initially, liberalisation and the creation of the single European transport area monopolised discussions, over the years, new transversal issues such as the green and digital transitions have received increasing attention.

A document is drafted after each Florence Forum, capturing the main takeaways from the discussions. This is something we refer to as the “Observer”. It starts with a short evaluative piece written by the Professors in the Florence School of Regulation, it is followed by a longer summarising piece and finally, closed with

short contributions from a number of participants reflecting their takes on the issues at stake. All the Observers are published on Cadmus, the European University Institute's research repository, as well as on our website.

After a decade of Florence Forums, we have developed a privileged observatory position on the evolution of the EU transport policy. We have understood what the overall policy objectives are, what the positions of the different market players are, why some proposals succeed in becoming legislation, while others fail.

The purpose of this book is to share the knowledge we have built as privileged observers by bringing to the forefront the most interesting pieces in our Observers. In particular, we have selected the more relevant valuative pieces opening our Observers over the last decade whilst organising them according to the topic they address in four different blocks. We open with the rail block, as rail was the original topic of most of our Forums. Aviation has also received a lot of our attention, and in particular, Air Traffic Management and the Single European Sky, which in turn, have their own dedicated sub-block. We close with a block on intermodality, which has drawn increasing attention. The texts have not been edited for the book other than minor temporal references to improve readability.

We have included as opening pieces our "Manifesto for the Next Five Years of EU Regulation of Transport", published in November 2019 ahead of the start of the von der Leyen Commission's mandate, and an update for a post-COVID-19 recovery, published in June 2020. In these documents, a more comprehensive vision of the challenges in EU transport regulation is provided.

Our gratitude goes to the hundreds of participants in our Policy Forums, who have devoted their time to travel to Florence and candidly discuss the more innovative proposals and initiatives. Very particularly, we thank the Commission officials who supported and participated in the design of the sessions and then

actively engaged in the discussions. And finally, we thank our donors, the group of companies that, with their contribution, not only financial but, equally as relevant, intellectual, have made this decade of Florence Forums possible.

PART I

Towards a Smart and Sustainable Single European Transport Area

Manifesto for the Next Five Years of EU Regulation of Transport

Matthias Finger, Juan Montero,
Teodora Serafimova

Highlights

- The recent renewal of the European institutions offers an opportunity for European regulation. While the new institutional composition will be in place for the next five years (2019–2024), the legislative and public-spending decisions made under the von der Leyen Commission will have implications for decades to come in terms of shaping the direction of the European transport sector.
- While the completion of the Single European Transport Area continues to be work in progress, new global challenges – namely climate change and digitalisation – are exerting additional pressure, but also offer new opportunities for the European transport sector.
- Climate change is set to be a central pillar of the next Commission mandate. Having pledged to deliver a ‘Green Deal’ for Europe in the course of her first 100 days in office, Commission President-elect von der Leyen reaffirmed her com-

mitment to making Europe the world's first climate-neutral continent by enshrining the 2050 objective into law. Achieving this goal will require vast transformations across all sectors of the economy, including transport.

- Digitalisation, on the other hand, is adding a new layer of complexity onto transport; yet, if carefully regulated, it has the potential to advance EU sustainability objectives, while at the same time increasing efficiency, enabling smoother and more customer-oriented operations and, not least, enhancing safety.
- In this Manifesto, we show that the challenges of digitalisation and sustainability can be turned into opportunities for furthering the Single European Transport Area.
- In addition, digitalisation and sustainability are challenges far too big to be tackled only at national levels; both call for a truly European approach.
- Furthermore, neither challenge can any longer be addressed in an exclusively sector-specific manner; a resolutely inter-modal regulatory framework will thus be in order.

Introduction

The hallmark and the very identity of the EU is the creation of a Single European Market. The free movement of people and goods is at the core of this Single European Market and mobility is essential to achieving it.

Over the past 35 years the European Commission (EC) has endeavored to further the mobility of goods and people in Europe by removing national barriers, by harmonising technical and operational standards and by creating intramodal competition in air transport, railways, roads, and waterborne transport.

This has been done mostly by way of a sector-specific approach, an approach which today however reaches its limitations, as mobility – both for passengers and freight – increasingly becomes multimodal. While the last Commission, and especially the outgoing Transport Commissioner Violeta Bulc, identified multimodality as the new frontier and challenge of promoting a Single European Transport market, the sector-specific approach still prevails and remains engrained in the institutional setup in both the market and its regulation, as well as in the organisation of the Commission itself.

Two new challenges – decarbonisation and digitalisation – have emerged ever more prominently and, so far, mainly in parallel to the unfolding of the Single European market. Both are increasingly being addressed by the Commission, with the Juncker Commission having already taken significant steps.

In the case of transport, decarbonisation and digitalisation are not only challenges –which can neither be addressed by the transport sector nor by the Commission alone –, but constitute significant opportunities for a much more integrated approach to mobility in the spirit of creating a single European transport market:

- Smart transport offers the opportunity to increase the economic and environmental efficiency of an integrated mobility chain for goods and people, and also offers new and more integrated mobility services to citizens and customers; and
- Addressing sustainability offers the opportunity for a much more harmonised approach to pricing the mobility of goods and people by internalising external costs in a systematic and more environmentally efficient way, while providing economic incentives to green transport modes such as railways.

The year 2019 is a decisive one – not only in terms of determining the EU's political leadership and priorities for the next

five years, but also in shaping the regulatory approaches and outcomes within the transport sector for the foreseeable future beyond the von der Leyen Commission's mandate. This Manifesto shares our vision for how to further the Single European transportation area for goods and people by turning the challenges of smart transport and sustainability into as many new opportunities for efficiency and competitive services.

Single European Transport Area

Back to basics: The vision of a Single European Transport Area

Transport is a central pillar of European integration and a key pre-condition for the creation of the European Single Market. The development of seamless and efficient transport services and infrastructures across Europe is key to fulfilling three of the four freedoms of the common market: the free movement of people, services, and goods. The overarching goal of the European Union is the creation of a Single European Transport Area and the completion of the Internal Market for the transport of goods and passengers. This was outlined in the [2011 White Paper](#). Corresponding activities of the European Union date back to the Treaty of Rome (1957) and have mainly been undertaken thanks to a sector-specific approach; that is, transport mode by transport mode.

The transport sector is facing increasing pressure as a result of global challenges such as climate change and digitalisation, which in turn calls for the uptake of new technologies and mobility solutions, as well as for a rethinking of some of the current regulatory approaches. The historical challenge for the EU transport sector has been, and remains, the elimination of barriers between nations. More precisely, there is the challenge of har-

monising the historically national approaches to land transport, something that is still most clearly visible in the railway sector. Such harmonisation pertains to technical and operational matters (interconnection and interoperability), to financing and to the institutional setup, as they all have the potential to lead to market distortions inside and across different transport modes. It is clear that a lot of work remains to be done and substantial financial resources to be committed for the elimination of bottlenecks and for the harmonisation and interoperability of the legacy national infrastructures.

The basic EU approach to creating a Single European Transport Area has been to distinguish the infrastructures from the services provided based on these infrastructures; this is also referred to as “unbundling”.

Intramodal competition has been introduced in the provision of transport services. National state-owned monopolies providing integrated transportation have started to disappear, at least in some sectors. Newcomers have entered the transport markets: they are both former national monopolies expanding across borders and new entrants from other transport sectors or even other industries. As a result, transport services providers are becoming more efficient and more responsive to users’ needs and have lost their ability to balance positive and negative network effects. European markets, well integrated in global markets, are emerging in aviation and maritime transport. Railways remain very national, but are catching up fast. Urban public transport has not been greatly affected by the reform of European transport.

There is still room to improve intermodal competition in the Single European Transport Area. The reform of the railways sector is subject to implementation; its impact – either positive or negative – has yet to be observed. There are continuous threats to intramodal competition in the aviation and maritime industries. While EU legislation does govern some aspects of

urban mobility, such as green public procurement (as laid down in the recently revised [Clean Vehicles Directive](#)), the subsidiarity principle ensures the ability of Member States to take legislative actions and decisions. As a result, the Commission has been shy to intervene in new urban mobility solutions and shared mobility.

However, the most fundamental challenges to the Single European Transport Area remain the monopolistic infrastructures. This is unsurprising given that competition can only play a very limited role here, given that these are natural monopolies (such as railway tracks). While the picture can vary significantly depending on the Member State and the transport mode, as well as depending on how the collected revenue from the customers is apportioned to the use of the infrastructure, it is obvious that many infrastructures require financial support when it comes to their expansion, not simply for their operations. This, in turn, means that national budgets have to contribute, most notably in rail, but also in road infrastructures.

The Connecting Europe Facility (CEF) supports investment in transport, energy and digital infrastructure through the development of the Trans-European Networks (TEN) and also promotes cross-border cooperation on renewable energy generation. Those networks and cross-border cooperation are crucial for the functioning of the Single Market and also strategic to implementing the Energy Union, the Digital Single Market and the development of sustainable transport modes. It is fundamental to underline the strategic importance of the CEF programme from the perspectives of integration of the internal market, smart mobility and the opportunity to deliver tangible added value for citizens, social cohesion and business through this programme, prosperity and added value for EU as a whole.

The future needs for decarbonisation and digitalisation will imply a growing convergence of the transport, the energy and the digital sectors. Synergies between all three sectors should thus

be harnessed to the full extent, maximising the effectiveness and efficiency of EU support. Investment in digital, innovative and sustainable transport projects must be accelerated in order to move towards a greener, truly integrated, modern, accessible-to-all, safer and efficient transport system. Social cohesion at EU level is to be enhanced by increasing the public investments in EU and regional added-value projects. The completion of TEN-T core network by 2030 and the transition towards clean, competitive, innovative and connected mobility, including an EU backbone of alternative fuels charging infrastructure by 2025 should be a priority. Multimodal and cross-border connections are of great importance in this regard. Priority should be given to large-scale EU-wide projects so as to digitise transport such as ERTMS, SESAR and autonomous driving. The 5G coverage of the TEN-T would be equally fundamental. To realise these projects, a blending of resources is needed: public funds from the CEF and private funds guaranteed by InvestEU.

It is estimated that the completion of TEN-T core network will generate 7.5 million job-years between 2017 and 2030 with an additional GDP increase of 1.6 percent in 2030. CEF shall prioritise investments on TEN-T cross-border infrastructures to achieve coherent capacity and avoid bottlenecks in all modes of transport, but in particular the greenest rail and waterborne, in order to obtain a fully integrated transport network. CEF aims for transport to contribute to the completion of both layers of TEN-T: the core network by 2030 and the more extensive layer by 2050. Investing in transport, and in particular in the TEN-T infrastructures, the upgrading and maintenance, is crucial for Europe's growth, jobs and long-term goal of decarbonisation.

The CEF Transport Blending call, launched in 2017, has supported actions combining CEF grants with financial instruments (€1.35 billion), thus encouraging the participation of the private sector in the funding of CEF actions. The second Blending call,

worth €350 million, as well as a call in 2018 (€421 million), have helped further the Commission's priorities along the EU transport policy agenda in terms of decarbonisation, inter-modality, road safety, and digitalisation. When it comes to the financing of infrastructures, an achievement of the Juncker Commission has been the adoption of the new EU budget for the Multi-Annual Financial Framework for 2021–2027, whereby €30 billion was allocated to the CEF program. The new CEF will rightly prioritise environmentally friendly modes of transport, such as rail and the development of charging infrastructure for vehicles using alternative fuels. In parallel, the Commission's work on the development of an EU-wide methodology for the assessment of "socially and environmentally sustainable" economic activities will be a key complementary instrument for channeling scarce financial resources towards future-proof transport technologies. As an enabler for railway transport, ERTMS funds shall be provided to ensure that the Core Network Corridors will be equipped with ERTMS by 2030 and the entire TEN-T network by 2050.

Despite clearly observable best practices (such as the Shift2Rail programme) and the EU's modal shift objectives, rail freight services are often still characterised by relatively low quality and reliability. As a result, rail freight's modal share today has stagnated at around 17 percent, significantly below the 30 percent aimed for by 2030. This can be attributed to the lack of cooperation for instance in the context of cross-border coordination in capacity offerings, traffic management, and planning of infrastructure expansion. The lack of fair intermodal competition has certainly been a cause for the slow uptake of customer-oriented services and innovative business models. Technical and operational interoperability barriers will need to be overcome in order to increase the share of freight that is transported by rail, as opposed to trucks. Moreover, standardisation will be crucial for reducing costs as well as for improving process efficiency.

Furthermore, the lack of harmonisation along the logistics chain and across the different transport modes also stems from numerous administrative barriers. Digitalisation and cooperation certainly have the potential to improve operations, to enhance customer experience, and to increase capacity, for example along rail freight corridors. However, unleashing the full potential of digitalisation will require a change in the way the entire logistics chain is organised and managed.

As competition plays a limited role in the governance of infrastructures, regulation serves as a substitute to improve their performance. In the past, the Commission has mostly focused on sector-specific regulatory frameworks. Despite being based on common principles, important differences in regulation exist and will remain across transport modes. However, differences also remain within the sectors across the Member States due to their reluctance to accept and enact EU regulations. This can also be attributed to high system complexity as well as the fact that a one-size-fits-all approach is not always feasible.

Also, the regulation of the infrastructures remains closely tied to the national and even local territorial development strategies. Authorities and citizens have mostly accepted markets when it comes to transport services, but they remain reluctant when it comes to infrastructures in a given territory. In air traffic management (ATM), for example, national sovereignty concerns are clearly an obstacle to the creation of a Single European Sky. Therefore, completing the reform of the different transport infrastructures is of fundamental importance, as transport service providers sometimes cannot really compete because of the rigidities in their underlying infrastructures.

The limitations of the traditional approach

While the story of the reform of European transportation is one

of success, the limitations of the overall approach of the past 35 years start to become apparent. Firstly, there are clear signs that European champions are not really emerging in the various transport modes. While it is true that some traditional monopolists are expanding across their national borders, they are not reaching a European scale, either through organic growth or through mergers and acquisitions. This is not specific to the transport sectors; it can also be identified in telecoms and banking, for example. The same can be said for manufacturers serving the transport industries. While Airbus is a success story, no parallelism exists in railways, maritime, or road transport. The frustrated Alstom-Siemens merger raises the question whether such an evolution is even desirable.

Secondly, no homogenous European markets have emerged in transportation. Aviation, along with international road freight and maritime transport, could be considered as exceptions. Still, even in air and maritime transportation, and certainly in railways and roads, national regulatory conditions remain different, mostly state-owned players tend to stay national (particularly when it comes to infrastructures), and markets continue to be fragmented. Not to mention the fact that urban public transport continues to be a fully national, if not local “market”.

Thirdly, perfect unbundling seems to be increasingly challenged by recent technological developments, particularly digitalisation. As a result of imperfect unbundling, but also as a result of various national (industrial) policies, (cross-)subsidies continue to lead to unsatisfactory market situations in most of the transport sectors and in many of the EU Member States.

Fourthly, the sector-specific approach promoted during the past 35 years by the Commission seems to be reaching its limits, considering that passengers and shippers are increasingly requesting a more integrated approach along the respective value chains. Thus, transport can no longer be treated in a

sectoral way only, and must now also be approached as an integrated system, the aim of which should be to deliver door-to-door (mobility) solutions to its users, both passengers and shippers. At the same time, users cannot be asked to coordinate these different transport modes, nor can this task be left to expensive and often inefficient intermediaries.

Consequently, European regulation must be enacted in order to better coordinate the transport modes. More homogenous rules across transport modes, as in the case of multimodal passenger rights (and transport providers' liabilities), will be needed where possible. Incentives for multi-modality and a better physical interconnection across transport modes would certainly also help.

Such enhanced coordination of incentives could deliver a more seamless and more efficient EU-wide transport system, given that sector-specific policies can and often do lead to contradictory incentives and thus suboptimal outcomes. While sector-specific regulation has been instrumental in securing compliance at the international level (for example, IMO targets in the maritime sector), it should be noted that a purely sectoral approach can also make it difficult, if not impossible, to identify and therefore to incentivise the most efficient and sustainable transport mode along the value chain.

Interconnected digitalisation and sustainability as new opportunities for accelerating the Single European Transport Area

While the Commission continues to face significant challenges to complete the Single European Transport Area, new challenges and opportunities are emerging. At first sight, it would appear that interconnected digitalisation is introducing a new layer of complexity into transport, while sustainability and decarbonisation

objectives require some major changes in the way transport will have to operate.

However, we believe that both digitalisation and sustainability offer just as many opportunities when it comes to building the Single European Transport Area. Also, both digitalisation and sustainability are at least regional in nature, which means they cannot be tackled at local or national levels alone. Consequently, given its continental reach and the depth of its regulatory competences, the Commission is optimally positioned to ensure that interconnected digitalisation and sustainability contribute to the Single European Transport Area.

Furthermore, neither interconnected digitalisation nor sustainability are challenges that can be addressed by a purely sector-specific approach and require at least an intermodal, if not a totally cross-cutting, approach. Therefore, we propose to identify digitalisation (*Smart Transport*) and sustainability (*Sustainable Transport*) as the two new opportunities to accelerate the Single European Transport Area. Both have the potential to overcome the limitations that have emerged after 35 years of European transport reform, and it is to this that we turn in the following two sections.

Smart Transport

Interconnected digitalisation: the pre-condition for automation and smart transport

New technologies are transforming the transport sector. Digitalisation and artificial intelligence (AI) have the power to automate certain operations and to better coordinate transport across service providers and transport modes. Technology creates opportunities to increase efficiency for the benefit of the user and the overall competitiveness of the European economy, to increase

safety, and to reduce CO₂ emissions. Furthermore, technology provides new instruments to accelerate the Single European Transport Area.

A new data layer is emerging on top of the traditional infrastructure and transport service layers. Digitalisation is the process of creating this data layer, which involves the production of data on transport, the transmission of such data, and the processing of the data.

Firstly, sensors are being installed in infrastructure, personal and cargo vehicles, as well as passengers; for example, in the form of smartphones and location chips to sophisticated meters, and electronic charging tools. All these elements produce data. The Commission can accelerate the installation of sensors through different means, including the compulsory installation of sensors (as has been the case with meters in electricity networks), and funding, as in the digital projects in the Connecting Europe Facility (€3.8 billion in the previous Commission). This is increasingly drawing attention to the need to ensure privacy rights, which is also linked to the question of data ownership (that is, should passengers/users of infrastructure own the data they generate?).

Secondly, data has to be transmitted from locations around the territory where infrastructure is displayed, to the centers where data is to be processed. Connectivity is a challenge as transport infrastructure and vehicles can be located in remote areas: high seas, in the air, etc. Different technologies are available to ensure connectivity, ranging from optic fiber to mobile networks (in particular 5G), WIFI, and satellite networks. Again, the Commission is playing a role in improving the connectivity of transport infrastructure and vehicles.

Thirdly, data has to be processed in order produce useful information that is incorporated into processes and to automate

services. AI and machine learning are fundamental tools to make smart transport a reality. The Commission is taking a leading role in AI, and transport needs to be an integral part of this strategy.

Smart transport and automation will be the result of further digitalising transport: creating, transmitting, and processing transport data. Automation of each transport mode, with the leading example of the autonomous vehicle, requires the best connectivity and data processing in the form of machine learning. The Commission has an important role to play in the development of automated vehicles by supporting research, improving connectivity around Europe, and eliminating regulatory obstacles (including testing environments in close collaboration with Member States). Automation in the coordination of transport modes, particularly in urban areas, is the response to congestion and emissions. Mobility-as-a-Service (MaaS) can benefit from the support of the Commission in terms of improving the flow of data.

However, a fundamental obstacle for smart transport in Europe is fragmentation. Many actors need to coordinate in order to fully digitalise transport. Markets have become increasingly fragmented as a result of liberalisation: horizontally, newcomers compete with incumbents; vertically, infrastructure managers are separated from transport service providers (airports/airlines, ports/shipping companies, etc.), sometimes as required by regulation (railways). Finally, fragmentation across Member States is a further obstacle in the European Union.

In general, actors are reluctant to coordinate their digitalisation strategies, which in addition to the associated high upfront costs can stand in the way of digitalisation. As data is presented as the new oil, players are hesitant to share it with other players, fearing that they might be eroding their position in the market, thus blocking the digitalisation of the transport sector. Infrastructure managers with strong market power, sometimes even

monopolistic positions, seem particularly reluctant to share their data.

Sharing data among existing actors: Standardisation, interoperability and cooperation

The Commission is playing a fundamental role in the promotion of transport digitalisation by facilitating the flow of data across actors in all transport modes. Different instruments are being used. Firstly, traffic flows are facilitated if common standards are defined for the exchange of data. Every actor is developing its own stream of data out from their assets and activities. Sharing this data might not be useful, as raw data is difficult and expensive to manage. In complex and highly fragmented sectors it is difficult to agree on common standards to exchange data, particularly across multiple Member States. A traditional role of public authorities is to facilitate the creation of common standards in network industries, and standards for the exchange of data are no exception. The Commission has a role to play in the definition of standards, including quality of data standards.

Secondly, the sharing of data might have to be imposed on actors that are reluctant to participate in the exchange of data. These might hesitate to take the cost of creating data exchanges as they see no immediate direct benefit for them. In fact, some players might think that sharing data will actually weaken their competitive position against other market players. Here, the Commission has a role to play in defining such obligations, and at the same time in striking a balance between the general interest and the legitimate business interest of the market players.

To promote interoperability in the railway single market and digitalise rail transport, it is fundamental to accelerate the implementation of ERTMS. Taking into consideration the current very slow pace of deployment of ERTMS along the corridors as well

as the lack of EU grants, insufficient to cover the entire costs, the financing aspect for ERMTS completion is indeed critical.

The implementation of ERTMS is key to improving cross-border connections, increasing international freight and passenger capacity, delivering higher reliability rates, opening up the supply market, and most critically improving standards of safety. By improving rail sector competitiveness, ERTMS can also help to level the playing field between rail and road and ultimately provide significant environmental gains, with passengers and freight moving from road to rail.

With the support of private investors and public funds, an EU-wide large-scale project is estimated of around €100 billion to fulfill such a goal.

The Commission has launched initiatives in all transport modes to facilitate and, where necessary, impose data sharing. These include National Access Points under the ITS Directive, European Maritime Single Window, electronic freight documents, smart tachographs, Digital Inland Waterway Area, and SESAR projects in the air transportation industry. This is only the beginning, as a lot of room remains for further improvement of data flows in EU transport through standardisation, interoperability, and compulsory data sharing. The uncertainty in the application of antitrust law might limit the willingness of actors to cooperate more efficiently.

New market structures: An opportunity for the Single Market

Digitalisation has the power not only to improve efficiency, but also to transform market structures. The traditionally separated transport modes can be transformed into multi-sided markets coordinated by digital platforms. Technology has the power to overcome fragmentation. Digitalisation reinforces multi-modality

and, more importantly, represents an opportunity to accelerate the Single Market.

Platforms operate in the data layer. They facilitate the interaction between different sets of actors, reducing transaction costs and creating new network effects. Transport platforms active in the data layer are in a position to design new and creative interactions within a sector as well as across transport sectors. Technology can be used to better coordinate isolated pieces of the transport puzzle, with a major impact on efficiency, safety and emissions.

Firstly, transport platforms can substantially increase efficiency across existing transport sectors. Thanks to predictive algorithms, they can empower a better use of the existing assets, increasing capacity without further investment. They can better adapt traffic flows in order to avoid congestion, thereby helping to mitigate air- and noise-pollution issues in urban environments. Efficiency increases in each transport mode, and the promotion of the more environmentally sustainable transport modes can help advance the European Commission's sustainability and decarbonisation objectives.

Secondly, platforms can make multimodality a reality by more efficiently coordinating different transport modes. Platforms can have access to the available information in real time to better integrate different transport modes. They can eliminate friction in the form of integrated information and ticketing for the user. They can provide alternatives if a connection is lost.

Thirdly, platforms can provide users with a seamless mobility experience across Member States, reinforcing the Single Market. By now, the challenges of the construction of the Single Market have become obvious, given the high costs involved in harmonisation and rendering infrastructure fully interoperable. There is political reaction to harmonisation of rules that seek to set common

standards for services across Member States. Moreover, there are unavoidable obstacles such as different languages and traditions in the way information is displayed and passengers interact with service providers. Finally, the emergence of EU-wide service providers is far from being realised in most transport modes.

Digitalisation, and platforms in particular, provide a complementary tool for the creation of the Single Market. It is not always necessary to fully harmonise service conditions, or to wait for European players to provide services across the EU. Platforms can build a network of networks, a frictionless coordination of fragmented services across Member States, empowering citizens and companies to use transport services across the continent. Thus, digitalisation can become the ultimate tool for the completion of the Single Market.

The regulation of transport platforms

While platforms represent an opportunity, they also pose regulatory challenges. The Commission has a leading role in facing these challenges and transforming them into opportunities for the completion of the Single European Transport Area.

As platforms grow larger ecosystems around them, the value created by network effects increases, which reinforces the position of platforms as system coordinators creating and distributing such value. The services being intermediated by the platform become commodified, the position of the service providers is eroded as they lose the direct relationship with the passenger/cargo dispatcher, competition becomes more intense, and traditional players might face challenges to even fund their operations.

All players are becoming strategic when it comes to data sharing. Traditional players are increasingly resistant to sharing data because it helps platforms transform transport markets into

multi-sided digital markets, where platforms coordinate commoditised transport service providers. Some traditional players are trying to vertically integrate in order to become the platform coordinating the market, using their position in the service layer as a competitive advantage.

Platforms are increasingly demanding that public authorities impose data sharing obligations on traditional players, so as to exclude strategic behaviors to reinforce the position of traditional players against new platforms. The Commission is fully aware of these dynamics and has the responsibility to ensure a level playing field. No regulatory obstacle should be introduced that hampers the construction of multi-sided markets when they are in the position to deliver smart transport and increase efficiencies. At the same time, it does not seem reasonable to unbalance the playing field in favor of newcomers.

Data sharing can and should be a two-way street. Entities that are forced to share data could be repaid with the new data generated by the data provided. In this way, digital platforms benefiting from data from traditional players would provide such players with the new and powerful data generated by the digital platforms.

In any case, it should be recognised that building a platform is a business in itself. Attracting partners to an ecosystem by sharing the potential value created by network effects is the fundamental business proposition of the digital platforms. The platforms that should succeed are those with the best technology, which are capable of identifying the right incentives for partners and creating a sustainable ecosystem. Regulation can solve market failures, but should not favor inefficient platforms by forcing market players to partner with them.

Furthermore, regulation should allow alternative platform arrangements, such as platforms managed by public authorities and decentralised platforms managed by the transport service providers intermediated by a platform.

As transport is platformed, it is the role of the public authorities to ensure fairness in the relationship between platforms and transport partners. Platforms that reach certain thresholds in size or market power must ensure transparency and fairness in their algorithms, providing redress mechanisms in case service providers have concerns with the functioning of the platform. Platforms are not neutral; they often face conflicts of interest, particularly as they vertically integrate and as they both intermediate and provide some of the intermediated services in competition with other service providers. The Commission is the world leader in platform regulation, particularly in the regulation of fairness in platform to business relationships. As transport is platformed, specific measures to regulate transport platforms might be considered.

Finally, transport is a service of general economic interest, but digitalisation might have negative impacts on the general interest. Platforms might reinforce transport modes damaging the environment, they might reduce the availability of services in scarcely populated areas, or they might reduce the funding available for the constructions and management of the underlying infrastructure they intermediate. Public intervention might be necessary in the future to ensure that the intermediation activity of the platforms does not damage the general interest.

In this regard, special attention must be paid to the social impact of transport platforms. On one hand, platforms empower small companies and even individuals to enter transport markets and compete with more established players. On the other hand, platforms increase competition between the service providers intermediated in the platform. As a result, platforms can trigger a 'race to the bottom' in the conditions of provision of services by individual and small companies. The new and particularly weak position of these actors has to be protected.

The Commission is already in a leading position in the regulation of platforms, given that it has the knowledge and the scale that local and national authorities often lack. It has the necessary legal base (freedom to provide services). Transport should play a larger role in the regulation of platforms. Transport already provides some of the leading examples of data-sharing frameworks and even one of the very first platform regulation examples (the Code of Conduct for Computerised Reservation Systems in aviation). The construction of the Single Transport Area could be one of the drivers of platform regulation in Europe.

Sustainable Transport

Bold ambitions should be met with correspondingly bold measures

In its Long-Term Decarbonisation Strategy “[A Clean Planet for All](#)”, the European Commission paints a clear picture of the vast transformations that will have to take place across all sectors of the economy for Europe to reach net-climate neutrality by mid-century. More recently, in her Agenda for Europe “[A Union that strives for more](#)”, newly elected European Commission President Ursula von der Leyen reaffirmed her commitment to making Europe the world’s first climate-neutral continent by enshrining the 2050 objective into law, and proposed a tightening of the EU’s 2030 emission reduction targets. Moreover, the Political Guidelines state that Europe needs to move towards a zero-pollution ambition. The European Green Deal, which the von der Leyen Commission has promised to deliver within its first 100 days in office, is set to elaborate policy measures to implement the aspired 2050 goal and thus offers new momentum to come up with a concrete decarbonisation strategy. For transport, which accounts for a quarter of the Union’s total greenhouse gas emissions and is a major contributor to health-damaging air and

noise pollution in cities, translating these objectives into reality will require a systems-based approach with significant changes across all transport modes.

However, regulators' experience has shown us that transport is a particularly challenging sector when it comes to decarbonisation. It continues to be largely dependent on oil for most of its energy needs and is the only EU sector whose emissions remain higher than in the 1990s. In the long run, this is both environmentally and economically untenable. Growing recognition of this situation, as manifested through the 'green wave' in the recent European Parliament elections, has resulted in the building of an overwhelming consensus regarding the need to shift away from business-as-usual and towards a more socially and environmentally sustainable system based on shared, multi-modal, and low-carbon mobility.

Firstly, it should be acknowledged that some positive developments were observed under the Juncker Commission (2014–2019) towards establishing a conducive regulatory and financial framework to unleash the considerable untapped potential in the transport sector. This has come in the form of three consecutive Mobility Packages towards the attainment of a modern, multi-modal, safe and low-carbon transport sector; these packages were marked by many firsts in terms of transport regulation.

Among these were the adoption of the EU's [first-ever CO₂ standards for heavy-duty vehicles](#), along with an incentives system for the production of low- and zero-emission trucks. Another was the introduction of [binding requirements](#) for the installation of charging infrastructure for electric vehicles in buildings. On the aviation front, examples were the inclusion of air transport in the EU Emission Trading Scheme and the introduction of ICAO's global market-based mechanism (CORSIA), which is set to offset the growth of sector's CO₂ emissions from 2021 onwards. In shipping, on the other hand, we saw the adop-

tion of the IMO's landmark sulfur cap in late 2016, which will significantly limit the allowable sulfur content of shipping fuel from 2020. However, a number of gaps remain to be filled in order to place transport on a firm path to carbon-neutrality by mid-century.

With this in mind, and given the long-lasting effects of EU legislative- and public spending-outcomes, the next five years of EU regulation will be decisive in determining the feasibility of the aspired mid-century objectives. Consequently, the von der Leyen Commission is responsible for mainstreaming policies and guiding investments towards transport technologies compatible with sustainable and climate-resilient growth.

Transport's external costs should be internalised in a socially just manner

It is widely acknowledged that personal and goods transport entail a significant societal and economic cost in the form of environmental and human health impacts, but also accidents, congestion, and infrastructure wear and tear. However, these costs are largely unaccounted for in the price that transport users pay today and are thus 'external'. In fact, a recent [study](#) by the European Commission estimated the overall size of transport-related external costs to be around €1 000 billion annually, the equivalent of 7 percent of EU28 GDP,¹ whereas users are only paying for roughly half of these directly generated transport costs. In other words, it can be concluded that the 'society pays' principle prevails over the 'the user pays' and 'the polluter pays' principles. This mismatch between external and infrastructure costs, on the one hand, and taxes and charges levied, on the other, is one of the main reasons for the persistent inefficiencies in the transport system. The enactment of efficient and cost-reflective pricing in transport, as acknowledged back in the Commission's

¹ https://ec.europa.eu/transport/themes/logistics/news/2018-12-17-costs-of-eu-transport_en

2011 [White Paper](#), will be key to incentivising more efficient transport, while enabling consumers and industry actors to make informed purchase and investment decisions.

However, it is difficult to enforce government tax reforms aiming to implement the user-pays and polluter-pays principles, given that they can result in a disproportionate burden for the working and middle classes, as manifested in the case of the yellow vest movement in France. Transport and logistics already account for a significant share of company costs and household expenditures. For the latter, transport is the second-largest expenditure item, preceded only by housing costs. On average, each person spends €1900 on transport per year, which represents 13 percent of their spending. This calls for careful planning and design of fiscal policy measures to ensure social justice and public acceptance. While the optimal pricing strategy might vary from one country to another, dynamic- and means-based pricing models in particular have been shown to offer the least regressive and particularly effective design options for limiting congestion and maximising environmental benefits. These models rely on income-based discounts and/or exemptions for the lowest-income segments. In order to mitigate possible imbalances, the generated taxation revenue is directly returned to citizens through lump-sum rebates.

While successful examples can be observed at the national level (for example, the Swiss distance-based heavy-duty vehicle fee in force since 2001), an overarching EU framework and guidelines will be key to internalising costs while securing a level playing field across the continent. Only in a framework that fully promotes the ‘polluter pays’ and ‘user pays’ principle, can green modes such as rail have a fair chance to compete and fully play their role. Rail is today the only motorised transport mode to nearly cover its marginal costs.

An important EU legislative opportunity in the freight sector

is the ongoing revision of the [Eurovignette Directive](#) on road charging, which, if adequately designed, can enable the fair and efficient use of road transport infrastructures and can moreover, help generate revenue for reinvestment in clean technologies and infrastructures. The Commission's legislative proposal for the reform takes us in the right direction by introducing distance-based charging (that is, km travelled) on the basis of CO₂ emissions, with the possibility of granting 75 percent reduced charges to low- and zero-emission vehicles. To promote modal shift, cross-financing greener infrastructure as railways with road tolls should be supported in the revision of the Directive.

The enactment of reduced vehicle taxation (circulation and registration), company car taxation as well as VAT rates, all of which fall within the remit of national governments, can be an effective though only temporary tool to lower the total costs of ownership associated with alternatively powered vehicles, thereby fostering their uptake. However, the picture remains highly heterogeneous across different countries due to the absence of an EU-wide framework.

Here, the long overdue revision of the [Energy Taxation Directive](#) (2003/96/EC) presents a unique opportunity to build a future-proof taxation framework for energy products and fuels with a view to providing correct price signals to consumers and promoting the shift to a clean and sustainable transport sector. Firstly, as the Commission already proposed back in 2011, a CO₂ component should be introduced in the new energy taxation rules. Another possible route to efficient pricing in transport would be the removal of the mandatory tax exemptions for aviation and maritime shipping fuels that the Directive currently provides for. The absence of taxation on conventional fuels used for air and maritime transport – two sectors with continuously growing emissions – directly contradicts the polluter-pays principle and stands in the way of fair intermodal competition.

On the aviation front, the removal of these mandatory tax exemptions for extra-EU flights would require amending existing bilateral and EU level agreements, as well as the Chicago Convention. The projected doubling in air traffic flows by 2035, as [estimated by IATA](#), calls for a combination of measures to be considered ranging from the enactment of an aviation tax, increased production and uptake of sustainable aviation fuels, as well as further improvements in aircraft efficiency. In parallel, targeted measures will be needed to ensure enhanced airspace efficiency within the Single European Sky, as well as improved efficiency of [airport slot allocation system](#). Last but not least, the adoption of market-based measures such as the EU Emission Trading System (ETS) and CORSIA will play an important role.

While intra-EEA flights have already been included in the EU ETS, President-elect von der Leyen has proposed in her Agenda for Europe to extend the ETS to cover the maritime sector and reduce the free allowances allocated to airlines over time, as well as to incorporate the traffic and construction sectors (the latter being a sector whose CO₂ emissions are entirely exempted from EU regulation).

The European Commission's modal shift objectives rightly seek to divert more traffic away from road and towards rail and waterborne transport, given that these are by far the least polluting modes by weight transported. Zooming in to the maritime sector, while we have seen the uptake of innovative vessel technologies, there is still room for improvement, especially around port areas, which are often heavily populated. The removal of the above-mentioned unfair tax exemption could help encourage the deployment and use of shore power infrastructure in port areas, which could enable electric and hybrid ferries and ships to plug into the electric grid when at berth, thereby shutting off their engines and reducing harmful air pollutants in coastal areas. However, such measures would need to be accompanied by

adequate financial support in order to avoid unintended consequences, such as an increased incentive to use more polluting modes such as road.

In more practical terms, tax matters require unanimity among national governments in Council. The modernisation of the EU energy taxation framework may require the Council to consider a move towards qualified majority voting as opposed to unanimity, as recently proposed by the Commission itself.

As highlighted above, a key challenge here will be to achieve the shift towards fair and efficient pricing with minimal or no regressive effects. In this respect, the challenge is to evolve in a socially just manner from unjust mobility practices towards a low-carbon, multi-modal mobility system, marked by higher shares of shared and public transport. To this end, internalisation techniques will need to be seen as part of a more comprehensive package of regulatory measures and accompanied by a systematic rethinking of mobility needs (both of which are discussed below).

A regulatory approach, combining a mix of stick and carrot components, will be needed to secure Paris Agreement compliance

As urged in the Commission's Long-Term Decarbonisation Strategy, a timely shift to highly efficient low- and zero-emission vehicles, such as electric vehicles, will be a key pre-condition to ensuring the transport sector is on track to delivering emission cuts in line with the 1.5°C target of the Paris Agreement. This requires the creation of a conducive regulatory and financial environment to accelerate their uptake, but importantly also implies a departure from the EU's current 'technology-neutral' regulatory approach.

Creating the right conditions for clean technologies to enter the market will depend – at least initially – on government policy,

enacted at the European, national, and local levels, and combining a mix of stick and carrot components. Road transport is the most emitting mode, but it also holds the largest untapped potential for further decarbonisation thanks to technologically proven and cost-efficient solutions that are already available today. In its final year, the Juncker Commission made important advances in providing the 'stick' component for the shift to powertrains with low and zero emissions. In addition to putting an end to unregulated truck CO₂ emissions with the adoption of its first ever fuel economy standards for heavy-duty vehicles, the EU revised fuel economy standards for new cars and vans for the post-2020 period. Compliance with the new rules will require manufacturers to step up investments in the production and sales of highly efficient vehicles with low and zero emissions. Here, the recently revised [Clean Vehicles Directive](#) (2009/33/EC), which mandates the procurement of minimum shares of clean municipal and public service vehicles from 2025 and 2030, can play a key complementary role by providing the 'carrot' component for manufacturers while creating scale and reducing the costs of clean technologies.

However, as the Dieselgate scandal has taught us, the effectiveness of fuel economy standards is highly dependent upon the adequacy of the vehicle emissions testing regime and the accompanying enforcement measures. Guaranteeing that real-world emissions match those reported on paper calls for the introduction of a real-world CO₂ emissions test, together with the creation of an impartial EU body to oversee vehicle type approval and ensure that data on fuel consumption and emissions is made publically available.

In light of the EU's new CO₂ and public procurement regulations, it is expected that the uptake of low- and zero-emission mobility will accelerate significantly in the post-2020 period. The growing penetration of electric vehicles and fuel cell vehicles

(the latter being especially relevant for longer-range and commercial vehicle applications) will have to be met with adequate coverage of smart and interoperable recharging infrastructure for electricity and hydrogen. Here, a revision of the [Alternative Fuels Infrastructure Directive](#) (2014/94/EU) will be instrumental in setting binding targets for recharging stations while reflecting the advances in battery and high power recharging technology in the case of electric vehicles, as well as tailoring to the diversity of charging needs (depending on territory, population density, and power speed).

Sustainable urban mobility plans (SUMP) are a key tool for encouraging planning for sustainable alternative fuel infrastructure with a view to promoting demand-driven rollout of charging infrastructure.² Railway stations and other public transport hubs in particular should be prioritised as prime locations for public charging points as these help to reduce the investment cost while supporting multimodality and improving connectivity between private and public transport. Furthermore, SUMP should incorporate wider current and future technological developments, such as automation and ITS, MaaS, and shared mobility. These should be promoted together with Member States, which will then monitor the implementation by local authorities. National and municipal policies will be instrumental in enforcing parking restriction regulations, defining low-emission circulation zones, and enacting scrappage schemes. At the same time, however, municipal policies should not be disconnected from the cities' environment, in light of the growing (perceived) fragmentation of the EU internal market and haphazard barriers to the freedom of mobility. These currently affect even the most technologically advanced internal combustion engine (ICE) vehicles through uncoordinated urban/regional regulations, such as bans of ICE vehicles in Balearic Islands, and bans of diesel vehicles in certain cities, in 2025.

2 Drawing on best practices of Amsterdam, Oslo, and London

A rethinking of mobility needs and development of smarter mobility concepts

In addition to being a central pillar of European integration, the transport sector has crucial economic and commercial significance for the Union, representing roughly 9 percent of the total gross value added of the EU economy and 9 percent of total EU employment, while enabling 17.2 percent of the EU's total exports, which depend on transport. With continuous trends of population growth and urbanisation, the transport sector will continue to play a key economic and commercial role. Reconciling this growth with the objectives of the Paris Agreement calls for a rethinking of mobility needs and the development of smarter mobility concepts.

As discussed above, the uptake of alternative powertrains will be central to keeping the transport sector in check with EU climate objectives. However, a technological shift alone will not suffice in addressing issues of congestion. In view of this, the foreseen evaluation of the 2011 White Paper is a welcome opportunity to further refine the existing paradigm, which sets that “curbing mobility is not an option”. In parallel to the uptake of low- and zero-emission solutions across all transport modes, additional measures will be needed to foster multimodality, as well as behavioral change towards greater reliance on cleaner, shared, and active mobility.

Since the optimal solution will vary from country to country, a combination of measures will need to be considered in parallel, ranging from the development of public transport, car sharing infrastructure, bicycle lanes, and light rails. Enabling modal shift offers a multitude of environmental benefits, while helping to offset capacity issues at some airports, but it will require public authorities, rail companies, as well as airlines and airports to work closely together to develop high-speed train links between key

cities where traffic volumes justify it, and boosting investments to improve infrastructure and frequency. Further measures related to passenger rights, and integrated multimodal ticketing will need to be considered to facilitate further uptake. Decarbonising EU transport requires a shift to clean transport like rail. Low- and increasingly zero-carbon rail is currently the most advanced green mode of motorised transport and must be enabled to fully play its role as backbone of the digitalised and seamless multimodal system.

Last but not least, a more efficient organisation of the entire mobility system will be needed, which relies on digitalisation, data sharing, and interoperable standards. These will be instrumental in enabling smart traffic management and increasingly automated mobility in all modes, reducing congestion and increasing occupancy rates. In this respect, and as highlighted in the previous section, digitalisation holds enormous potential in reducing transaction costs and enhancing the complementarity and even substitutability of the different transport modes.

Moving towards a cross-sectoral regulatory approach

The attainment of seamless multimodal door-to-door mobility has been stressed as a clear priority on the EU policy agenda. Having declared 2018 as the “Year of Multimodality”, the Juncker Commission has, in the past year, put together a number of legislative and policy initiatives relating to better infrastructure, connections, incentives, and digital solutions, with a view to promoting the shift towards a fully integrated, multimodal, and sustainable transport sector.

However, transitioning from concept to reality requires the creation of favorable conditions for transport users, which includes the availability of “[multimodal ticketing and payment systems](#)”. In practical terms, this means that the purchase of tickets in

one go would enable passengers to travel using different transport modes provided by numerous operators. As this definition implies, an integrated ticketing system relies on the close collaboration of multiple players on the execution of a number of steps throughout the whole lifecycle of the value chain. More importantly, and as stressed above, it may also imply a departure from the EU regulation that has so far tended to take a sector-specific approach, towards an increasingly cross-sectoral and intermodal regulatory approach. Such an overarching EU framework may be needed for multimodal transport especially in cross-border contexts.

A sustainable financing taxonomy will be needed to guide investments in environmentally sustainable mobility

Last but not least, the financial sector will inevitably have a central role to play in supporting the shift towards sustainable and climate-resilient transport sector. An important milestone of the Juncker Commission was the recent publication of its guidelines laying out the foundation for a [future EU legislation on a taxonomy](#) – or, in other words, a common EU methodology – for the assessment and identification of ‘environmentally sustainable’ economic activities. This is key to enabling well-informed investment decisions, safeguarding investment security, and putting an end to greenwashing practices.

A key challenge in developing the taxonomy will be to strike the right balance among width, depth, and flexibility. In other words, the taxonomy would have to have a sufficiently wide scope in terms of covering all relevant sectors of the economy and to significantly contribute to the transition to climate neutrality, at the same time as ensuring a sufficient level of detail to accommodate sector-specific, or even mode-specific particularities in the case of all modes of transport. In addition, the methodology should be dynamic enough to reflect continuous market

and technology developments. Not least, the taxonomy should reflect short- vs. long-term considerations. This is particularly important in the context of infrastructure investments, which are often carbon-intensive in the construction phase, yet deliver substantial emission reductions in the long run.

While a sound taxonomy is of course an important step, it will need to be accompanied by adequate oversight and enforcement mechanisms in order to prevent greenwashing, on one hand, and double-counting practices seeking to artificially inflate the CO₂ mitigation potential and overall environmental performance of given technologies or projects, on the other hand. In parallel, we need to see a timely phasing out of environmentally harmful subsidies and an enactment of cost-reflective pricing across all transport modes. Lastly, appropriate spending of public finances is key, but these alone will not suffice. Private investment needs to be tapped into, by placing sustainability criteria needs at the core of the financing chain. The EU taxonomy will direct capital flows to the most sustainable transport modes, something that could be further supported by way of fiscal incentives.

Published in June 2020

Manifesto for a post-COVID-19 Recovery Towards Smarter and More Sustainable Transport

Matthias Finger, Juan Montero,
Teodora Serafimova

Highlights

In Fall 2019 we published our [Manifesto for the next five years of EU regulation of transport](#) as an input for the incoming European Commission, and the Directorate General for Mobility and Transport (DG MOVE), in particular. It contained our ideas and recommendations for how to further advance the *Single European Transport Area* (SETA).

It is fair to say that, of all the EU policy areas, transport was probably most dramatically hit by the recent COVID-19 pandemic, both internally and across the Member States. But, at the same time, the past three months have also demonstrated how crucial a well-functioning transport sector is for each country and for the EU as a whole. As a matter of fact, transport is foundational for the very functioning of a country and of Europe, be it in times of crises, or not.

Against the backdrop of the pandemic we, at the Transport Area of the Florence School of Regulation, have concluded that our original Manifesto needed updating, not so much in terms of its objectives, but rather in terms of making sure that proposed objectives are not sidelined, rolled back or even abandoned. We remind readers of the EU's overarching objective - to achieve a decarbonised SETA by making optimal use of both market and funding instruments as well as of digitalisation.

Because of the virus, national priorities have come to overshadow common European interests. These fragmented approaches have thrown us back to pre-SETA times, and sometimes even beyond, and greener modes of transport appear to be less of a priority at the present, especially, if judging by the allocation of State aid, for which the main beneficiaries have been the aviation and the automotive sectors. It is our contention that the original agenda towards a digital and decarbonised SETA remains not only valid, but is needed more than ever before.

In this Post-COVID-19 Manifesto we therefore set out to examine the response to the crisis in matters of transport at this stage and to make recommendations as to how main recovery measures can be turned into opportunities for furthering the SETA.

This Manifesto is structured in the same way as our original Manifesto. In the first part, we will highlight both the threats to an integrated European transportation area and the opportunities that arise from the various recovery measures, which would not only bring it back on track but, furthermore, accelerate it. In the second and third parts of this Manifesto we look at how digitalisation can and should be used to that effect and how decarbonisation of European transport can be further developed, to the benefit of the SETA and in line with the Commission's [European Green Deal agenda](#).

Past and Future of the Single European Transport Area

The overarching political objective of the European Union in the area of transport, namely the construction of a Single European Transport Area (SETA), has been put at risk as a result of the pandemic, in particular because of the asymmetric political response from different Member States. There is indeed a very real risk of losing the progress achieved over the past 30 years, both in terms of the construction of a single transportation market and in terms of harmonising corresponding rules about market opening and access, not to mention environmental protection and cohesion.

Clearly, the response to the COVID-19 crisis has been led by the Member States. This has been the case for the closing of borders, for the specific restrictions to transport and then, for the support provided to selected transport companies particularly affected by the demand shock, including State aid and even nationalisations.

The COVID-19 crisis has triggered the most drastic closure of borders between Member States since the adoption of the Treaty of Rome and actually, since WWII. Member States almost completely banned passenger cross-border services during the peak of the pandemic. While it is obvious that restrictions to mobility were necessary, the unavoidable tensions and lack of coordination regarding border closures have created asymmetries across the Union. Today, there is overwhelming agreement that there is an urgent need for a more systematic, more harmonised approach to the management of transport between EU Member States.

Specific restrictions in the provision of transport services have been decided at national levels. Overall, Member States have imposed drastic reductions in the provision of these services

during the confinement. Other restrictions are being decided by the various Member States on a more permanent basis in order to ensure social distancing. Supply of public transport is being severely limited. Disparate rules are being applied in different Member States. This disparity in legislation is also true in the various transport modes: from fewer restrictions in aviation to more restrictions on trains and buses. Again, there seems to be agreement that a more uniform approach, across Member States and across transport modes, would be desirable, so as to ensure clarity for both transport operators and users throughout the EU.

The shocks in both supply and demand have led to widespread State aid so as to support transport operators in various manners. This support has been highly asymmetric, with asymmetries between Member States, between transport modes and even between business models in the same transport mode. These asymmetries have been particularly pronounced between Member States. Some Member States are striving to be faster and more generous in the provision of aid to transport undertakings. Other Member States, mostly those with weaker public finances, are more restrictive in providing aid to transport companies. The consequences of this will only become visible after the crisis.

As regards to transport modes, important asymmetries can also be observed. Aviation and the automotive sector have been the biggest beneficiaries of State aid. In the air transport sector, for instance, over €30 billion (as of 12th June 2020) has gone to airlines. In France alone, on the other hand, a €5 billion loan guarantee to the Renault group was approved to mitigate the economic impact of the Coronavirus outbreak³. In all this, systemic considerations, be they for a sector (aviation, urban transport) or for the entire mobility chain, have been totally lacking.

Other transport modes such as railways and urban transport

3 https://ec.europa.eu/commission/presscorner/detail/en/IP_20_779

have received less or no support. Railways were probably considered to be less in need of State aid because they were already State-owned, while urban or regional operators (i.e., bus, rail, airports) were not considered of national importance.

State aid has not been homogenously distributed in each transport mode either. National champions with traditional business models have typically received more support, while new entrants (for example, low cost air carriers) have received less or no support. On the flip side, analyses of the aviation sector have shown that the low-cost and alternative business model carriers have proven to be more resilient to the effects of the crisis as compared to incumbent players, which, in turn, could provide an alternative explanation for the disproportionate allocation of State aid.

Needless to say, all these asymmetries constitute a major threat to the SETA as originally conceived. Not only are some competitors receiving an undue advantage, thus distorting competition inside a sector or across the different transport modes, but State aid is often contradicting the traditional objectives of the EU's transport policies: players receiving more State aid are typically those still aligned along national borders, while newcomers and urban transport operators, which are not structured along national borders, are granted nothing. Furthermore, these asymmetries are also playing against the EU's objectives which favour more carbon neutral transport modes: typically, aviation and automakers are receiving more support than railways and urban public transport. Finally, asymmetric State aid is playing against cohesion policy, thus strengthening undertakings based in Member States that are financially more solid.

Overall, this is not a positive evolution, for transport users or for Europe. In what follows, we will thus make recommendations as to the way post-COVID-19 recovery measures can and should be used to strengthen, rather than to weaken the SETA.

Better plan for crises situations

In light of the uncoordinated border closures between the Member States, a more coordinated and better planned approach to crises situations is obviously needed. The Commission has responded proactively in the form of so-called 'green lanes' for freight transport, thus guaranteeing the circulation of goods and the availability of supplies along the TEN-T Network. Building on this experience of the 'green lanes', a more systematic approach for managing border closures and openings in case of future crises seems absolutely necessary. This necessity has already been acknowledged by the German Council Presidency, who have announced the intention of setting up a European emergency pandemic plan for freight transport.

Harmonise national restrictions

The COVID-19 crisis has revealed more generally, serious limitations in the EU transport legislation when it comes to facing exceptional circumstances. EU transport legislation has rightly focused on eliminating restrictions to the provision of transport services. But less to no attention has been devoted to the harmonisation among the Member States of the restrictions that are required under exceptional circumstances. As a consequence, EU legislation does not have, on the one hand, provisions for Member States, for transport service providers and for infrastructure managers when it comes to measures that may be adopted when facing exceptional circumstances. On the other hand, certain caveats and exceptions that exist in the EU framework allow Member States to introduce restrictions, but there are no provisions for harmonising or coordinating such restrictions, so as to have the EU transport system react in a coherent way to these very exceptional circumstances. Resilience should thus become a much more relevant objective of the EU transport reg-

ulatory framework. It thus seems advisable to review the different transport Regulations and Directives with the aim of introducing instruments to face crises in a more harmonised way in the future. Enhanced coordination will also be needed among transport operators when it comes to the implementation of alternative protective measures for social distancing. Currently there are huge discrepancies in the measures adopted across and within Member States as well as across transport modes, ranging from legal requirements to mere recommendations for the wearing of masks, for instance.

Support transport operations, not just infrastructure development

In the past, the actions of the Union have been focused on the improvement of infrastructures, particularly cross-border infrastructures and infrastructure in territories benefiting from cohesion funds. COVID-19 has shown that infrastructure itself is not enough and that the existing network of transport services is delicate and deserves protection. Therefore, EU funds could and should also support cross-border services, for example by funding public service obligations (PSOs) defined at the EU level, as well as services under PSOs in Member States, at least as long as the necessity of the services is demonstrated within the framework of a coherent, smart and sustainable plan.

Use recovery instruments for transport

The Commission has proposed a [Recovery Plan for Europe](#). It includes a reinforced, long-term budget for the EU for the period 2021-2027, but also a new recovery instrument of €750 billion for the period 2021-2024. The New Recovery Instrument should provide funds for transport, as transport has been one of the sectors that has been hardest hit by the COVID-19 crisis, not

only during the confinement period, but also going forward, as social distancing requires special measures for transport service providers and for the managers of transport infrastructures. The Commission has already admitted that transport companies will be among those with a larger liquidity shortfall by December 2020. This is of major relevance, as transport is a basic service supporting the rest of the economic and social activities more generally. It is, in our opinion, a priority to ensure the financial viability of the transport industry. The following instruments proposed by the Commission can and should thus also be used to support transport operations:

- The European Recovery and Resilience Facility (€560 billion) for grants and loans by implementing Member States' national recovery and resilience plans defined in line with the objectives of the European Semester;
- REACT-EU: Recovery assistance for cohesion amongst the territories of Europe (€55 billion);
- Next Generation EU funds (€55 billion) to support the green transition to a climate-neutral economy;
- Enhanced InvestEU Programme, including a Strategic Investment Facility (€30 billion);
- New Solvency Support Instrument to support equity of viable companies (€31 billion).

Use recovery funds to counterbalance the asymmetries created by the Member States

In terms of advancing the harmonised goals of the SETA, the new recovery instrument could and should also counterbalance the asymmetries generated in the transport sector by the various national responses to the crisis. In this way support could be provided to those players that have been left out, often as

they operate cross-border or service less resilient territories. More generally, the money should be used to support the European perspective, the Single Market and the integrated mobility system across all transport modes.

Condition State-aid to the goals of the SETA

Overall, the COVID-19 crisis is triggering an array of public interventions in the transport sector at national and sometimes even at EU levels, often in the form of financial support, which are, unfortunately, rolling back years of effort towards an integrated European market and mobility system. Yet, already existing EU legislation provides tools to control State aid and can certainly be applied in order to decide how these EU funds should be used. These tools, in our opinion, should be used to see that the allocation of funds align with the goals set for the industry, namely the smart and sustainable SETA. In this regard, the Commission's Directorate General for Competition (DG COMP), in particular, plays a fundamental role. DG COMP has published a Communication on the temporary framework for State aid measures to support the economy in the current COVID-19 outbreak,⁴ as well as three specific documents on State aid for air, land and maritime transport. While each case of course has to be decided according to the legislation and the merits of each individual aid and company, it is important to keep a balance between all the cases in order to guarantee a level playing field across the EU. In this way equilibrium between Member States, a balance between the different transport modes, and a balance inside each transport mode can be upheld.

⁴ Adopted on 19 March 2020, OJ C(2020) 1863) with amendments on 3 April and 8 May

Condition national recapitalisation measures to the goals of the SETA

The Commission has been particularly clear in the conditioning of recapitalisation measures (nationalisations). On the one hand, *'large undertakings must report on how the aid received supports their activities in line with EU objectives and national obligations linked to the green and digital transformation'*.⁵ Moreover, *'If the beneficiary of a COVID-19 recapitalisation measure above EUR 250 million is an undertaking with significant market power on at least one of the relevant markets in which it operates, Member States must propose additional measures to preserve effective competition in those markets. In proposing such measures, Member States may in particular offer structural or behavioural commitments'*.⁶

In terms of commitments, it is important to note that they have to be offered by the Member State granting the aid, not by the undertaking, as in the case of mergers. This broadens the scope of the commitments, as they are not limited to the activity of the company, but can be extended to the whole ecosystem where the company is active, and, in particular, to legislative measures ruling the ecosystem. In our previous Manifesto, we underlined how liberalisation was more advanced in the provision of services than in the management of transport infrastructure. Commitments could also be extended to the legislation on infrastructure management, even if the State aid is directed to a service provider.

5 Ibid. p. 18.

6 Ibid. p. 23.

Use recovery funds to further the digitalisation and decarbonisation of the SETA

The new EU funds for transport should be used wisely, not only to support the industry, but also to ensure that it advances in line with the goals set for the industry: the single market, digitalisation and the green transition (see below). Some of these recovery instruments could and should even be used to diminish the investment gaps for the green and digital transitions in transport. It has been calculated that, out of the green transition investment gaps, transport represents €120 out of the €470 billion, and certainly a fair share of the digital transformation investment gap of €125 billion.⁷

The COVID-19 pandemic is going to strongly influence the path taken by the European transport sector and the subsequent progress made towards the Green Deal objectives. Imminent EU and national fiscal recovery packages will thus be decisive in determining whether the current mobility system becomes more integrated, smarter and more sustainable. In this regard, the Sustainable Taxonomy, EU Green Bond Standard, and Paris-Aligned and Climate Transition Benchmarks, developed by the EU Technical Expert Group on Sustainable Finance (TEG), are key tools that should guide public and private sector recovery plans in the COVID-19 aftermath, as well as the Commission's Recovery Package.⁸

The post-COVID-19 period will be one marked by a serious shortfall in private investment, with many companies facing liquidity issues. Despite this, the private sector will continue to play a decisive role in shaping a sustainable recovery path. Corporate and investor strategies that do not clearly align with the EU's climate and environmental objectives are not only putting themselves at greater financial risk (i.e., stranded assets), but

⁷ Commission Staff Working Document Identifying Europe's recovery needs

⁸ https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/200426-sustainable-finance-teg-statement-recovery_en.pdf

may also possibly derail overall progress on the Green Deal agenda. It will be crucial that private sector recovery plans are transparent and clear on their alignment with the EU decarbonisation and digitalisation transitions.

Smart Transport

Digitalisation will continue to transform the transport sector. In the absence of the power of many of the above outlined measures, it may well be the most powerful force; indeed, it may also be the only force aiming towards a more integrated European as well as towards a more multi-modal mobility system. Technologies, such as artificial intelligence (AI), automation, electrification of transport and others, create as many opportunities to increase efficiency for the benefit of the user and the overall competitiveness of the European economy, to increase safety and to reduce CO₂ emissions. Overall, technology provides many new instruments to accelerate the SETA. However, such digital technological dynamics as applied to transport should not simply be left to market forces and national interests; rather it should be channeled to serve the SETA and thus be accompanied by a corresponding regulatory framework. Current financial recovery, conditioning and regulatory instruments can and should thus be used to support the technological power for the SETA.

Digitalisation for better coordination

We have already seen how digitalisation can contribute to efficiently managing social distancing, which is an exceptional challenge for the transport industry. It forces new habits, new ways to use transport infrastructures, new ways to provide services and new intermodal solutions for passengers. Digital technologies can be used by transport operators to adapt their services to the new circumstances, communicate changes to passengers

and enforce the new rules. Passengers can use digital technologies to identify the new conditions for transport and adapt their mobility habits, thus fully exploiting multimodality. Boosting Digital Automatic Coupling technologies can also be the basis for a revolution of rail freight and, at the same time, resolve capacity challenges of rail infrastructures. This is directly linked to automated train operations and therefore, to improved end-to-end rail-based transport solutions.

However, digitalisation cannot be an isolated exercise on the part of each player. The full benefit of digitalisation can only be exploited by coordinating the disparate digitalisation efforts of the different players: infrastructure managers, service providers, passengers, shippers and public authorities. Clearly, a systemic view is in order here. Indeed, supporting a coherent European digital response to COVID-19, both by applying financial recovery measures to it and by conditioning, would undoubtedly make the transport system more resilient and efficient for the future.

Data sharing

The current crisis is also a good opportunity to accelerate data sharing if properly supported, conditioned and regulated. The coordinated digitalisation of transport requires standardised data to flow across the different transport ecosystems, if digitalisation is to be fully exploited. Business-to-Business data exchanges, particularly between infrastructure managers and transport service providers, is necessary for a more resilient and efficient SETA. Transport actors can drastically improve their efficiency through better coordination, thanks to technology. Digital port calling in maritime transport, a faster implementation of the European Railway Traffic Management System (ERTMS) in railways, and a new Air Traffic Management (ATM) system based on higher levels of automation, virtualisation and enhanced data analysis can significantly improve European transport.

Reluctance by the different operators to digitalise and share data with other industry players often alludes to the strategies of players hoping to protect their market power. Actually, obstacles to data sharing are often the reflection of the refusal to better coordinate with other actors, for instance, in the provision of access to infrastructure services. More sector specific measures for transport could and should therefore be introduced in the EU Data Strategy.

Business-to-Customer data exchanges, often connected to the commercialisation and ticketing of services, are usually perceived as being delicate, as they can modify the *status quo* to the benefit of new digital actors and to the detriment of traditional players who are heavily investing in the provision of transport services. Data sharing for the full display of information for passengers and shippers, so they can better decide on their travel plans seems a right objective and a balanced obligation to be imposed upon traditional players, if they benefit from public funding.

On the contrary, disguising the obligation imposed on transport services providers to sell their services through digital platforms as 'data sharing' could unbalance the equilibrium between traditional and digital actors in favor of cream-skimming and to the detriment of the financial viability of infrastructures and operations. The terms for platforms and aggregators to become distributors of transport services should be commercially negotiated. Compulsory commercialisation of transport service through digital platforms should only be imposed on traditional players under exceptional circumstances and only when the regulation of platforms is mature enough to avoid abuses by 'winner-take-all super-intermediaries'. Air transport provides the right model in this regard, wherein widespread data sharing co-exists with a long-lasting regulation of the activity of the intermediaries (i.e., Computerised Reservation Systems).

Towards a digitally-deepened SETA

In our previous Manifesto we stressed how digitalisation can support, accelerate and deepen the construction of the SETA. Fragmented systems with thousands of transport service providers and infrastructure managers, such as the scenario in the current European transport area, can and should be integrated, not only at the infrastructure and at the service layers, but also at the new data layer (on top of both of them).

Integration at the infrastructure and at service layers has proven elusive. Since the construction of the SETA was initiated back in the 1980s, obstacles continue to be observed at many levels. Liberalisation has proven effective in removing barriers to better transport services, but it has not delivered in terms of creating competition between players active in all the European territory. Legacy national service providers have not evolved into continental companies, and newcomers are too weak to provide service in all the territory. The COVID-19 crisis has made this limitation all too evident. The fragmented and nationalistic response to COVID-19 has significantly set us back.

Liberalisation of the infrastructure layer has proven impossible, as infrastructures are often natural monopolies - at least the scope of competition is limited there. The construction of a regulatory framework substituting the pressure of competition was the alternative, but Member States have often blocked the adoption of a fully coherent and effective regulatory framework for transport infrastructure.

Digitalisation clearly appears as the new opportunity for the construction of the SETA. The network of infrastructure managers, under the right access regulation and participating in the network of service providers in competition, even within a geographically limited reach, can be coordinated at the data layer so as to provide passengers and shippers a seamless experience

across the EU. The objective is to create a network of networks at the data layer. We believe that the COVID-19 crisis can accelerate the digitalisation of transport infrastructure and service providers and the adoption of digital technologies by European citizens, but only if digitalisation is properly framed, regulated, funded and conditioned.

Sustainable Transport

The Green Deal in general and Sustainable Transport in particular should remain the overarching objectives, also in the post-COVID-19 era. In light of the fact that this sustainable transport agenda is seriously jeopardised by the current responses to the crisis, we would like to reiterate that the objectives laid out by the Commission in terms of reducing the sector's CO₂ footprint as well as tackling air- and noise-pollution stemming from its operation, should be upheld. Furthermore, EU recovery funds, authorisations and harmonisation efforts should all be focused on furthering, as opposed to weakening, Europe's sustainable transport agenda. Let us recall this sustainable transport agenda, mode-by-mode, as well as indicate how post-COVID-19 recovery measures should be used to advance it.

Giving a boost to rail

The shift of passenger and goods transport to rail constitutes a key pillar of the EU transport decarbonisation strategy. What is more, the higher safety and reliability of rail freight have been brought to light more prominently during the COVID-19 pandemic, where rail has offered efficient cross-border cargo connections carrying large volumes of essential goods and medical supplies using minimal human resources. To promote a modal shift, the cross-financing of rail infrastructure with road tolls should therefore be supported in the revision of the [Eurovignette Directive](#)

on road charging. If adequately designed, the Directive could enable the fair and efficient use of road transport infrastructures and could moreover, help generate revenue for reinvestment in clean technologies and infrastructures, such as rail. We argue that the current crisis should not deter the revision of the Eurovi-gnette Directive. What is more, improved connections of South-Eastern European Mediterranean ports to the European core network should be further supported, in light of their importance in supplying goods from transcontinental shipments.

Similarly, passenger and high-speed rail are likely to grow in significance as the aviation sector undergoes restructuring and short-haul flights become increasingly replaced by high-speed rail. In fact, according to UBS Research, Europe's high-speed rail market is set to grow by 10% each year this decade. According to the [2011 Transport White Paper](#), high speed rail should absorb a significant share of the medium distance traffic (300 to 1000 km), triple the length of the existing high-speed rail network by 2030 and complete a European high-speed rail network by 2050. There is thus a need to promote climate-friendly transport modes to reduce externalities and to foster the creation of a European high-speed network that is interoperable, linking European capitals and major cities, while connecting urban nodes and airports.

What is more, just before the arrival of COVID-19, a growing number of rail operators were starting to reintroduce night-train services in response to growing public demand. Facilitating this modal-shift from air to rail will require public authorities, rail companies, as well as airlines and airports to work closely together to develop high-speed train links between key cities where traffic volumes justify it, and to boost investments which will improve infrastructure and frequency. The French government recently announced that its financial support to Air France-KLM was pre-conditioned on a set of sustainability criteria, which include a commitment to reduce greenhouse gas emissions by 50% by

2030 and to halve domestic flight emissions by 2024. In short, the Commission's recovery package should provide an important stimulus for rail, while supporting the aviation sector's decarbonisation objectives. Having said that, measures to promote modal shift should ensure that the carbon intensity per passenger-kilometre of travel is reduced, taking into account the full cost of building transport infrastructure.

Transport infrastructure policy at EU level, and in particular the Trans-European Transport Network (TEN-T) policy, is a fundamental instrument for the promotion of important transport projects. Adequate resources should thus be committed for the timely completion of the TEN-T core network by 2030, in particular for cross-border projects and their access routes.

Notwithstanding the positive long-term outlook for rail, in the immediate term, ridership and demand are likely to drop for both mainline and urban rail passenger services due to the need to comply with social distancing rules and the general limitation of movement. According to a [study by SCI Verkehr](#), in a scenario where governments re-introduce lockdown measures due to a virus resurgence in autumn, a reduction of 40% in passenger traffic for 2020 as a whole can be expected, while rail freight transport across Europe might decline by nearly 20%. The net result of these trends would be a significant reduction in the funding available for investment, which, in turn would have a negative impact on vehicle procurement volumes.⁹ In light of this, it is paramount that the new Multiannual Financial Framework (MFF) prioritises the development of an efficient rail network in line with the Green Deal objectives. In this regard, the budget allocated under the new Connecting Europe Facility (CEF) should be expanded, supported by an ambitious Cohesion Policy and a strong Horizon Europe Framework Program to ensure the extension of the [Shift2Rail](#) Joint Undertaking. The implementation and timely installation of the EU's new standard, the ERTMS, will be

9 <https://www.railwaygazette.com/business/covid-19-crisis-is-hitting-the-rail-industry-hard-csonconsultancy-finds/56457.article>

key to supporting cross-border rail travel by ensuring inter-operability between the different markets. In this regard, a focus should also be on the funding of European Train Control System (ETCS) on-board units.

An opportunity for structural changes in aviation

Aviation emissions in Europe have increased by 10% between 2014 and 2017, and before the onset of COVID-19, were projected to grow by a further 21% by 2040.¹⁰ The growth in aviation emissions has been faster than the increase in flights, due to larger aircraft flying longer routes, more than offsetting the increases in aircraft efficiency. The European Green Deal stresses the need to curb the sector's CO₂ footprint while improving air quality near airports by tackling the emission of air pollutants by airplanes and airport operations. In addition, aircraft-related noise levels continue to pose a serious health risk for communities living close to airports and, thus, also need to be tackled. At the same time, aviation directly and indirectly provides more than 12 million jobs and makes a €700+ billion contribution to the economy.¹¹ It is, therefore, clear that, while restoring air connectivity will be important for economic recovery post-COVID-19, such a move will be decisive as to whether Europe is placed on a path to climate-neutral growth. A more systemic approach and a close cooperation between national governments, airports and airlines will be essential for ensuring that the sector's growth is compatible with the Green Deal agenda.¹² National and EU support should therefore be conditioned on such a systemic approach,

10 EASA, EEA, EUROCONTROL: European Aviation Environmental Report 2019: <https://ec.europa.eu/transport/sites/transport/files/2019-aviation-environmental-report.pdf>

11 ACI Europe: Sustainability Strategy for Airports, 2019: <https://www.aci-europe.org/downloads/resources/aci%20europe%20sustainability%20strategy%20for%20airports.pdf>

12 International Transport Forum: Restoring air connectivity under policies to mitigate climate change, 2020: <https://www.itf-oecd.org/sites/default/files/air-connectivity-covid-19.pdf>

as opposed to playing each aviation actor – airlines, airports, ATM – against each other.

The completion of the Single European Sky (SES) remains a key and long overdue policy objective. Today, sub-optimal aircraft routing because of fragmented airspace increases flight time, fuel burn and emissions. The next set of SES proposals, which the Commission's Green Deal communication has promised to deliver, must serve the goals of increasing network performance, balancing capacity and demand, and, in doing so, recognise the importance of a systemic approach in aviation.

COVID-19 has already prompted EU leaders to temporarily suspend the 'use-it-or-lose it' rules under the [Slot Regulation](#), thereby enabling airlines to retain rights over their slots without having to run 'ghost flights' and unnecessarily waste jet fuel. While this measure was certainly necessary during the height of the crisis, it will need to be toned down now as air traffic starts to recover in order to avoid a strengthening of legacy airlines at the expense of newcomers. As mentioned earlier, the latter have emerged as being more resilient and are driving new business models and new technology. More generally, ensuring that the most efficient users of airports and airspace have access to airport slots is important. A reform of the Slot Regulation needs to ensure that competitive policy tools exist to promote transparency and efficiency in airport slot utilisation.

The pandemic should also be seen as an opportunity to enact longer-term structural changes in the aviation sector. Just as for the entire transport sector, there is a need to internalise the external costs of aviation through the taxation of aviation fuels. This, in turn, will be key to incentivising the production and deployment of Sustainable Aviation Fuels (SAFs), which remain very costly today. The uptake of SAFs will have to accelerate significantly, in particular for long-haul flights which cannot be replaced by rail. In fact, IATA expects half of the industry's CO₂

emission reductions towards the 2050 objectives to be achieved through the uptake of sustainable biofuels and synthetic fuels. Electric and hybrid powered aircraft, on the other hand, will have increasing short-haul applications. Here, the recast of the [Energy Taxation Directive](#) could be an opportunity to close existing loopholes (i.e., current tax exemptions for aviation fuels) with a view to ensuring more efficient pricing of air travel and fostering a level playing field between transport modes.

The revision of the Slot Regulation could, furthermore, be used to prioritise slots for quieter aircraft and/or aircraft running on SAFs, whereas a modulation of airport charges on the basis of environmental criteria, by means of reforming the [Airport Charges Directive](#), could help to encourage the uptake of SAFs, while alleviating congestion at airports. As already acknowledged by a number of national governments, short-haul flights can and should be substituted by rail trips where possible and the provision of multi-modal travel information through the ongoing reform of the [Air Services Regulation](#) could help to encourage consumers to make these choices. This shift from air to rail should be an attractive option for air carriers too, given that it stands to free up limited airport slots, which, in turn, can be allocated to more profitable long-haul routes.

Particular attention should be paid to the deployment of SAFs as well as to R&D in new aircraft propulsion systems, including electric and hybrid aircraft. While legislation may tilt the market toward a preferred technology, general R&D support should allow for the development of non-distortive aid for the technology that most effectively abates carbon emissions. Consideration should be given to the most effective environmental options for the future of EU Emission Trading System (ETS) for aviation in the context of the implementation of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) in Europe.

Rethinking urban mobility

Cities are home to roughly 70% of the EU's population and often serve as major hubs for international business and movement. While this makes urban areas particularly prone to spreading the virus, many cities have shown a high degree of innovation in dealing with the crisis, especially when it comes to urban mobility. This has manifested itself in the form of policies targeting re-allocation of space to pedestrians, micro-mobility and other types of clean urban mobility. The Commission, we think, should also view this crisis as an opportunity to further its urban mobility agenda.

Among other things, COVID-19 has helped to expose some of the shortcomings of existing business models and regulatory approaches vis-à-vis micro-mobility. Electric scooter and bike operators are confronted with poorly designed regulations and levied charges, which has led to multiple operators scaling down operations in order to limit expenditures. The Commission's Recovery Package can be an important driver for urban mobility by unleashing the potential of the Urban Mobility Windows in Cohesion Funding and InvestEU. This will be crucial to securing new cycling infrastructure to underserved parts of Europe and for Mobility-as-a-Service (MaaS) solutions to cities – the combination of cycling, public and individual transport in one, offering clean transport-on-demand services to remote regions.

The increased levels of tele-working and flexible working hours, which are likely to prevail in the post-confinement period, could initially help to alleviate crowding in public transport, while reducing congestion-related emissions during peak hours. However, it is reasonable to expect that public transport will continue to operate at lower levels for some time, resulting in revenue losses for public transport operators. In China, an increase in private car use was reported where people replaced trips previously taken by public transport, taxis and car sharing. A similar development in Europe could, of course, risk coming into conflict with

EU climate and sustainability objectives. In light of this, despite the urgency of addressing short-term health and safety issues, policy makers should not sideline objectives linked to reducing the transport sector's environmental footprint.

Electric and hydrogen-powered buses have, in fact, been steadily growing across European cities and stand to reduce costs for our mobility systems – something that will be particularly important in what is going to be a budget- and spending-cautious aftermath of the pandemic. Recently, the cities of Bonn, Brussels, Dublin and Milan, together with civil society organisations, called on the Commission to support public transport as part of its COVID-19 recovery strategy through the creation of a **fund worth €3.5 billion** in support of zero-emission buses, including electric and hydrogen-powered buses, as well as cycle paths. EU investments, moreover, will be needed for the deployment of recharging infrastructure for zero-emission vehicles and for the creation of a dedicated social fund for the upskilling and reskilling of workers to further facilitate the transition – both of which have been promised in the Commission's recovery plan.

The implementation of congestion charges, on the other hand, can be an effective instrument to generate net-revenues for re-investment into sustainable mobility plans, such as cycling and other forms of clean urban mobility, thereby reducing congestion and improving air quality.¹³ In addition, Urban Vehicle Access Regulations (or UVARs), which regulate vehicular access to urban infrastructure, can be a powerful tool to regulate space allocation and ensure that pedestrians, micro-mobility and clean vehicles are prioritised over private and conventionally-fueled vehicles. What is more, it is important that UVARs are not developed in isolation but form part of a broader framework, set out within a local or regional Sustainable Urban Mobility Plan (SUMP).

13 European Cyclists' Federation, Congestion Charges and Cycling, 2020: <https://ecf.com/sites/ecf.com/files/CONGESTION%20CHARGE%20internet.pdf>

Making urban mobility in the EU more sustainable, however, will require coherent action across Member States' local authorities and other relevant stakeholders. In light of this, the recommendations provided to the Commission by the European Court of Auditors in their recent [Special Report on Urban Mobility](#) for the collection and subsequent publication of data on urban mobility by Member States, as well as for the pre-conditioning of funding to the existence of comprehensive SUMP, should guide future EU work on urban mobility. While there have been clear limits to EU powers in the local and municipal spheres, SUMP and their linkage to EU funding offer a powerful instrument to foster a more coordinated approach across European cities, by incorporating current and incentivising future technological developments such as electrification, automation and ITS, MaaS, and shared- and micro-mobility mobility. This, in turn, should be supported by EU-wide, methodically sound, and practically feasible Sustainable Urban Mobility Indicators (SUMI).

Conclusion

The COVID-19 pandemic has brought about unprecedented challenges for the European transport sector. National priorities have prevailed at the expense of the common European interest, fragmented approaches have thrown us back to pre-SETA times, while greener modes of transport have appeared to be less of a priority. Yet, the original EU agenda of shifting towards a digital and decarbonised SETA remains not only valid, but is more needed today than ever before. In light of this, imminent EU and national fiscal post-COVID-19 recovery packages will have to be instrumental in counterbalancing potential asymmetries in national responses, while placing the transport sector on a path towards resilient, smart and sustainable recovery.

A well-functioning and agile transport system is key to guaranteeing the uninterrupted movement of passengers and goods,

while supporting economic and social activities in general. In light of this, safeguarding the financial viability of the transport industry will be paramount to economy recovery post-COVID-19. One main lesson we can draw from the uncoordinated border closures between the Member States is the need for a collaborative and better planned approach to crises. Building upon the experience of the 'green lanes', a more systematic approach for managing border closures and openings will be needed in future. What is more, the concept of resilience should become enshrined into all future EU transport policy by means of reviewing relevant pieces of legislation.

Besides supporting infrastructural improvements, EU funds should support cross-border *services*, for instance, by funding PSOs defined at the EU level, as well as services under PSOs in Member States, as long as the necessity of the services is demonstrated within the framework of a coherent, smart and sustainable plan. Existing EU tools should be taken advantage of in order to condition funds to the goals of a smart and sustainable SETA. The recently developed Sustainable Taxonomy, EU Green Bond Standard, and Paris-Aligned and Climate Transition Benchmarks should, moreover, guide public and private sector recovery plans in the COVID-19 aftermath, as well as the Commission's Recovery Package in order to ensure that the progress towards the Green Deal objectives is not sidelined.

Lastly, the pandemic has demonstrated the importance of digital tools and sustainable mobility in coping with the crisis. The use of digital tools can enable transport operators to adapt their services to the new circumstances and to communicate changes in real-time to passengers, while passengers can use them to make informed mobility choices, thus fully exploiting multimodality. On the other hand, the crisis has opened up the question of space regulation and its allocation to pedestrians and micro-mobility, as a greener and more individual way of travelling in line with social distancing regulations. The European Commission,

national and local authorities should build upon this momentum in order to translate these temporary trends and positive side-effects into new and more permanent habits, ways of using transport infrastructures, ways of providing services and intermodal solutions for passengers.

PART II

Railways as the Backbone of the European Transport System

Modal Shift: The Moment of Truth. Main Takeaways and Lessons Learnt from the European Year of Rail

Teodora Serafimova, Matthias Finger,
Juan Montero

Introduction

The shift to rail is one of the main pillars of the EU strategy to reach its ambitious [European Green Deal](#) objectives in transport and has thus ranked highly on its agenda during the past year: [the European Year of Rail 2021](#). However, data shows that modal shift is not happening at the desired pace. Rail passenger traffic remains mostly domestic, with only 7% of it crossing borders in 2018, whereas the modal share of rail in freight transport even decreased from 18.8% to 18.7% between 2015 and 2018, with significant differences between countries ([Rail Market Monitoring, 2021](#)). On a positive note, the European Year of Rail has been instrumental in bringing to light the various regulatory and technical challenges to operating cross-border freight and passenger rail services. Against this backdrop, our [2nd Florence Rail Regulation Conference](#) brought together leading academics, industry experts and public officials in evaluating existing policies and analysing new proposals to accelerate modal shift in both the passenger and freight segments.

Though the European Year of Rail is now over, the journey is yet to begin. Drawing inspiration from the discussions, this policy brief outlines the main obstacles preventing modal shift, and furthermore, elaborates possible solutions and policy recommendations for EU and national authorities to consider in their future planning. Existing barriers, as well as future policies, will ultimately revolve around a set of key pillars, namely the introduction of competition in the market, the internalisation of external costs by means of cost-reflective pricing, investments in both physical and digital infrastructure, standardisation and interoperability, innovation, and not the least, intermodal ticketing specifically for the passenger segment.

Rail Freight

Around 75% of European cargo operations in terms of ton-kilometres are today performed by trucks, which in turn, entail massive environmental and societal impacts. Prior to the COVID-19 pandemic, the sector was expected to continue growing, and road freight transport, in particular, was **projected** to increase by around 40% by 2030 and by a little over 80% by 2050. In view of this, the **European Green Deal** calls for a substantial part of inland freight traffic to shift away from road onto cleaner modes such as railways. Building upon this, the **Sustainable and Smart Mobility Strategy** stipulates that rail freight traffic should increase by 50% by 2030 and double by 2050. While other modes are increasingly intensifying their greening efforts (e.g., road transport electrification), rail remains the mode with the greenest credentials, emitting nine times less CO₂ emissions, eight times fewer air pollutants and being seven times more energy-efficient per ton kilometre and passenger transported than other modes. Consequently, rail accounts for a mere 0.4% of the total EU transport sector greenhouse gas (GHG) emissions (**EEA, 2020**). The pursuit of modal shift objectives in the freight sector has centred

around four main pillars, namely the introduction of competition, the internalisation of external costs, investment in infrastructure, and innovation.

In contrast to the passenger rail segment, rail freight is a liberalised industry today. **The introduction of competition** in rail freight has resulted in newcomers gaining important market shares, in particular in the larger markets. If measured in terms of “share of newcomers”, the process can thus be said to have been effective. Notwithstanding, the introduction of competition is not a goal per se, but a tool to boost efficiency, cut costs and improve the overall performance of the industry. Still, if the process is to be measured in terms of “modal shift”, i.e., an increase in the modal share of rail, then it cannot be claimed to have been a success. Whereas the introduction of competition at the national level has been completed, there remains ample room for growth in terms of better coordination and cooperation of the various stakeholders along the value chain, with infrastructure managers playing a particularly central role. Being inherently construction companies, infrastructure managers have historically managed and maintained their own networks; however, this function falls short of meeting future needs. Their functions will have to evolve from mere lines managers to managers of Europe’s transport streams, which do not stop at national borders. To this end, better coordination among infrastructure managers will be needed especially when it comes to path allocation and track access charges.

Because rail is primarily domestic, which in turn is dominated by incumbent operators, competition itself has not produced the same results as it has in the aviation sector, where traffic flows are largely international. The highest untapped potential for rail in Europe thus lies in the long-distance services, which by definition are cross-border. However, the current regulatory framework, which centres around national network managers, is not

conducive to cross-border services. The [Rail Freight Corridors \(RFCs\) Regulation](#) has enhanced coordination and communication among the different stakeholders, but it has produced limited results due to its limited level of ambition and its insufficient implementation. The creation of a European entity entrusted with the monitoring of performance on a daily, monthly and yearly basis and the subsequent reporting on the problems is an idea worth exploring. An analogy could be drawn here to the Performance Review Body in air traffic management. Enhanced accountability for performance could, furthermore, support policymakers in securing the necessary investments for infrastructure (see below). Another lesson that could be drawn from the aviation sector is that market liberalisation should have come after standardisation. To illustrate this, the high degree of standardisation in the aviation sector when it comes to fuels, pilots' licensing, and spoken language, among others, makes it possible for airlines to operate at any airport across the globe. Railways still lag behind when it comes to having a single standard.

A recent impact assessment carried out by the Commission concludes that some revisions to the [Guidelines on State aid for railway undertakings](#) may be in order to deliver on the priorities set out in the European Green Deal. Among these is the possibility to design State aid rules regarding the compensation of public service obligations (PSOs) in freight transport by rail as well as the possibility to revise the maximum limit on the contribution to rail undertakings, presently at 50% of the avoided external costs. Drawing on the experience from the passenger transport sector, the adoption of a sound methodology will be instrumental in assessing and identifying real market failures (as opposed to non-profitability) in rail freight and in imposing PSOs only on the greener alternative available for each route.

The second pillar, namely **the internalisation of the external costs of transport**, is broadly viewed as the leading driver for

change. Though the polluter- and user-pays principles are long-standing environmental policy principles acknowledged already back in the Commission's [2011 Transport White Paper](#), they have seen marginal implementation to date. Notwithstanding, the recent [Fit for 55 Package](#) represents a first tangible attempt by the Commission to introduce reforms aimed at implementing cost-reflective pricing in transport by creating a level playing field between the different modes and by rendering cleaner modes more attractive. More concretely, the Package seeks to achieve this by means of revising the EU Emission Trading System (ETS), as well as the rules governing energy taxation in the EU. The ETS' scope extension to include aviation and the eventual creation of a separate ETS for road are welcome first steps to instating a level playing field. Generated ETS revenues should be reinvested in clean modes, such as railways. Moreover, the Energy Taxation Directive should enable tax exemptions for rail freight as long as cargo-only flights are exempted from energy taxation.

The recent reform of the [Eurovignette Directive](#), on the other hand, lays down new rules on charging for the use of road infrastructure, which seek to implement the polluter- and user-pays principles. Higher road tolls can incentivise the shift of goods from away from road towards cleaner modes, such as railways and inland waterways, whereas the revenues generated from road tolling could be earmarked for rail infrastructure and other kinds of support for clean mobility. Whereas road tolls for heavy-duty vehicles are differentiated based on air pollutants and emission standards, there has been hardly any differentiation of rail track access charges to reflect externalities in the EU28. This continues to be the case despite the fact that the average external costs in terms of Euro cents per passenger-kilometre in the EU28 are much higher for heavy-duty vehicles (4,1) than for electric freight trains (1,1)¹.

1 European Commission, Directorate General for Mobility and Transport (2019), Sustainable Transport Infrastructure Charging and Internalisation of Transport Externalities: <https://op.europa.eu/en/publication-detail/-/publication/0efedf2c-a386-11e9-9d01-01aa75ed71a1>

Drawing on the policies that have been implemented to date, it is fair to say that freight has been less incentivised in the rail sector than in road transport. An appraisal of rail and road transport policies has to consider all the measures that affect the competitiveness (and ability to pay) of each mode, in a context of intramodal and intermodal competition, including energy costs (fuel or electricity), vehicle purchasing and operating costs, and infrastructure charges, among others. In the case of Italy, for instance, the incentives and exemptions granted to the road sector have increased over the past years as a result of COVID-19. These have come in the form of reduced motorway tolls, incentives for the purchase of new generation motor vehicles, and reductions of social security contributions. This difference in the charging components between the two industries affects their respective competitiveness, which in turn calls for measures to harmonise and streamline the different policy measures on rail and road transport.

The political support for the internalisation of the external costs of transport is being reflected, among other things, in larger **investments in infrastructure**, which in turn constitutes the next pillar. A key message echoed by the railway industry is the need for investments into both physical and digital infrastructure. Indeed, investments in hardware as well as software will be instrumental in enabling flexibility and smart capacity use. The concept of flexible airspace use (between military and civil aviation) could inspire future policies in the railway sector, for instance, by allowing for the flexible use of railway infrastructure between passenger, freight, national and international rail traffic.

This demand for more investment into infrastructure has been met with an unprecedented willingness to invest in railways in the aftermath of the [Recovery and Resilience Facility](#), the Fit for 55 Package, and the [UN Climate Summit COP26](#). Boosting the modal share of rail in both the freight and the pas-

senger segments would necessitate an increase in the capacity of infrastructure while making its management smarter. An evidence-based approach to investments in physical infrastructure will be needed following the identification of infrastructure bottlenecks (not removable in the short-term) and measures aimed at promoting the inter-modality of rail transport with other modes and at removing entry barriers to so-called rail last-mile. Not the least, swift implementation of minimum train parameters in terms of length, weight and profile (i.e., 740 m, 22,5 tons axle load, P400) will be critical to optimising the capacity and productivity of rail freight.

The near-zero margin nature of the rail freight industry makes investments particularly difficult. In view of this, besides securing large amounts of funding for infrastructure, a key task will be to ensure the efficiency of these investments. As an alternative to the direct granting of public funding for the construction of infrastructure, some Member States, including Italy, have explored the possibility of channelling public funds to infrastructure managers to ensure the effective use and operation of infrastructure as a supplement to the track access charges paid by the railway undertakings. This approach has proven helpful in realigning incentives to render rail freight more attractive for infrastructure managers. In sum, investments into infrastructure alone will not suffice to stimulate modal shift unless accompanied by adequately designed and well-aligned performance-based incentives (e.g., on path allocation, prices, track access charges).

As in the past, rail continues to be unprepared for crises in the network. Both major and minor disruptions as well as temporary capacity restrictions will have to be managed in a more flexible and swifter manner in the future by reinforcing Rail Freight Corridors. While maintenance and construction works are necessary, these works need to be preceded by cost-benefit analyses and coordinated across borders and, in case of disruptions, even

postponed to optimise capacity and reduce costs and risks for railway operators.

Massive investments will also be needed to develop and deploy innovative technologies, such as train control systems, automation, digital coupling, and digital exchanges, among others. These make up for the final fourth pillar, namely **innovation**. Though not a new concept, the rollout of the European rail traffic management system (ERTMS) will be key to rendering the European rail transport borderless. Digital capacity management is another crucial tool that has been gaining increasing support for its ability to boost flexibility and create additional capacity by allowing for its better management. Digitalisation, however, does not stop at capacity issues, as we need digital platforms to integrate different IT tools into a single system. Even if some of these technologies may already be developed today not all of them are being introduced in the market fast enough. This is the case of train control systems, where conventional systems may continue to be in operation for decades before they eventually expire. In view of this, here too, well-aligned incentives will have to be enacted to ensure that investments are smart and that technologies are implemented in a timely fashion.

The ultimate objective is to build a high-performing multimodal transport system in Europe, with railways at the backbone. It is thus not a rail-only solution that EU policy strives for, but the seamless integration of all transport modes into one single system. With 70% of its transalpine traffic running on rails and road traffic steadily declining, Switzerland is an illustrative example showing that intermodal and combined transport can grow. This has been possible thanks to an underlying national long-term modal shift policy, coupled with heavy infrastructure investments, a strong focus on freight requirements, corridor thinking “beyond borders”, guaranteed capacity for freight, and a high cost for road transportation via Switzerland in order to balance the cost between road and rail.

Passenger Rail

The European Year of Rail has been instrumental in demonstrating how difficult it is to operate cross-border rail services today. Whereas policymakers have demonstrated good intentions on paper (e.g., monitoring and reporting of CO₂ emissions across modes to demonstrate rail's green credentials), these have not yet produced tangible results in practice, and the proportion of cross-border passenger rail traffic stagnates at 7%. In recognition of the above, the Commission recently released an [Action Plan to boost long-distance and cross-border passenger rail services](#), which follows up on the milestones laid down in the Sustainable and Smart Mobility Strategy, namely that by 2030 rail traffic should double, by 2050 high-speed rail traffic should triple, and that collective travel under 500 kilometres should become carbon neutral within the EU. The Action Plan identifies specific barriers and solutions to cross-border long-distance passenger rail, namely the late implementation of EU law, unconnected networks, sub-optimal use of networks, lack of interoperability, problematic ticketing, costly rolling stock, shortage of train drivers, high access charges and unclear PSO rules. One of the objectives of the Action Plan is to ensure better implementation of existing EU railways acquis.

The limited modal shift and the continued absence of a “Ryanair of railways” can be attributed to the lack of **interoperability**, which continues to hinder the operation of international rail services in the EU. As highlighted in the first section on rail freight, there is a need to overcome the different standards and rules across national borders, interconnect networks and introduce flexible capacity management enabling different types of traffic (passenger, freight, national and international) to co-exist in an efficient manner. In Europe, there are four different current systems and at least 16 different signalling systems which have to

be integrated into the train sets. Needless to say, this absence of a single Europe-wide standard makes it costly and difficult to operate cross-border rail services. At present, only one train set is equipped to handle three countries, whereas most trains' operations are limited to only two European countries.

High-speed and night trains can be a sustainable alternative to cheap flights with a range of 1000 kilometres if appropriate political support is provided. Several legal and technical obstacles need to be addressed in relation to setting up new cross-border international train services, including night trains: that is why fast harmonisation of technical and operational rules, norms and requirements is needed. A stronger role could be envisaged for the European Union Agency for Railways (ERA) in setting and enforcing standards for international trains. Financial support will have to be guaranteed to ensure the effective rollout of multi-system train sets and interoperability. Until this common EU standard has been implemented, stronger long-term cooperation between the various stakeholders in the value chain will be vital to increasing cross-border services. The cooperation model has proven particularly effective in the night train services segment as well as in other non-regular services in Europe.

As is the case for rail freight, **infrastructure capacity** constitutes another key obstacle to boosting the share the passenger rail traffic. Oftentimes, the excessively high track access charges have been blamed for the limited traffic and passenger flows. However, the reality is more complex than this. Even if track access charges were to be reduced to zero, this measure on its own would not resolve the issue because there is insufficient capacity on the network, and many legs are overly congested (e.g., Frankfurt-Mannheim line utilisation stands at 104% during normal times). As stressed above, there is a need for investments in enhancing capacity and smarter management of capacity to avoid congestion.

Notwithstanding, the COVID-19 crisis has profoundly impacted the sector's ability to make the necessary investments. To recall, total revenue for the EU rail sector fell by around €26 billion between 2019 and 2020, out of which €24 billion was directly related to passenger traffic. Accumulated losses of the entire rail system today equal more than €50 billion. Over the same time period in Germany, France, Italy and Spain, passenger kilometres dropped by 40 to 60%. Some high-speed services (e.g., Thalys and Eurostar) witnessed as much as 95% of reduction in traffic. Revenue losses are likely to continue in the short term as demand with mostly fixed costs does not scale back.

Investment in infrastructure is indeed a necessary precondition for modal shift, but the difference will be made by regulation. The revision of the [TEN-T Regulation](#) must promote a European high-speed network linking major European cities. International passenger corridors must be created, and the cooperation between Rail Freight Corridors and Core Network Corridors improved. Urban nodes and last-mile infrastructure for freight must be integrated into the current TEN-T network. Stations should be transformed into international multimodal mobility hubs. As is the case for rail freight, a key precondition to seeing the share of passenger rail taking off will be safeguarding a **level playing field in intermodal competition by means of cost-reflective pricing**. Rail bears the highest share of its external costs, with no track access ever being granted for free. The same cannot be said for the road sector, where some Member States do not charge at all for the use of road infrastructure (e.g., no tolls on German motorways). This imbalance between the different modes has been further exacerbated during the COVID-19 outbreak, where aviation has emerged as a prime beneficiary of State aid.

While a number of EU countries have announced measures aimed at banning short-haul air travel where reasonable rail connections exist or imposing minimum air ticket prices, these are

politically difficult to implement. Notwithstanding, complementarity can and should also be sought between two competing modes to improve medium-distance routes (e.g., city-airport connections). To this end, the right incentives for air-rail links will have to be enacted (e.g., airport charges, rail track access charges, or non-aeronautical revenue for airports such as car parking).

Intermodal ticketing is another area deserving particular attention when it comes to boosting the modal share of passenger rail. The mass cancellations during the COVID-19 pandemic have shown the importance of EU-wide rules and their uniform implementation and enforcement while at the same time highlighting the value of flexibility. What is more, studies have found that between 20% and 25% of the workforce in advanced economies could work from home between three and five days a week, affecting permanently commuting and business market segments. Furthermore, unlike leisure, business travel will likely not return to its historic levels in future. All of these need to form prime considerations for rail undertakings and should be factored into the future regulatory measures which the Commission will propose with a view to enabling innovative and flexible tickets that combine various transport modes and give passengers true options for door-to-door travel.

It should be noted that the market has already delivered some solutions for intermodal and cross-border train travel, with one interesting example coming from Austria, the country with the highest share of rail passengers in the EU. The recent introduction of a so-called Klima or Climate ticket, which comes at the cost of €3 per day, comprises all public transport operators, including open-access private competitors. A national law obliges all operators providing rail services to accept the climate ticket as valid on their trains. While the journey experience depends on seamless ticketing and digitalisation, other parameters will also need to be ensured, such as the affordability of ticket prices, the speed

and duration of rail passenger travel, and onboard facilities.

Conclusions

In sum, there is a clear need to shift away from the current focus on national strategies and rules towards a European vision, which in turn, should be delivered by means of a European Masterplan for rail infrastructure, similar to what we have in air traffic management. It is precisely in this Masterplan that issues linked to priority rules, earmarking of revenues from the EU ETS, among other measures aimed at resolving bottlenecks around borders, could be laid down. At present, EU legislation is being applied on top of already existing national laws, resulting in the coexistence of these two layers. Unless rail can compete internally, it would not be able to compete externally (i.e., with other modes). Thus, deregulation at the national level should pave the way for regulation at the EU level and thinking beyond national borders. While this will be a necessary precondition to making long-distance cross-border services viable, caution should be exercised to avoid an over prioritisation of international services at the expense of domestic services (including risks of destroying national timetables and node services), where the real modal shift materialises. Domestic and international requirements thus need to be considered in parallel when designing new measures.

Published in May 2021

Building a European Railway Network for Long-Distance Passenger Services

Juan Montero and Matthias Finger

The European Green Deal has set ambitious objectives on the decarbonisation of transport. Railways will have to play a key role, as such ambitious decarbonisation objectives can only be met if a substantial proportion of passengers currently travelling by plane and by car will shift to rail.

Long-distance passenger services provide the most obvious opportunity for rail to grow. In Europe, long-distance often means cross-border. Yet, at the moment, only 7% of all cross-border trips are made by rail (Rail Market Monitoring, 2021). But, in order to meet the Green Deal objectives, the number of high-speed rail passengers must double by 2030 and triple by 2050.

To achieve these objectives, we will have to simultaneously act on three layers and make sure that these three layers are well coordinated, namely the infrastructure, the services and the digital layers.

The infrastructure layer

Railways have been built as national systems and not as an integrated European network, which explains the low numbers of cross-border rail passengers. Multiplying the number of long-distance cross-border rail passengers inevitably requires a substantial increase in infrastructure capacity. However, as important as increasing funding is funding of the right projects, requiring strategic investments.

High-speed rail services have proven their ability to substitute aviation in distances up to 1,000 km (Montero & Finger, 2020). This has been the experience in southern Europe, as national high-speed services in France, Italy and Spain have beaten aviation as the preferred transport in city pairs such as Paris-Marseille, Milan-Rome and Madrid-Barcelona. In some cases, high-speed modal share has reached 90%, and air services have been terminated, as they could no longer compete.

However, high-speed infrastructure has been mostly developed following national priorities, aiming to connect the largest cities within a Member State. Cross-border high-speed infrastructure is still rare, despite the success of Thalys, the service connecting Paris, Brussels, Amsterdam and Cologne and Eurostar, connecting London with the continent.

The next step is to connect the existing fragmented national infrastructure to improve traveling times between the European Union's largest cities. The 1,000 km threshold puts many European metropolises within distance to have a competitive high-speed service, particularly in Western and Central Europe.

Night train services are also a competitive alternative to aviation. They do not rely on speed to match aviation, but on the contrary, they rely on the ability to travel long distances during the night while passengers sleep. Ambitious plans are being pre-

sented by railway undertakings, particularly in Central Europe, spreading South to Rome and Barcelona, and North to Hamburg and even to the Nordic capitals. Investments are necessary for night services, not only in dedicated rolling-stock but also in bottleneck infrastructures in selected cities. Still, night train services require fewer investments than high-speed and can be a viable alternative for lesser demand routes.

Consequently, EU investments must play a role in the development of cross-border infrastructures, as such investments are often neglected by the Member States. EU investments must also play a role in the development of infrastructure components for interoperability. For example, investments into the deployment of the European Rail Traffic Management System (ERTMS), can increase capacity by 30% in the existing infrastructure.

These are policies that have been in place for decades already. These policies need to step up to the task and the subsequent investments need to be increased in order to meet the challenges of the Green Deal, but action on the other two layers is also needed.

The services layer

Interoperable cross-border infrastructures are a pre-requisite to building a European rail network, but they are not sufficient. Equally important is to ensure smooth services across infrastructure managed by different entities in the various Member States. Such coordination at the services layer will take different forms and should address at least the four following points:

First, it is necessary to coordinate the allocation of infrastructure capacity. Cross-border services require the allocation of coordinated track paths by all the infrastructure managers along the route. At the moment, path allocation is made following an EU-harmonised procedure, but it is separately implemented by

each infrastructure manager, as national rules define the allocation priorities. Today, no effective mechanisms to coordinate the allocation procedures across infrastructure managers exist.

Rail Freight Corridors could indeed provide a model for the coordination of infrastructure managers (RailNet Europe Path Coordination System). However, more stringent coordination mechanisms could and should be envisaged, be it in the form of more formal coordination between national infrastructure managers or even in the form of an EU body, just like in aviation (EUROCONTROL), allocating paths to cross-border services.

Second, it is necessary to coordinate traffic management. As disturbances occur due to technical failures and accidents, but also due to delays in other services, infrastructure managers have to react in real-time and allocate new paths to railway undertakings. Again, such re-allocation is done separately by each infrastructure manager, with little coordination for cross-border services. Once again, the Rail Freight Corridors could provide a model for better coordination. However, as passenger services require direct routes between cities (as passengers are more time-sensitive), and as a high number of corridors would be necessary, a corridor approach might not be as effective for passengers as for freight services. On the contrary, a single coordination mechanism, at least for the Trans-European Transport Network, could be more useful. A harmonised performance scheme could also be of use so as to incentivise improvements in traffic management, again, like is observed in aviation.

Third, track access pricing varies from country to country. While Directive 2012/34 sets the common charging principles (i.e., direct costs, plus mark-ups up to the extent the market can bear them), track access charges vary greatly, ultimately reflecting the different ways to finance the railway sector (always a combination of subsidising the infrastructure manager and the railway undertakings, mainly in the form of Public Service Obligations compensations).

A cross-border service will benefit from low access charges in some countries but might face difficulties in assuming high access charges in other countries, in particular, if there is no compensation in the form of PSO compensations for the cross-border service.

Therefore, the creation of a specific EU funding instrument for cross-border services would help build a more sustainable economic model for such services: EU funding could, for example, support the payment of EU-harmonised mark-ups on top of the direct access cost to the different infrastructure managers across a corridor. Such a harmonised mark-ups could be used as a signal for all market players. It could be an incentive for infrastructure managers to prioritise cross-border services in track allocation and traffic management more generally.

Fourth, and closely connected to the previous point, is the definition of a Public Service Obligation scheme for cross-border services. Regulation 1370/2007 applies to cross-border services, but it does not include specific instruments to define obligations at the EU level, or finance them. Intervention is left to Member States, despite the apparent difficulties and lack of incentives for States to coordinate for the implementation of these services. As a matter of fact, the role of PSOs in long-distance services is very controversial. However, as there is now pressure to promote long-distance railway services, including high-speed and night services, and to harmonise the financing of these services, it seems increasingly urgent to clarify the role of PSO compensations in these types of services.

Still, it is clear that European coordination instruments, both operational and financial, are needed to create European-wide rail transport services on top of the fragmented national infrastructures.

The digital layer

While the challenges at the infrastructure and at the services layers are well known when it comes to cross-border passenger rail transport, our understanding of the challenges at the digital layer is less advanced. Also, it is not yet entirely clear how the digital and the two physical layers above will be linked with one another. What is however, clear is that digitalisation provides new opportunities for the coordination of fragmented systems as it is the case of European railways, both at the services and the infrastructure layers. In fact, digital platforms are increasingly perceived as being the ultimate instrument (layer) to build network effects (Montero & Finger, 2021).

Digital technologies permeate the entire value chain. It has already been pointed out how ERTMS improves the interoperability of infrastructure. Digital technologies can also be applied at the service layer, facilitating the automated exchange of information among infrastructure managers to serve cross-border services both in the track allocation procedures and in the real-time response to traffic disturbances. Furthermore, digital technologies can improve the communication between infrastructure managers and railway undertakings offering cross-border services. These Business-to-Business (B2B) applications can substantially increase efficiency in complex and fragmented infrastructure systems, such as European railways, even more so when it comes to cross-border operations.

What is new is that digital platforms now also have come to play an active role in Business-to-Consumer (B2C) relations. Access to information and through-ticketing has traditionally been perceived as an important challenge for cross-border passenger services. While ticketing is very sophisticated in aviation, both in terms of functionalities and even regulation (Regulation EU 80/2009 on a Code of Conduct for Computerised Reservation Systems), ticketing in railways is, so far, lagging behind.

But digitalisation does more than that: it has profound disruptive effects in all the industries, and it will not be different in railways. Indeed, digital platforms should not be seen as mere computerised reservation systems or mere distribution channels for transport service providers. They should also not be perceived as mere instruments to facilitate market entry in a liberalised industry. Experience in other industries shows that digital platforms can create unprecedented network effects to the point that they become the ultimate coordinator, and therefore arbiter, of the underlying fragmented (infrastructure and services) systems, and by doing so, replace the traditional players as coordinators. In other words, the balance of power between infrastructure managers and transport services providers on the one hand and digital platforms on the other can evolve to the point so as to make the traditional players mere commodities. In other words, infrastructure managers and train operating companies will be working for the platforms and their algorithms.

In conclusion, this power of the digital platforms has to be kept in mind when coordinating cross-border passenger transport, be it along corridors or more generally. One must also consider that the EU is already working on regulating these platforms, and such regulation will necessarily override data sharing and ticketing regulation in railways.

References

- 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.
- Montero, J. & M. Finger (2021). *The Rise of the New Network Industries. Regulating Digital Platforms*. London: Routledge.
- Rail Market Monitoring (2021). Seventh monitoring report on the development of the rail market under Article 15(4) of Directive 2012/34/EU of the European Parliament and of the Council, COM(2021) 5 final.

Published in January 2021

State Aid in a Sustainable and Smart Railway Ecosystem

Juan Montero and Matthias Finger

The Community guidelines on State aid for railway undertakings need a review to be adapted to the European Green Deal's new policy goals. Railways can thrive if their competitive advantages are fully exploited, which requires bottlenecks and market failures to be reduced. The guidelines could provide more guidance on State aid for multimodality as well as for very-long-distance services. State aid for digitalisation could unleash the competitiveness of rail. New possibilities for Public Service Obligations could be explored.

The new objectives for a sustainable and smart transport system in the European Union require new coordination policies and a review of the State aid policy for the coordination of transport.

The Green Deal objectives call for bold policies to ensure a shift to rail both for freight transport and passenger mobility. Net climate neutrality in Europe by 2050 is the ambitious target set in the European Green Deal Communication. Transportation accounts for a quarter of the EU's total greenhouse gas emis-

sions. Railways and inland waterways are the environmentally more sound transport modes and thus the shift to railways and inland waterways is the only form to reach the sustainability objectives.

The Community guidelines on State aid for railway undertakings need a review in order to be in line with the new policy goals, as State aid plays a fundamental role in the coordination of transport. The guidelines, adopted in 2008, already identified in railways a great potential for contributing to the development of sustainable transport in Europe. However, twelve years later, the necessary modal shift to rail has still not happened. A bold change in the transport coordination policies is necessary, and it has to be based on the exploitation of the competitive advantages of railways. State aid has an important role to play.

Firstly, the guidelines could provide more guidance on multimodality. Railways are the most competitive transport mode in dense routes, but they are hardly competitive for door-to-door services, as the first and last miles tend to have low density of usage, both for goods and passengers. We have learnt that modal shift will not be the result of railways completely substituting other transport modes. On the contrary, goods and passengers will shift to railways, as they are better integrated in the wider transport and mobility system. For railways to increase their modal share, goods and passengers need to use other transport modes for the first and last miles, so they can reach the high capacity routes served by railways. Together with more traditional public transport solutions, the new micro-mobility solutions are the perfect complement for railways both for urban and long-distance traveling. Goods also require simple and efficient transshipment from road to rail, as well as from vessels to railways in ports.

The guidelines could evolve from ruling State aid to railway undertakings, to rule State aid for multimodal land transport.

Specific mechanisms are necessary to solve market failures related to railways' interconnection with other land transport modes. State aid can support the investment in multimodal terminals, both road-to-rail and inland waterways-to-rail terminals. Furthermore, the land transport system needs to be better connected to maritime routes by building specific terminals in maritime ports. Investment in infrastructure to facilitate the efficient transfer from railways to other public transport modes and new micro-mobility solutions would also be of interest. Operating aid to reduce the cost of the transshipment of goods and integrate railway services with other land transport modes in public service contracts, would also facilitate modal shift. Certainly, multimodality increases complexity not only in the operation of transport and mobility systems, but also in the analysis of State aid. This is why more directions in relation with multimodality in the guidelines would be helpful.

Secondly, the guidelines could provide more support for international services. Railways are competitive in very-long-distance routes. The longer the route, the more competitive railways are for the transport of goods. This is why railways enjoy larger modal shares in large countries such as Russia and the US. Even passengers are increasingly interested in using rail services as a substitute for flights, particularly if the trip takes place at night. The EU's very long-distance services are necessarily cross-border services, and cross-border railways in the EU means interoperability challenges and poor coordination of access to tracks across national systems.

The guidelines could provide specific attention to cross-border services. Interoperability in general, and cross-border infrastructure bottlenecks in particular, are well-recognised challenges and they are already subject to specific EU funding programs. Furthermore, State aid for investment in cross-border rolling stock, and specific equipment for managing services across systems

with different gauges would be helpful. Operating aid for cross-border services in the form of payment of track access charges could incentivise long-distance railway services, both for goods and passengers. Economic incentives for infrastructure managers in the form of subsidised track access payments could increase cross-border services' reliability.

Third, the guidelines could provide specific guidance for the use of digital technologies in land transportation. Digitalisation can play a fundamental role in the coordination of a system as fragmented as land transport in the European Union. Digital technology can facilitate the coordination of different transport modes, including micro-mobility services. It can also facilitate the coordination of national railway systems for cross-border services. Digitalisation can finally enhance the railway system's efficiency, for instance, increasing capacity in the congested segments of the railways' network.

Fourth, the guidelines could explore new possibilities for public service obligations. At the moment, no guidance is provided for freight public service obligations in freight transport, and these services are excluded from Regulation 1370/2007. Services in remote areas under harsh conditions for road transport or inter-modal solutions for islands (maritime and railways) could benefit from some guidance.

Finally, as State aid becomes more relevant under the Green Deal, and the analysis is more complex as it includes more transport modes and more players, the guidelines would benefit from simplification. Models for the notification of straightforward schemes, and even block exemptions, could be an example. The review of some confusing thresholds could be another. In parallel, more guidance in the application of Regulation 1370/2007 in the definition of public service obligations, the coexistence of competition and public service obligations in some segments and the definition of compensation schemes would be welcomed. In

this regard, the resilience of public service obligations against risk becomes an even more relevant issue, as COVID-19 has demonstrated.

Shift to rail will not become a reality just reiterating the same policies that have failed over the last decade. The bottlenecks and market failures are well-known at this stage, as well as the competitive advantages of rail over other transport modes. State aid can be used to eliminate the obstacles that hinder the full exploitation of railways' competitive advantages.

From National Railway Infrastructures to a Pan-European Freight Network

Juan Montero and Matthias Finger

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%² 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

2 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>

to be more evenly spread (European Court of Auditors, 2016)³. 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,⁴ 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.⁵ (Vassallo & 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

3 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

4 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.

5 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.

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 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,⁶ is the model in aviation.

⁶ Eurocontrol also includes non-EU countries, such as Turkey, Ukraine and Russia, something that could also be envisaged in rail freight.

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.

How to Revitalise Rail Freight with Digitalisation?

Juan Montero and Matthias Finger

Digitalisation has the potential to overcome some of the inefficiencies derived from the fragmentation of European rail freight transport. Rail freight transport in Europe is fragmented because railway systems have historically evolved at a national level with little interaction among them. Furthermore, market opening has actually increased fragmentation, as the sector has been vertically unbundled (infrastructure managers versus railway undertakings). At a horizontal level, an increasing number of railway undertakings compete in the provision of freight transport services.

Fragmentation creates inefficiencies, particularly in cross-border freight services. Rail freight services are particularly competitive as distances increase above 500 km. Such distances are mostly reached in Europe when services stretch across national borders. But cross-border services require the coordination of more than one infrastructure manager (and sometimes several of them). Capacity is constrained, and capacity allocation needs to be coordinated. Further coordination is necessary when trains run behind schedule and incidents require the definition of alternative routes or new railway paths, sometimes passing via other

countries. Railway Freight Corridors (RFCs) were constituted to eliminate such bottlenecks and to increase coordination, but delays are still too common and service quality is still too poor for modal shift to materialise.

Digitalisation holds the potential to make coordination better and more cost-effective. It reduces transaction costs, as the cost of generating data is reduced, data transmission is enhanced and sharing data across organisations and national borders is facilitated.

Lessons from other sectors

Data standardisation is a common theme across all transport modes. For data to be exchanged, it is necessary to standardise it. Firstly, it is necessary to identify the data that are relevant. Secondly, it is necessary to ensure that, across players, relevant data have the same meaning. In particular, it is commonly underlined that standards defined at a global scale, if available, should be used, as to avoid new standards. Thirdly, data quality has to be ensured.

Data sharing is also key in all transport modes. Actors might share data on a voluntary basis. But it is often the case that market players are reluctant to do so. As data has become “the new oil”, some players are simply reluctant to share it, thinking that they are giving away a valuable asset. More sophisticated players might consider that sharing data might empower new players to disrupt the market and reduce the market power of the incumbent player(s). Data sharing obligations might therefore be necessary. However, data sharing is not neutral for the different actors involved; therefore, before imposing such an obligation, a proportionality analysis should be undertaken, and the impact on the market should be assessed. As a matter of fact, data sharing seems more disruptive in the B2C segments than in the B2B segments.

Data governance is also important. Here, it is necessary to identify not only which data have to be shared, but who will have access to the data and who will be managing the data. Different models are possible: a fully distributed model where everyone has access to all the data, a platform model whereby an entity centralises the management of the data. In such a centralised model, it will be necessary to identify who will act as the platform operator, as there are many candidates: a traditional player (for instance an IM), new start-ups, large traditional technology groups (i.e., Siemens and alike) and others more. The wrong governance might create distrust and block collaboration.

It is also important to understand that coordination is not automatically triggered by data sharing. Data sharing introduces transparency. This might generate some efficiencies in itself. It might also help to identify bottlenecks and inefficiencies. But coordination across different organisations requires a more active role, either of the players themselves to act in a coordinated way, or of a regulator setting the right incentives. As a matter of fact, debates about data sharing often hide deeper issues of past distrust or of a redefinition of the power relationships among the involved actors in the transport system.

For instance, port-calls can be optimised if data is exchanged between vessels (time of arrival) and ports (slots available for the provision of services). But data will only provide transparency. Full optimisation requires time of arrival and available slots to become real commitments by the relevant players.

Finally, any policy around digitalisation and data sharing requires a deep understanding of the incentives and costs for each player. While digitalisation and data sharing improve the system, not all players benefit in the same way and not all players have to assume the same costs and consequences. Specific solutions have to be defined when the higher costs have to be assumed by players that will not benefit the most.

Digitalising Rail Freight Corridors (RFCs)

Digitalisation offers obvious opportunities for Rail Freight Corridors (RFCs). We see three such opportunities:

1. Performance monitoring: Digitalisation can facilitate the monitoring of performance in each RFC. However, in order to make this effective, it is necessary to fully implement the existing Train Information System (TIS), to ensure the quality of the data and to create the necessary interfaces.
2. Capacity management: Digitalisation can improve the management of capacity by better coordinating the allocation of existing capacity. Yet, this implies that the interfaces have to be improved for all the data, which will have to be centralised within a single point of contact.
3. Traffic management: Digitalisation can empower RFCs to manage traffic both under regular conditions but also when disruptions emerge. However, such a role of the RFC has to be better defined and the necessary interfaces have to be put into place.

Doubts are allowed as to whether digitalisation of RFC will be sufficient to solve the more pressing problems of rail freight transport.

- Firstly, the ability of the existing standardisation process (TAF TSI) to support digitalisation is in doubt, as implementation is too slow. There is also a risk to experience the same fate as ERTMS did (i.e. proliferation of national variants), as the technical specifications are not enforceable and do not yet contain clear obligations. Moreover, there is no guaranteed access to information.
- Secondly, the existing standardisation process regarding the digital exchange of data (TAF TSI) is not defined within the

RFC, but more broadly within the RNE framework. It would be a mistake to fragment digitalisation by defining standards and procedures for each RFC. Players are increasingly dubious as to the role of the RFC as the most appropriate governance mechanism for overcoming fragmentation.

- Thirdly, the debate on data sharing hides a deeper debate about the allocation of capacity for international freight services. Indeed, capacity is scarce and priority is often given to passenger transport, as well as to national services over international services. This is one of the main reasons why quality of international rail freight services is poor. National infrastructure managers have little incentives to invest to increase capacity, as access charges paid for freight services are low, and in absolute terms represent a very small percentage of their revenue. Data sharing will not change this reality, even if it might increase transparency and help identify bottlenecks.

A centralised allocation of capacity is proposed as a solution. The creation of a centralised unit to allocate capacity for international freight services, making use of digital solutions, could substantially reinforce quality of the service. The EUROCONTROL model implemented in aviation could indeed be followed. The precondition, however, seems to be to make more capacity available for these services.

The full picture: rail in the logistic system

Rail freight transport is only one piece in the European logistics system. If rail is to become the backbone of such a system, it will be necessary to first increase the quality of the service, secondly to ensure a better integration within the rail system, and thirdly to better coordinate with the entire logistics system.

Firstly, shippers are sending a clear message: rail freight transportation has to increase in quality, as it has to become more reliable. Business to Customer (B2C) data sharing might exactly do that. Indeed, railway undertakings might well use digital tools to provide their customers more visibility about their services (location of rolling stock, wagons, cargo, etc.). There will also be increasing pressure on the infrastructure managers to share their data directly with final customers and the intermediaries, bypassing railway undertakings altogether. Being state-owned entities, IMs might be obliged to make public some of their data, including location data. Railway undertakings, in turn, will be reluctant to have data widely shared, in particular with digital platforms that might end up excluding service providers from the relationship with the customer thus commoditising their services. In any case, it is widely understood that data sharing would not include commercial data.

Secondly, it is necessary to better integrate rail freight infrastructure within the logistic system. It is not always the case that at the physical level terminals are well prepared to connect with other transport modes, including ports but also trucks. Digitalisation will hardly help to overcome this obstacle.

Thirdly, digitalisation will only be fully exploited when data is shared across transport modes so they can be better coordinated. Digitalisation can build a network of coordinated networks. However, if coordinating the players in the rail sector is not easy, coordinating the whole logistic sector will be even more complicated. It does not seem to be the role of public authorities to impose such coordination, but public authorities have a role to play. If data is standardised for each sector, and the Commission plays a role in such a coordination, it can be then left to market dynamics to define the most efficient model to manage all the available data and procedures for the coordination of the overall system. Different models and companies will then be competing to integrate the overall system. It does not seem to us to be the role of the public authorities to pick winners.

Public authorities, however, have a role to play in the standardisation of data and data-sharing across the transport modes. The Commission has been active in the definition of B2B data sharing ("Towards a common European data space", Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM/2018/232 final). For transport in particular, the Commission has established the Digital Transport and Logistics Forum (DTLF) as the framework for the definition of common principles across transport modes. This is certainly an important first step.

Published in February 2019

Green Finance and Sustainability: Is there a Space for Railways?

Matthias Finger and Teodora Serafimova

In our 17th Florence Rail Forum we explored where railways will fit into the broader “Green Financing” debate at the EU level. To recall, achieving climate neutrality by mid-century, as called for in the European Commission’s recent long-term decarbonisation strategy, will necessitate a comprehensive approach with significant implications for all sectors of the economy. This is turn will have to be matched with annual average investments in the range of €1.19 to 1.48 trillion from 2031 through 2050, according to Commission estimates. With this in mind, and given their long-lasting effects, investments and public spending today should be mainstreamed to future-proof technologies and solutions compatible with the 1.5°C target of the Paris Agreement.

Why a green taxonomy?

In the aftermath of the US’ withdrawal from the Paris Agreement, the EU and China have reaffirmed their commitment to ambitious climate action and have called on other signatories to do the same in order to compensate for the expected gap in climate

mitigation on the other side of the Atlantic. For the EU, translating its bold objective of 'net zero emissions by 2050' into reality will require a shift towards an overarching 'carbon budget' for the entire economy. This in turn opens up critical questions relating to the appropriate 'burden sharing' not only among Member States but also among the different sectors of the economy in order to keep within the targeted carbon budget.

The definition of common EU-wide (and hopefully also global-level) rules for the assessment of the environmental footprint of various economic activities will be of crucial importance in helping to clarify the above question by guiding 'green investments' and equally importantly – diverting investments away from polluting technologies and infrastructures, and thereby preventing 'stranded assets'.

Today the absence of such commonly agreed upon principles and metrics, however, acts as a significant roadblock to well-informed investment decisions. This has resulted in a situation where different financial institutions apply different metrics and taxonomies for the identification of sustainable and climate-friendly economic activities.

This in turn acts as a hindrance for investors who have to make sense of and compare a myriad of different financial products. Consequently, this discourages investors, increases the risk of greenwashing, and thereby inhibits the shift towards a zero emission sustainable economy.

A unified taxonomy would make it possible to determine which investments, such as loans, stocks and bonds are environmentally sustainable, making it easier for market participants to finance these activities. While a sound taxonomy will of course be an important step, it will need to be accompanied by adequate oversight and enforcement mechanisms in order to prevent green washing, on the one hand, and double-counting practices seeking to artificially inflate the CO₂ mitigation potential

and overall environmental performance of given technologies or projects, on the other hand.

The European Commission's recently established Technical Expert Group on Sustainable Finance (TEG) is therefore a welcome step in getting us on the right track, by assisting in the development of such an EU classification system, or so-called taxonomy. In addition to providing guidance on economic activities' classification as 'environmentally sustainable', the TEG is also working towards an EU Green Bond Standard, benchmarks for low-carbon investment strategies, and guidelines regarding the disclosure of climate-related information by corporations.

One key challenge in defining the taxonomy will be to strike the right balance between width, depth and flexibility. In other words, the taxonomy would have to have a wide enough scope in terms of covering all relevant sectors of the economy, while at the same time ensuring sufficient level of detail to accommodate sector-specific, or even mode-specific particularities in the case of transport. In addition, the methodology should be flexible enough to reflect continuous market and technology developments. Not least, the taxonomy should reflect 'short- vs. long-term' considerations. This is particularly important in the context of infrastructure investments – which are often carbon-intensive in the construction phase, yet deliver substantial emission reductions in the long run.

Where do railways fit in?

The discussions at the 17th Florence Rail Forum demonstrated overwhelming consensus among relevant stakeholders that the ultimate goal should be to develop a common system that provides investors with clarity on which activities are considered sustainable and offer the largest climate mitigation potential.

The need for this becomes particularly evident when we zoom into the transport sector. It is well known that both personal and

goods transport entail a significant societal and economic cost in the form of environmental and human health impacts, accidents, congestion, as well as infrastructure wear and tear. These costs are, however, largely unaccounted for in the price that transport users pay today.

According to latest figures of the European Commission, the external cost of transport amounts to an alarming EUR 1000 billion annually, or the equivalent of almost 7% of EU28 GDP. What is more, the analysis shows that the external costs vary greatly depending on the transport mode, whereby the costs associated with rail and inland waterways are much smaller than those of road transport for example.

Rectifying this, by means of enactment of 'polluter pays' and 'user pays' principles will be key to safeguarding cost-reflective price signals: a key pre-condition to efficient transport patterns among consumers, while enabling informed investment decisions.

The currently ongoing update of the Commission's handbook '*Sustainable Transport Infrastructure Charging and Internalisation of Transport Externalities*' which is expected in spring 2019, will provide new estimates on external- and infrastructure costs. Moreover, it will develop a solid methodological framework, which can in turn serve as a useful common reference point to orientate green investments in transport.

It is no coincidence that our Forum took a closer look at the role of railways in the EU green taxonomy discussions. European railways are up to 9 times less CO₂ intensive than road for freight, and 4 out of 5 trains are already running on electricity⁷. In addition to offering a much less CO₂-intensive means of transport and helping to cut air-pollution levels in urban centres, a greater reliance on rail for the transport of dangerous goods helps to

⁷ <http://www.cer.be/sites/default/files/publication/CER%20Factsheet%20Climate%202018.pdf>

minimise risks otherwise associated with road transport.

In recognition of their social and environmental benefits, the Commission has set a target of shifting 30% of goods transport away from trucks, and onto rail and inland waterways by 2030, and subsequently by 50% by 2050. Thanks to these positive attributes and its expected growth in Europe, rail has good chances of positioning itself at the forefront of the EU green taxonomy exercise.

Where do we go from here?

In parallel to the definition of an EU green taxonomy, the outcome of the currently re-negotiated EU budget for the 2021-27 period will be decisive in determining what types of transport projects will receive financial support and subsequently the future direction that the European transport sector takes. While rail is already a front leader in terms of climate performance, funding should be prioritised for projects that foster inter-modality and innovation within the sector, such as systems capable of recovering, storing and reusing braking energy of rail-based public transport, as well as the deployment of electric and hydrogen trains. Let us not forget that infrastructure construction and maintenance is also increasingly following the principles of circular economy and compensation mechanisms are put into place to compensate harm to natural habitat.

In addition to supporting efficiency gains and the switch to low- and zero-emission solutions in transport, investments should target demand-reducing measures, namely by stirring the shift towards greater reliance on shared- and soft-mobility modes, alongside further advancements in automation.

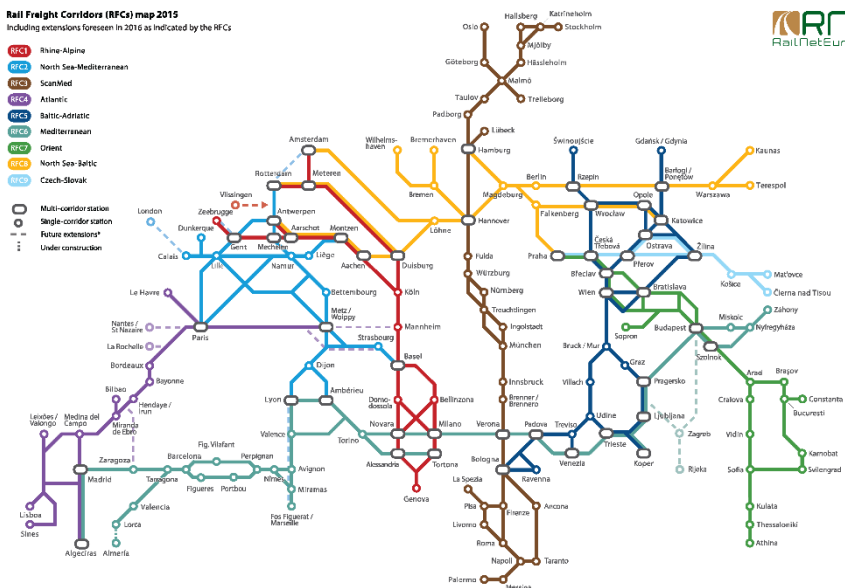
What is Wrong with European Rail Freight?

Matthias Finger

The results of the 16th Florence Rail Forum are quite sobering: rail freight is not making significant progress. Still, all the good arguments are there and remain valid: rail freight is economically superior to road, especially on long distances. Not to mention the fact that it is also ecologically superior, thus actively contributing to the EU's decarbonisation objectives. Yes, there is inter-modal competition which is tilted towards transport by road, but this cannot fully explain why rail freight stagnates at 17% market share. And there is also no excuse anymore that the regulatory frameworks are not sufficient; indeed, much of the regulation is in place and has been so for quite a while, namely when it comes to interoperability, most recently thanks to the 4th Railway Package (2016). Significant investments have also been made; one can mention the fact that 75% of all the CEF investments go into railways, but also contributions from structural and cohesion funds, along with EFSI and EIB investments. Also, in terms of research and innovation (e.g., Shift2Rail), significant efforts have been made recently, which should lead to cost reductions and efficiency improvements in the rail sector overall. Furthermore, market liberalization has happened and should stimulate competition and investments.

The focus on Rail Freight Corridors (RFCs)

Already back in 2005 an international corridor management approach was promoted among Infrastructure Managers (IMs) and Allocation Bodies (ABs). Regulation No. 913/2010 concerning a European rail network for competitive freight became effective on 9 November 2010, requiring Member States to establish international, market-oriented RFCs. Already then the main challenges had been identified, namely, coordination of path allocation among the IMs involved in a given corridor, interoperability, infrastructure investments and development, as well as integrating intermodality and especially terminals into the corridor management process. Today there are 9 corridors and corresponding corridor management bodies, coordinated in turn by RailNet Europe (RNE), as shown on the below map (two additional ones are proposed (Amber and New Alpine-Western Balkan) in Eastern Europe).



And this focus on corridors is clearly the right approach, especially when integrated into the TEN-T network. This approach has been developed further since and become institutionalised with corresponding executive boards. In 2016 the so-called Rotterdam Declaration gave explicit support to the rail freight corridor approach, reflecting the agreement of both the railway sector and the politicians.

What is wrong? Why is there not more progress?

The reasons for the slow progress are actually mainly the same ones as the ones for which remedies have already been taken: there is first of all lacking interoperability and lacking investments, a typical chicken-and-egg problem: investments will only come if progress is made in terms of interoperability and, inversely, progress in terms of interoperability requires more investments. And this is of course a much broader problem which cannot be handled by corridors and the corridor approach.

To recall, half of the European rail freight is cross-border. So, corridors would be particularly crucial, yet there are still big cross-border problems, which have not been overcome by corridor governance. National specificities in many technical and commercial matters still significantly prevent efficient solutions, not to mention the lack of data exchange across both companies and countries. And this despite the fact that railway infrastructures remain an underutilised asset in most of the countries. In short, the potential of rail freight corridors is not yet fully exploited, owing to the fact that national priorities still generally prevail.

Overall, while there is some progress in matters of rail freight corridors, rail freight and railways more generally, such progress is simply too slow as compared to the other transport modes, namely road, where we witness, as of recently, disruptive innovations in terms of automatization and digitalization. This, of course,

again increases modal competition. In short, in the current rapidly evolving mobility world, rail turns out to be the most vulnerable mode of transport, to the point that one wonders whether, despite all the good arguments and huge amounts invested, rail freight can remain competitive at all.

So, what to do?

At this point, I see mainly three types of remedies, that could potentially get us out of the gridlock in which cross-border rail freight and rail freight corridors in particular are trapped:

The first remedy pertains, in my view, to a broader, more inter-modal definition of the rail freight corridor. Indeed, corridors and corridor management should not be limited to rail, but should also include both the front and the back ends of the corridor, namely ports and dis/charging stations, i.e., the link to maritime and road transport. Such a broader definition of freight corridors, including a broader governance of such corridors involving road and maritime actors certainly has the potential to improve modal shift.

The second remedy pertains to national rail freight plans: such plans sometimes already do, or at least potentially could, some of the measures mentioned at the Forum, such as lower track access charges for rail freight, higher charges for road transport, possibly using the money to finance rail, traffic limitations, priority rules and others more. As a matter of fact, many countries have started to develop corresponding plans and rail freight corridors should more actively build on them in some sort of bottom-up approach.

The third remedy pertains to rail freight corridor governance: the point was convincingly made by one of the participants to the 16th Rail Forum, namely that an EU-wide rail freight corridor governance body should be set up so as to harmonise the various

and often similar efforts in the various corridors and, especially, to create visibility for the corridor approach.

Given the urgency to make rail freight corridors more competitive in light of the more rapidly innovating road sector, one may indeed ask the question whether the purely sector (railway) approach to corridors is still appropriate. And the Commission's recent focus on multimodality (e.g., the "Year of Multimodality") is certainly pointing into exactly that direction, and is as such certainly a good indication of the way forward.

Published in December 2017

Private Financing of European Railway Infrastructure?

Matthias Finger

Can private financing solve the investment gap into railways infrastructures? This was the guiding question of our 15th Florence Rail Forum. And the answer is rather sobering: yes, it probably can, but the overall price tag, and the cost for the taxpayer, will be higher than if government or the infrastructure managers did it on their own. So, what can or should the EU do?

Can railway infrastructures be attractive to investors?

But let us develop our argument in more detail: rather than thinking from the financing needs of the railway infrastructures which are indeed impressive (the cost for ERTMS deployment alone will be currently estimated at 80 billion⁸). Let us first think from the perspective of the private investor. And there is indeed (a lot of) private money looking for long-term investment opportunities, and infrastructure projects, including railway infrastructures, could be as good an investment opportunity as many others.

8 European Court of Auditors (2017): Special report no 13/2017: A single European rail traffic management system: will the political choice ever become reality?

But it is private investments after all, meaning that the private sector is ultimately looking for a profit. The profit that is sought after is the higher the higher the risks associated with the investment are. And these risks are proportionate to the complexity of the project (e.g., building the infrastructure, operating the infrastructure, operating the trains) and the amount of actors that have to be coordinated in order to make it work.

PPPs in other network industries, such as highways, ports, airports and water and wastewater infrastructures have shown that the private investor or the consortium that builds and operates the infrastructure typically seeks to transfer the risks to government. I would be astonished if this were different in railways infrastructures.

Adding to these risks are adjacent policies that determine the degree to which railway infrastructure investments are going to be lucrative or not: the most important one pertains to access regulation to railway infrastructures. The second most important adjacent policy pertains to access pricing, i.e., the price railway undertakings will be paying to the infrastructure manager. As a result of railway liberalization in Europe, such policies are now typically fixed in separate regulations: private investors, however, would most likely insist on them being part of their contractual arrangements. The third most important adjacent regulation pertains to road. Indeed, the attractiveness of road transport will determine to which degree railways infrastructures are actually going to be used. It is in these adjacent policies where the European Commission can actually play a decisive role in making railway infrastructure more (or less) attractive for private investors.

Should PPPs be realised in railway infrastructures, the concrete contractual arrangements will most probably be done at the national level, namely between the government and a consortium which will create a Special Purpose Vehicle (SPV) to that

effect. Typically, this will take the form of project finance, i.e., the consortium will define a project that is limited in time and space and will seek to receive the necessary government guarantees, so as to make it as little risky and as lucrative as possible. The government, in turn, will have to decide how much risk it is willing to bear and whether it cannot find a cheaper way to finance the same infrastructure. In normal circumstances, it will however not be cheaper for the government to have private investors, no matter how creative the construct, than taking a loan to finance the railway infrastructure. Also, such private financing will always only cover certain – namely the most lucrative – lines and never be able to cover the entire costs of a national (or regional) railway infrastructure. In other words, the government will always be left with remaining infrastructure financing needs. This leads to a second, perhaps more fundamental consideration about private financing of railway infrastructures.

The challenge of (further) fragmentation

Because of railway liberalization, especially because of unbundling, the railway sector has already been considerably fragmented. This is problematic to begin with because railways is ultimately a system which needs to be operated as such. The fragmented system was subsequently held together by regulation and regulators ... with mixed effects. If in addition now also railway infrastructure is being separated into privately and publicly financed parts, and the privately financed parts are put up by different consortiums, this will lead to additional fragmentation and to additional needs for coordination - with additional costs and risks for the overall system. While, in the short term, private infrastructure financing may indeed appear to be an attractive solution for national governments, mainly keeping public debt off the balance sheet, this may well be a problem in the medium and long-term, both financially and in terms of system governance.

It may be a financial problem because ultimately the costs of private financing will most likely be higher, considering that the remaining potentially non-lucrative part of the railway infrastructure will still need to be financed and that the profits from the more lucrative parts will have gone to the private investors.

But, in my view, the main problem will be the further fragmentation of the railways system, at least in the European context. While private financing may be interesting in countries where lines can be isolated (e.g., freight lines in the case of the United States), in countries with integrated railway systems, privately financed (and operated) railway infrastructures will contribute to further fragmentation, and thus making the national railway systems more fragile and creating additional costs for coordinating the fragmented parts, most likely by way of additional regulation and regulatory bodies.

Published in September 2017

Competition in the Passenger Railways in Europe

Matthias Finger

The European Commission still considers increased competition as the main tool to make railways more competitive and foster the modal shift from road to rail in both passenger and freight. Neither modal shift nor competition in railways has happened on a significant scale, even though both are not necessarily directly related. Indeed, modal shift (and in particular the reduction of the use of the private car) depends on many other things as well, including oil prices, the internalization of environmental externalities on road transport, emerging intermodal competition with bus transport and new forms of sharing mobility.

On the other hand, fostering competition in passenger rail transport – while still being a worthwhile goal, even though not necessarily the most effective weapon against the above trends – turns out to be more complicated than originally anticipated, owing in particular to the technological nature of railways with its heavy implications on both operations and financing. Let me finally mention that this discussion about furthering competition in railways comes after the adoption of the 4th Railway Package, following a lengthy process which has strained most involved

parties. The uncontested success of this 4th Railway Package is its technical pillar aiming at harmonizing technical standards and thus at fostering technical interoperability without which no competition in railways is ever going to take place in Europe.

Enter DG Competition, and this is the real novelty for railways and railway operators, for the European Commission itself and for railway regulation more generally. Indeed, the real novelty consists of no longer looking at railways from a purely sectoral regulatory perspective (i.e., the railways' perspective) but also from a competition regulatory perspective. While historically so-called access competition has already been approached from a sectoral regulatory perspective (and led to the creation of sector specific rail regulators), other competition relevant dimensions – such as tendering of PSO (Public Services Obligation) contracts, anti-trust considerations and state aid issues – were more difficult to approach from a purely sectoral point of view, as they are by their very nature transversal.

There is indeed a solid theory and a long-lasting practice of regulating tendering (of contracts), state aid and anti-trust among academics and competition regulators at global, EU and national levels, and this theory and practice should now also come to bear on the railways, as railways are gradually entering competition, not the least because of growing technical interoperability.

Yet, our Florence Executive Seminar clearly showed that applying competition regulation to railways and especially integrating competition regulation and railway sector specific regulation is more easily said than done. Most of the Seminar was therefore spent on trying to understand what competition regulation in railways would actually mean and entail, not in theory, but in practice.

And rail specificities abound; let me highlight here the four most important ones:

- There is first the **technological** specificity of railways, characterised mainly by difficult and costly interoperability between rail infrastructures (namely tracks) and train operations (mainly locomotives and wagons). Such interoperability makes not only access competition difficult but it also adds complexity to tendering, inasmuch as investments in rail infrastructure and train operations have different time horizons.
- There is secondly the fact that railways are never self-financing. A significant portion of any railway system will always be **subsidised**, in EU on average for approx. 50% of its costs. Furthermore, public subsidies are paid both for a portion of the infrastructure, as well as for a portion of train operations, thus creating problems for tendering, as well as potential market distortions, not to mention potential state aid problems.
- On top of this comes the fact that many infrastructure managers or integrated companies are **indebted**, thus distorting the level playing field even further, as well as raising issues with regard to state aid rules.
- The fourth specificity, while having existed for a long time, has recently been much exacerbated by digitalisation, namely **intermodal competition**. Indeed, increasingly questions of and decisions about anti-trust in railways will have to take into account the evolution in adjacent markets, especially in the long-distance bus and the long-distance car-sharing markets.

It must be made clear that rail transport and modal shift to rail will always remain a public policy goal connected to growing road congestion and pressing CO₂ emissions reduction goals. In other words, neither the member states nor the European Commission can afford for railways to decline. Therefore, whatever

will be done in terms of fostering railway competition in Europe and with member states it will only be politically acceptable if it strengthens railways as a transport mode vis-à-vis the other transport modes, or if it fosters intermodality, both in passenger and freight.

Published in July 2017

Railways in the Age of Digitalisation?

Matthias Finger

This *European Transport Regulation Observer* reflects upon the discussions at the 14th Florence Rail Forum “Which Role for Railway Undertakings in the Mobility of the Future” that took place in Florence on May 22nd, 2017.

In this Forum, we had a systematic and bold look at what digitalization does to railways. Of course, digitalization does not affect railways specifically. Rather, digitalization is a pervasive technology that affects all industries, and it is precisely as such that we have to discuss it in the case of railways. We built on the experience of previous Florence discussion yet we focused, for the first time in Florence, on the role of Railway Undertakings (RUs). The Forum showed that there is still much confusion as to what digitalization and what it does concretely. The purpose of this paper therefore primarily is to clarify our thinking in this matter. In that respect, a clear distinction must be made between (1) what digitalization does to railways in particular and to mobility more generally and (2) the specific new reality created by digitalization for RUs (and all other transport operators).

Digitalization: from railways to mobility chains

As to the first point, it is obvious that digitalization places railways within a broader mobility chain. Indeed, for the users (passengers) railways becomes one of several transportation modes which can be combined to provide a seamless and fully integrated transportation experience / solution. In their search for a way to go from A to B, customers use a digital interface where mobility is treated as a service provided through different modes. To be clear, this is not unique to passengers and the exact same thing happens for goods /freight/cargo, even though, at this Forum, we did not much talk about it. And this very new reality has profound consequences for railway undertakings as well as for regulation.

- All RUs can no longer simply consider themselves as being “only railway” undertakings, being it for passengers or for cargo. Rather, they must now see themselves as becoming integrated and multimodal mobility services providers. Consequently, they all seek to enlarge their activities to cover the last mile, as well as to become active at the urban level, where such integrated mobility is much more prevalent.
- But this new intermodal reality also has profound implications for regulations, as became clearly apparent at the Forum: it becomes questionable whether regulation of the different transport in isolation from one another, in particular the regulation of railway undertakings separately, continues to make sense. Rather, the new multimodal reality calls for regulation of mobility as such with particular attention being paid to the definition of the level playing field and the distortion of competition among the transport modes along with a redefinition of what public service (and Public Services Obligations for that matter) means in the new multimodal mobility world.

Digitalization: data layer(s) and platforms

Everybody agrees: the new (digital) reality is mainly characterised by the emergence of a so-called digital or data layer. Yet, it became evident that there is still a lot of confusion about what that data/digital layer exactly is. For a start, a distinction needs to be made between the debate on data availability, and the debate on (data/digital) platforms:

- As for data availability, different transport operators generate and possess numerous data, which must clearly be distinguished. A helpful categorization was proposed at the Forum by SBB distinguishing in particular between (a) open, (b) restricted (contractual arrangements) and (c) closed data. Depending, such data can or cannot be made available openly or to selected partners.
- Yet, such data are different from those possessed by platforms where such data are analyzed (by algorithms) so as to extract value from them leading to (commercial) services. Much of the discussions focused on what such platforms exactly are and how they operate and it was concluded that more thinking is needed in order to understand them better.

Digitalization: what consequences for railway undertakings and regulation?

Railway undertakings, as said, possess numerous data. The question is whether they can or should be forced to make some of these data publicly available, mainly by virtue of being publicly owned. Another question is whether, railway undertakings should see such data and corresponding platforms as being a new business opportunity, for example when becoming integrated mobility services providers.

Regulation of data and especially of platforms is a different matter altogether: the underlying reality is one of platform economics, which should guide the theory and practice of regulation. Yet, it still remains unclear how such platforms should be regulated and some question whether they should be regulated at all.

Still, there is general agreement on two issues: first, digital platforms lead to a “winner-takes-all” situation. Secondly, **value appropriation** by platforms that redirect value-added and profit to platform owners and operators might remove revenue from much needed investments into rail and other infrastructures. Probably both such consequences of digital platforms will have to be regulated at some point, the question being primarily how, at which level and by whom. This is notably where the European Commission comes in: in our mind, the EC does not necessarily need to come in as a regulator, but rather as a body capable of thinking the regulation of both access to data and of platforms through in a proper way. Indeed, the regulation of such platforms should respect subsidiarity and keep in mind that digitalization leads to integrated mobility chains, which such (digital mobility) platforms precisely enable ... or not.

Published in November 2016

Competition in the Railway Passenger Market

Matthias Finger, David Kupfer, Juan Montero

Introduction

A Workshop on the European experience of competition in the railway passenger market was held on 16th September 2016 in the Fundación de los Ferrocarriles Españoles in Madrid. The workshop was organised by the UNED University in the realm of the research project REGUTRAIN, funded by the Spanish Ministry of Science and Technology.

Experts from Austria, Italy, the Czech Republic, United Kingdom and Sweden participated in the Workshop. They presented the national experiences of competition “in the market” or so called “open access”, that is, competition of more than one undertaking in the provision of passenger transport services along the same route, as opposed to competition “for the market”⁹. Table 1 illustrates the state of play of open access competition in the railway sector.

9 The introduction of competition in the railway sector raised a number of questions, and many categories and definitions have been used. For an overview, refer to Finger, M., Rosa, A. (2012)

Table 1 Open Access Operators (OAO) and market share in Europe.

Country	Main OAOs	Service	Entry date	Market share (%)	
				OAO in relevant segments/routes	Incumbent country overall
Austria	Westbahn	LD	2011	[20–25]*	88
Czech Republic	RegioJet	LD	2011	[35–40]†	95
	Leo Express	LD	2012	[25–30]†	
Germany	HKX	LD	2012	[5–10]‡	88
Great Britain	Grand Central	LD	2007	[0–5]§	-
	First Hull Trains	LD	2002	[0–5]§	
Italy	NTV	HS	2012	[20–25]#	83
Sweden	Veolia/SkandJern/TAG	LD	2011	N/A	68
	MTR	LD	2015	[25-30]~	

Source: Based on 2013 data (passenger miles) available in the Staff Working Document accompanying the European Commission's Fourth report on monitoring development of the rail market (SWD (2014) 186 final) and from interviews conducted with national authorities and OAOs in Austria, the Czech Republic, Germany, Italy and Sweden.

* Market share estimate relating to the Vienna–Salzburg route.
† Market share estimate relating to the Prague–Ostrava route.
‡ Market share estimate relating to the Hamburg–Cologne route.
§ Market share estimate relating to long-distance services on the East Coast main line.
Market share estimate on the overall national high-speed services market.
~ Market share estimate relating to the Stockholm-Gothenburg route.

Source: *Competition and Market Authority (CMA) (2016), p.86*

Some lessons can be learnt from the experience of those countries where competition in the market was introduced. We would identify three lessons: Firstly competition is limited to a few lines and a few competitors. Secondly competition has a positive impact for the passengers and thirdly competition can have a negative impact on the system as a whole.

Competition is limited to a few lines and a few competitors

The first conclusion is that competition tends to be limited to a few key routes and among a very small number of competitors.

In each country, new competitors tend to focus on the busiest routes, which are usually the lines with the best infrastructure and achieving the highest speeds. In fact, in Austria and the Czech Republic new comers operate only a single route, which is always the busiest in the country. In the Italian case, presented by Andrea Giuricin, the new entrant also began operations exclusively on the Rome-Milan line in 2011. Since then, it has begun operations on other lines, but always with high passenger volume (such as Milan-Venice).

The number of new entrants is also very limited. In Austria and Italy, only a single newcomer competes with the traditional public railway undertaking. In the Czech Republic, as explained by Zdeněk Tomeš, three undertakings now compete on the busiest line in the country.

A positive impact for the passengers

A second conclusion is that the introduction of competition has led to a drastic reduction in prices, increased frequency of services and, therefore, a significant increase in passenger volume.

The impact on prices has been very marked. Average prices have dropped sharply in all countries: -42% in the Czech Republic and -40% in Italy, and, furthermore, quite suddenly after the introduction of competition, in the case of Sweden, as explained by Bertil Hylén. In addition, there have been very dramatic discounts resulting from innovative pricing policies.

The frequency of service has also improved, although the new frequencies tend to concentrate at peak times and not nearly so much in non-peak hours, especially in services late in the day, when there is a tendency to advance the last departure to an earlier time.

The volume of travellers has increased dramatically in most countries, with the most notable being in the Czech Republic (+

91%) and Italy (+ 65%). However, part of the increase should be attributed to other factors, as noted by Dietmar Pfeiler explaining the Austrian case, namely improvement in infrastructure, limitations in the air or road alternatives offered, etc.

Negative impacts on the system

Competition also seems to have caused some negative effects on the railway system, which must be considered for the correct and proper regulation of the activity.

Price reductions can be larger than the efficiency gains resulting from competition. Even more, in some cases unit costs per passenger may increase, resulting from the tendency to offer greater frequency with smaller trains and, perhaps, with lower occupancy rates. Increased frequency with lower capacity also involves congestion problems in infrastructure.

As a result, liberalisation has meant a greater financial pressure on the system, causing a chain of consequences, all of which were largely predictable.

To begin with, the financial pressure on railway undertakings has led to the deterioration of services on other routes. The customary cross-subsidisation within a public undertaking between the most and least profitable routes has been reduced significantly. This effect has been clearly observed in the Czech Republic and in particular in Italy, where the public railway undertaking suspended long distance services in deficit (as they did not benefit from any compensation resulting from public service obligations) just before the entry of a new competitor into the market.

In the same vein, the financial pressure on railway undertakings has also been tempered by the reduction of fees for the use of the railway infrastructure. This is the case in Italy where the infrastructure management was forced to assume a greater share of the cost of the system.

Finally, despite the measures indicated above, it should be noted that competition has caused public undertakings to assume losses on lines that were previously highly profitable, and new comers also face a high risk of incurring losses over a prolonged period, although the more mature competitors in Italy and the Czech Republic appear to be stabilising their financial situation.

Conclusion

In most of the countries analysed, liberalisation was not the result of a policy designed to achieve specific objectives. Indeed, in the case of Sweden liberalisation was considered to have occurred *by accident*. As a result, liberalisation was not accompanied by regulatory measures to ensure specific objectives. This was not so in the British case, which, as Phillip Wheat explained, originally was clearly aimed at reducing the system's operating costs. It should be noted that over time, the costs have increased and the franchise model has failed to control the evolution of costs.

Unregulated competition has generated obvious benefits in the form of price reductions for travellers on competitive routes. However, these reductions have not necessarily been accompanied by a parallel reduction in the economic cost of the system. In fact, it has become evident that the introduction of competition usually presents a parallel trend to shift costs to the infrastructure manager and to the users of other routes that cannot benefit anymore of internal cross-subsidies. Yet further competition causes financial stresses to both the public railway undertakings and the new participants in the market.

It may be of interest to have a greater regulatory intervention to combine the benefits of competition with a reduced negative impact on the system, at least for a transitory period.

Case Study 1 - Passenger Railway Competition in Austria

This text is based on the presentation of Dietmar Pfeiler, ÖBB, at the workshop 'Competition in the Railway Passenger Market', Madrid, 16.09.2016 and the other sources referenced in the text.

Open access competition in Austria took off in December 2011 on the Vienna-Salzburg route, the country's busiest connection that, so far, remains the only case of open access competition in the country. The private operator Westbahn was founded already in 2008 but faced several difficulties in the beginning filing complaints among other about allegedly discriminatory access to essential facilities by the infrastructure manager ÖBB Infrastruktur AG, which is part of the integrated ÖBB Holding. In spite of having access to Vienna's main station Westbahn is operating uniquely from Vienna's Westbahnhof. The train cars Westbahn uses were requested from and provided by the manufacturer Stadler Rail (CH).

Open access competition in Austria is legally possible for every path upon the request of a licensed Railway Undertaking. The priority rules of the path allocation process can be an obstacle as Austria has a mix-use network with long-distance, local and freight trains using the same tracks.

Open access competition seems to have had several effects on the passenger railway market in Austria:

- Increase in demand: the overall passenger rail transport demand has risen by 25% over the last three years on the Vienna-Salzburg-route. The overall market volume of the incumbent ÖBB, however, has remained stable since 2011. In 2013 the market share of Westbahn on the Salzburg Vienna route was between 20-25% which is equal to a national share of about 3% (Casullo, 2016).

- **Quality of Service:** in terms of extra services, from the beginning Westbahn offered free Wifi on their trains, it allowed on board ticket sales and special discounts. Today the incumbent is also offering Wifi on their high speed trains. However, as the competition is mainly focussed on price competition an overall reduction of service quality is a possible trend.
- **Capacity and travel time:** Westbahn offers 15 train pairs per day, with standard travel-time of 2h28min (7 intermediate stops) and 2h16min/2h19min for early-morning-services with two intermediate stops. ÖBB offers two hourly lines to Salzburg, both with 16 pairs of trains each. The fast railjet line with a travel time of 2h15min (two intermediate stops) and the other line with 2h46min (with 8 intermediate stops). ÖBB has invested in quality (new railjet-trainsets). These improvements in travel-time and number of connections were made possible because of new investments to upgrade the infrastructure. The number of trains operating on the route was overall increased as a result of competition. Westbahn has announced it will offer more once more rolling stock becomes available.
- **Prices:** Westbahn offered very low fares and permanent special offers, most of them uncontrolled. Their standard fare was at 50% of the regular full-flex ÖBB fare and equalled the ÖBB fare for holders of *ÖBB-Vorteilscard*. Also ÖBB offers a special offer with the restriction of having a limited promo-capacity per train. Westbahn has also entered several partnerships with regional tickets but later abandoned some of them.

In spite of the overall positive impact for travellers there are problems with regard to the legal framework. Rules for the integration of timetable information and for a possible integration in sales platforms are missing. The rules for track access may need to be revised as well as the current system has a clear system of

prioritization (for instance giving long distance priority over short, international over national), which may not be compatible with fostering open access competition.

Case Study 2 - Passenger Railway Competition in the Czech Republic

This text is based on the presentation of Dr Zdeněk Tomeš, Masaryk University, at the workshop “Competition in the Railway Passenger Market”, Madrid, 16.09.2016.

The Czech railways had been liberalised with the unbundling of infrastructure and services in 2003. The process was structurally completed with the creation of a fully independent infrastructure manager in 2011. Competition in passenger rail (unlike rail freight) had developed very slowly at first¹⁰.

One of the peculiarities of the Czech railway market is the fact that almost all railway connections are subsidised (operated under public service obligation) on the regional as well as on the intercity level.

Table 2 Revenues and Profit in the Czech Republic.

	2012		2013		2014		2015	
	Rev	Profit	Rev	Profit	Rev	Profit	Rev	Profit
Regio	246	-76	318	-93	523	-42	718	+41
Leo	11	-78	193	-159	178	-137	258	-84
ČD	19 500	-517	19 900	-1 795	20 723	-865	21 075	-1 395

- mil. CZK
- RegioJet and LeoExpress - data for Prague-Ostrava;
- ČD – data for all Czech passenger rail network

Copyright: Zdeněk Tomeš

¹⁰ Non-incumbent operators had a market share of 1.4% in 2011, see Tomeš, 2014

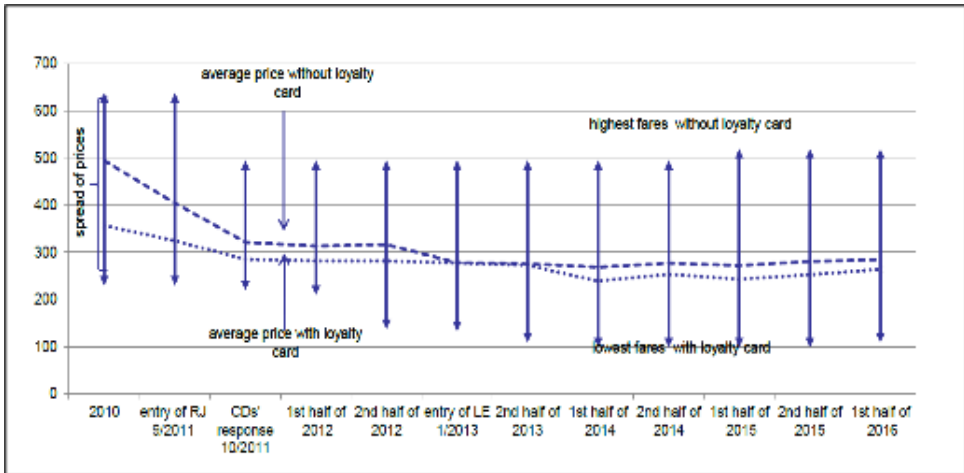
While in theory open access competition is allowed on all routes, a new entrant on any connection would have to compete with the incumbent operator (České Dráhy, ČD) that receives public funding. The Ministry of Transport is, however, entitled to withdraw public funding and open connections to on track competition. This has happened once so far on the case of the Prague-Ostrava route, where currently several operators compete.

The Prague-Ostrava route is one of the main routes in the small country and it has ideal conditions for new entrants: high traffic volumes and little intermodal competition because of a lack of a direct highway connection. At the same time, the incumbent operator used to charge high prices and offered low quality of service, for instance due to using outdated rolling stock. Several new entrants with diverse business models entered the market from 2011 on the two most important ones being Regio Jet and LeoExpress. The greatest positive outcome (from a passenger's perspective) has been the reduction in fares (see Figure 1) with a simultaneous increase in travel volume and service quality. While the incumbent operator has been accused of predatory pricing there is no official verdict yet. However, estimates suggest that all the operators are currently operating at a loss.

The problem of predatory pricing is exacerbated by some intrinsic factors. Operators engage in such fierce competition partly because they face high sunk costs; some of their rolling stock used cannot be used in other countries and would be hard or impossible to sell after a possible exit from the market. The second problem that arose in the Czech Republic is capacity constraints due to increased congestion: competition has led to a much higher train frequency on the Prague-Ostrava track because all operators moved to shorter trains with shorter time intervals. This has negative impacts for freight operations as passenger trains always have priority in the track allocation in the Czech system.

The Czech Republic is a case of relatively unregulated competition. Clear rules, for instance on pricing and fare integration, are not in place. The Competition Authority of the Czech Republic lacked staff and experience in the railway sector when it had to deal with claims about anti-competitive behaviour of the incumbent operator. This experience may well give rise to the idea of establishing a truly independent railway regulator. Currently the railway regulator is part of the Ministry of Transport and has no authority over competition issues.

Figure 2 Average fare prices for rail services in the Czech Republic.



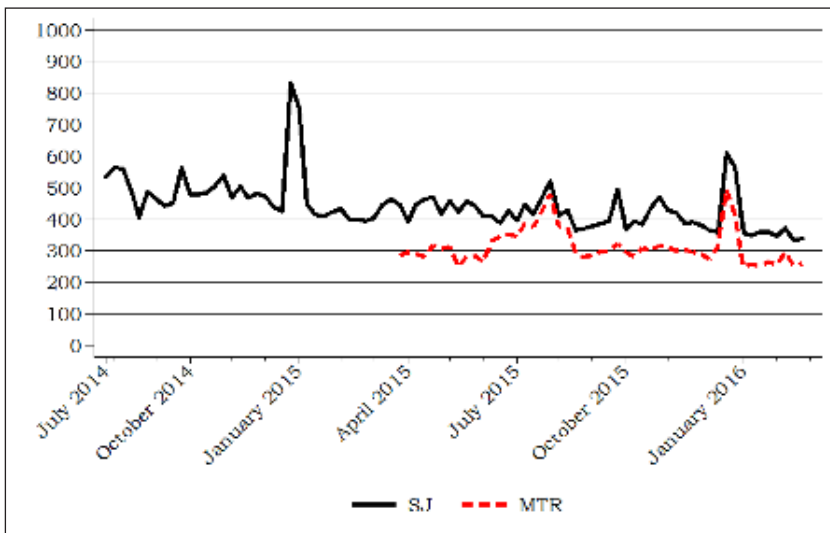
Copyright: Zdeněk Tomeš

Case Study 3 - Passenger Rail Competition in Sweden

This text is based on the presentation of Bertil Hylén, at the workshop “Competition in the Railway Passenger Market”, Madrid, 16.09.2016 and the other sources referenced in the text.

Sweden has opened the entire passenger railway market to competition in 2010. Nevertheless the incumbent state owned operator SJ has remained in a strong position in spite of some minor entries to the market. Recently competitors had operated on a small scale and in niche segments that did not challenge SJ. This changed when MTR entered the market on the Stockholm-Gothenburg line, the country’s busiest route, in March 2015 (see Figure 2).

Figure 3 Weekly average prices of Swedish incumbent operator SJ and new entrant MTR.



Source: Vigren, 2016, p. 11

The Hong Kong based corporation MTR had already entered the Swedish market in 2009 for the operation of Stockholm's metro network.¹¹

Conflict arose upon MTR's market entry with regard to access to the incumbent's sales platform. When its request to be included in SJ's online ticket platform was rejected, MTR complained to the Swedish Competition Authority. The complaint was dismissed with the authority ruling that access to SJ's sales platforms is not indispensable for market entry. MTR now uses the neutral resrobot.se platform.

Capacity shortages are a serious challenge for railway competition in Sweden. The infrastructure manager has to bring together conflicting demands between fast and slow passenger trains and freight transport, while priority rules are not well defined in Sweden. Capacity is in principle allocated on an annual basis. New entrants, however, need to plan several years ahead.

It seems that after a relatively short time on the market MTR has affected ticket prices. MTR's cheapest ticket is 10 SEK cheaper than the corresponding ticket of SJ. The incumbent's ticket prices have decreased by 12.8% between March 2015 and June 2016 (Vigren, 2016: p.18). Both the incumbent and the competitor have introduced a more dynamic yield management system to optimise load factors. This of course means more special offers on the one hand and higher prices during peak times such as holiday periods on the other.

MTR always stresses to seek competition not only with the other rail operators but with the other transport modes. They focus on increasing the share of online ticket sales through mobile applications and travel platforms and on attracting more business travellers (Barrow, 2015). SJ states that competition is generally good as it creates more attention in to the rail sector.

11 Competitive tendering is common practice in Sweden: 95% of public transport operations is tendered out under the authority of the Passenger Transport Authorities.

Case Study 4 - Passenger Railway Competition in Italy

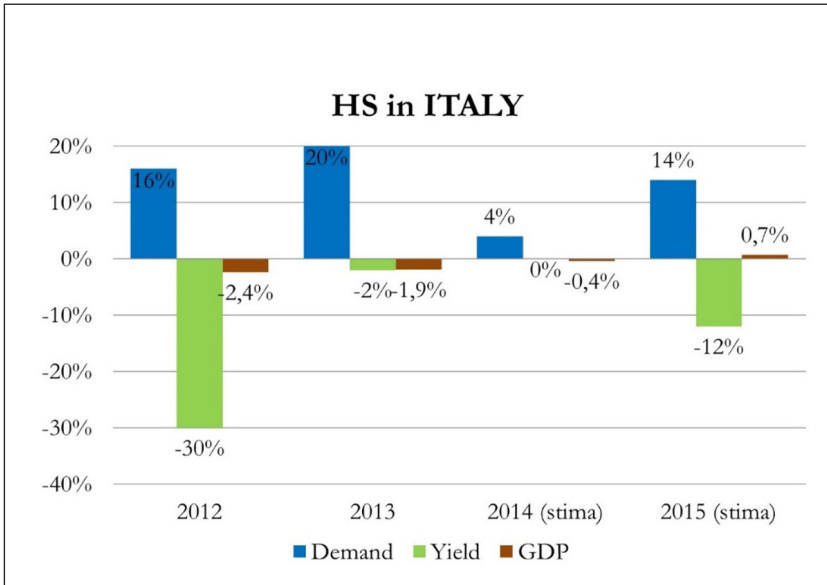
This text is based on the presentation of Dr Andrea Giuricin, University of Milan Bicocca, at the workshop “Competition in the Railway Passenger Market”, Madrid, 16.09.2016 and the other sources referenced in the text.

The case of open access competition in Italy has received a lot of attention as it has developed quite significantly over the past years. In 2012 competitor NTV entered the high speed rail market challenging the incumbent Trenitalia. NTV was founded in 2006 but it took until March 2012 to get the final authorization to operate.

A decree allowing open access competition in Italy is in place since 2001. In the beginning NTV filed numerous complaints about the FS Holding (which comprises infrastructure manager and the incumbent operator). These complaints mainly regarded access to essential facilities, delays in the path application process and predatory pricing by the incumbent. In 2013 Italy's new transport regulator and competition authority (ART) started their operations and supported the development of competition with several interventions in the market aimed at ensuring non-discriminatory conditions. Among other things a significant reduction of track access charges in 2014 brought down costs for all operators.

The effects of open access competition in Italy have been quite significant: the overall demand for long distance rail transport rose by 65% (in PKM) while the ticket price yield fell by 40% (Figure 3).

Figure 4 Demand, GDP and reduction in ticket prices for high speed rail in Italy.



Copyright: Andrea Giuricin

Continuously adding new connections on profitable connections the national market share of competitor NTV had arrived at 26% in 2016. In spite of having to bare high investment cost in the starting phase, NTV is operating at a profit and is currently making investments in new trains. Italo is currently operating with 25 high speed trains, but at the end of 2017, 12 more will be added.

Part of this development was also an increase of the overall market share of rail vis-à-vis (low-cost) air because the cost for available seat kilometres of NTV is now lower than the majority of low cost airlines. In fact some routes in Italy have been abandoned by Ryanair as a consequence of the competition with high speed rail (Florence School of Regulation, 2014).

Case Study 5 - Passenger Railway Competition in the UK

This text is based on the presentation of Dr Phill Wheat, ITS Leeds, at the workshop “Competition in the Railway Passenger Market”, Madrid, 16.09.2016.

The UK was one of the first countries with a liberalised rail system. Yet open access competition (competition in the market) exists only to a very limited extent and the number of cases is actually decreasing. The vast majority of train services are operated by government awarded franchises for a period of 7 to 15 years preceded by a competitive bidding process (Competition and Market Authority (CMA) (2016)).

Operators need to seek permission from the Office of Rail and Road (ORR) to operate an additional train on an existing connection (overlapping franchise) or to offer an alternative route to an existing city connection (parallel franchise). In its assessment on whether to allow an open access operation the ORR considers among other things the risk that new operations could defer revenues from the existing franchises making it likely that they will submit lower bids in future tenders (and thus jeopardise funding needed for infrastructure). In addition, the ORR's has role to arbitrate if the infrastructure manager doubts that there is path capacity for such operations.

The overall evaluation is that the liberalization has boosted passenger numbers and to some extent customer satisfaction. At the same time, the operational costs of the railway system are still considered too high. Hence the policy context today is mainly concerned with increasing efficiency and bringing down cost, whilst maintaining the quality and reliability of the service.

The ORR is the independent body in charge of overlooking the efficiency of the infrastructure manager Network Rail, to

guarantee fair access to the infrastructure and to promote competition and safety regulation. ORR needs to balance several, sometimes conflicting duties: it has the duty to promote competition in the railways and at the same time favour sufficient revenues for the infrastructure manager.

To date there are about 20 franchises in operation. While at the beginning of the liberalization process there were financial problems with some of the franchises, their financial situation has stabilised by now. Yet the overall cost of providing train services has not fallen as expected and thus a priority for the industry is to improve this situation.

The Competition and Markets Authority (CMA) has recently completed a policy project which concluded that one strategy to address this issue and generally increase innovation in the industry is to increase the so far limited number of open access competition. There is some evidence that, where it is allowed, service levels and customer satisfaction improves. Potential efficiency gains were found for instance by an ORR study showing that costs of open access operations are on average 30 % lower than the cost of a franchised operation working at the same density of operation (Rasmussen et al, 2015)). A second benefit that is observed is the potential of open access operators to pressure the network manager to become more efficient. More open access competition means overcoming barriers to entry. Legally access to the infrastructure is not an obstacle as ORR may not discriminate against an operator applying for access rights. However, capacity constraints on many tracks and the often difficult access to rolling stock limit the chances of new entrants entering the market.

It would be important to further investigate financial and other implications of a move towards more open access competition on certain routes. If such a path is chosen policy action would need to continue to remove such barriers. One such issue relates to

access charges and the extent to which a greater open access would prevent recovery of fixed costs for the infrastructure manager. Considering charges based on both marginal cost and avoidable cost offer some potential to recover such costs (Office of Rail Regulation, 2016, p23-24).

References

- Barrow, Keith (2015), International Railway Journal: MTR Swedish open-access venture targets air and road, International Railway Journal, available at: www.railjournal.com/index.php/main-line/mtr-swedish-open-access-venture-targets-air-and-road.html
- Casullo, Lorenzo (2016), The Efficiency Impact of Open Access Competition in Rail Markets - The Case of Domestic Passenger Services in Europe, International Transport Forum Discussion Paper 2016/07, available at: <http://www.itf-oecd.org/sites/default/files/docs/dp201607.pdf>
- Competition and Market Authority (CMA) (2016), Competition in passenger rail services in Great Britain - A policy document
- Finger, M, Rosa, A. (2012), Governance of competition in the Swiss and European railway sector, Florence: European University Institute, available at: <http://cadmus.eui.eu/handle/1814/34259>
- Florence School of Regulation (2014), High Speed Rail vs Low cost Air, European Transport Regulation Observer 2014/01, available at: <http://cadmus.eui.eu/handle/1814/39126>
- Office of Rail Regulation (2011), The potential for increased on-rail competition – a consultation document
- Office of Rail Regulation (2016), Conclusions on initial consultation on the 2018 periodic review. Available at: <http://orr.gov.uk/consultations/pr18-consultations/periodic-review-2018-initial-consultation>
- Rasmussen, T, Wheat, P and Smith, A (2015), Do open access train operators exhibit inherent cost benefits compared to their franchised counterparts?, available at: <https://assets.publishing.service.gov.uk/media/55a8cde240f0b6156000000b/>

[Econometric_analysis_of_efficiencies.pdf](#)

Tomeš, Zdeněk, et. al (2014), Competition in the railway passenger market in the Czech Republic, Research in Transportation Economics Volume 48, December 2014, Pages 270–276

Vigren, Andreas (2016), Competition in Swedish Passenger Railway: Entry in an open-access market, CTS Working Paper 2016

Published in November 2016

Security: Rail is NOT Air!

Matthias Finger

Regulation of railway security is only in its infancy, while regulation on security in air transport is mature with many specific measures already implemented. Yet, recent terrorist attacks which directly targeted the European transport system (Thalys – 21 August 2015, Brussels metro and airport – 22 March 2016) increased the pressure especially on the rail sector to come up with a comprehensive and systematic approach to security. The 13th Florence Rail Forum discussed how security in rail should be approached and which actions should be taken. It was acknowledged that in the railway sector – unlike in air and maritime transport – there is currently no legal basis for imposing EU measures on passenger security. Indeed, this was not seen as a burden to overcome, as **very detailed, prescriptive rules on security are not desirable because of the very open nature of the railway system.**

A remarkable consensus appeared among the participants. The ultimate ‘railway sector alignment’ is even more astonishing as the perspectives and interests present were highly diverse:

- clearly, **passengers** want (more) security, yet without compromising the convenience of mobility (from searching to booking to travelling);
- even though they have their specific interests, the different **operators** in the railway sector – train operating companies, infrastructure managers, railway station owners and operators – all want to respond to the customers' demands, yet also see security as a cost; and
- **suppliers**, in turn, at least certain ones, consider security to be a business opportunity yet the definition of the standards should consider the existing technologies available without discrimination.

In short, while all agree that security has a cost, they also agree that security is a must for the system and that none of the actors can achieve it alone. Collaboration and 'alignment of responsibilities' is seen as paramount to achievement security in the railway sector.

Three main issues arise and will have to be addressed when developing a European rail security agenda:

- There is, indeed, first the question of **costs**, which will have to be proportionate to the level of security achieved; it will furthermore be necessary to clarify the roles and responsibilities for each of the actors involved in the rail security ecosystem;
- Then, there are many **legal** questions, such as passenger name record, data sharing, data protection, privacy, and many others more. While these will not be typical railway issues, it will nevertheless have to be clarified how these matters are treated in the context of railways;
- But, most importantly, the issue of **how to approach secu-**

urity will be key: can security be added onto other sector specific issues that are already more advanced, such as safety or theft protection for example? In other words, can security be treated as an expansion of already existing practices, or does security have to be approached afresh with new actors and new rules, with the risk of creating yet another layer of rules, regulations and corresponding actors on top of the existing ones? And if so, who should be the leader (is it the railway sector - namely DG MOVE and the national railway regulatory authorities, or should the matter be treated at another level - namely DG HOME and the national Ministries for Internal Affairs)?

But, rules and regulations – be they expansions of existing or totally new ones – will not be the only actions needed to address the newly emerging challenges to security in the railway sector and industry. Technology inevitably will and will have to play a key role as well. “Security by design” has emerged as a concept that will build certain levels of security into technology itself. But even here arises the question of (technological) standards and some rules may well be necessary so that security by design remains affordable and non-discriminatory. The participants to the 13th Florence Rail Forum also stressed the importance of involving both staff and customers into the various security measures, be it by way of training (staff) or sensitizing and educating (the customers).

In all the discussions it appeared clearly that rail is not air: unlike air where security can and is approached from a closed or confined system perspective – the idea being to seal off the airplane or the airport from its surrounding environment –, this is not possible in rail and public transport more generally. Both are by definition open systems, concerning much bigger numbers of people (e.g., mass transport) and involving public spaces

and free movement (of people). Besides the fact that it would be technically impossible to seal off rail and public transport from its environment, such an approach is also not desirable. The goal must be to increase security in rail and public transport while preserving the public space, mass transportation and free movement. The security aspect should not be used as an excuse to stop the process of integration of the Single European Railway Area and to block the potential development of the stations into new opportunities for business and an element of attraction for the systems as a whole. In fact, stations are increasingly becoming commercial areas and gathering points not only for the travelers and the commuters. In this sense rail and public transport must be preserved from the airlines' approach to security, as this approach would run contrary to everything public- and rail- transport stand for.

Published in May 2016

Regulating the Performance of European Railways: What can we learn from Air Transport?

Matthias Finger

The 12th Florence Rail Forum took on a difficult and controversial topic, yet one which is already on the Commission's agenda: the question of regulating the performance of European Railways. But, what is exactly railway performance? What exactly should be regulated and how should this be done concretely?

The idea that is guiding the European Commission is to proceed by analogy to air transport, where, in the context of the creation of a Single European Sky (SES), a performance scheme has been set up in 2004 ([Regulation 549/2004](#)) defining mandatory performance targets for the different European Air Navigation Services Providers (ANSPs). This analogy is certainly worth exploring and perhaps even translatable into the European railway sector. Yet, it is certainly also worth to do some bold thinking before rushing into exporting an approach that is arguably working in air to rail. I will do this in three steps: I will first discuss what, in my mind, rail performance should be about. I will then raise the question of the conditions for such performance.

Finally, I will critically discuss the translation of the air approach into European railways.

What is rail performance?

Let us start from the times when railways were national, vertically integrated monopolies, a time when, by the way, performance was not really an issue because the railway system was seen as a public good. Yet, at that time measuring and “regulating” rail performance would have been relatively easy: one would have simply had to define politically desirable “performance indicators”, an approach which, probably, would have been inspired by new public management philosophy, treating the integrated railway company as a more or less autonomous public entity. And this is still the approach that underlies the Boston Consulting Group’s rail performance index, whereby the performance of the main vertically integrated railway companies is compared along a series of indicators.

There is nothing wrong with this approach, except that many railway companies have, since, been vertically separated (to different degrees) and access competition is starting to take hold. So, what is performance now? What are the relevant actors whose performance needs to be measured (and perhaps even regulated)? Everybody would probably agree that the performance of infrastructure managers (IMs), train operating companies (TOCs) is worthwhile measuring (and it is done, at least to a certain degree). One should, however, also consider the performance of stations in the case they are autonomous entities or the performance of railway regulators, for that matter, as it certainly plays a key role in the performance of the overall railway system. But even more problematic is the fact that the performances of the different actors that make up a national or even the European railway system, added together, will not automatically lead to a performing system. So, should railway performance be thought

from the perspectives of the different relevant entities that make up the European railway system, or should it not rather be thought from the perspective of the system as a whole and then, perhaps, be broken down into the different relevant actors that do play a significant role in the overall system? In the first case, this is, in my mind, not really a matter of regulation, but rather a matter of corporate governance, whereby the owners – or the service contractors (generally the government) – should set performance targets and hold management accountable against them. In the second case, the question is whether it even makes sense to set system-wide performance indicators, as no single actor can be held accountable for (not) achieving them, given that system performance is by definition a collaborative effort. Either way rail performance should be seen in the general context of mobility, since the railway system is, after all, part of the intermodal transport system.

Conditions for rail performance

This leads me to consider whether we should not rather pay attention to the **conditions of the performance** of the overall (national or even European) railway system, rather than to the performance of the system itself. At least when it comes to regulation.

By conditions for performance I mean, technical aspects such as interconnection and interoperability in the case of the railway sector and standardization as the main underlying condition. It is standards that will ultimately lead to the smooth integration of the European railways by way of harmonizing infrastructures, signaling, rolling stock, data exchange and many other things more. I would claim that the progress in matters of performance of the overall railway system, be it at a regional, national or at the European level, will be almost totally correlated with the progress made along these different standardization dimensions. So,

should we not rather measure or even regulate the performance of standard developers on the one hand and monitor or even regulate the implementation of these standards on the other hand?

In the first case (standard development), we might again be inspired by the air transport sector namely the promotion of standardization research by way of SESAR (Single European Sky ATM Research) and the designation of a so-called “deployment manager” to make such research operational. In other words, this not so much a matter of regulation, but rather a matter of inspiring, facilitating, financing and then implementing standardization together with all involved stakeholders.

In the second case (standard implementation) I do indeed see a case for regulation, namely when it comes to mandating and ultimately regulating the adoption and implementation of technical standards by the different concerned operators, in particular IMs and TOCs, but probably even suppliers. This is typically the task of the European Rail Agency (ERA), which, perhaps, needs to be strengthened so as to perform this task.

Air and rail performance: analogy or more?

This leads me to the original thought of the European Commission, namely the ideas (1) to measure and (2) to regulate the performance of railways as it is currently done in air. Without going into details as to how this is done in the European air transport sector, it is nevertheless essential to recall the exact scope and subsequent limitations of such an approach: what we are talking about here are, as stated in the beginning, the ANSPs, which are the equivalent of the IMs in the railway sector. There is, indeed, much to be said about independently regulating the IMs along predefined key performance indicators (KPIs). However, these KPIs cannot simply be imported from air transport, as the nature of the rail network – namely its capillarity, along with the distinction

of different types of networks (e.g., high-speed, long-distance, agglomeration) – is better compared with electricity or gas rather than air. Also when it comes to the method of defining, measuring and ultimately sanctioning performance, the approach – and the governance of the approach – chosen in the case of air offers significant room for improvement and would probably have to be redesigned in the case of rail. It is, among other things essential to “keep it simple”: as a first step, let us define and measure KPIs; then, if they work, more complex KPIs can be introduced.

However, the ultimate goal is entirely identical with the air transport sector, namely to achieve a performing, interoperable und ultimately fully integrated European rail infrastructure.

The Digital Single European Railway Area: How to Think it?

Matthias Finger

The digital transformation is rapidly unfolding since the late 1990s affecting all industries and sectors. Not astonishingly, it will not stop at the railway sector either and will inevitably transform it. The 11th Florence Rail Forum was dedicated to understanding and exploring how this digitalization can and will affect the development of the Single European Railway Area as foreseen by the European Commission since 2012 ([Directive 2012/34/EU](#) of the European Parliament and of the Council of 21 November 2012 establishing a single European railway area). Here I would like to do three things: I will first recall the main features of this so-called digital transformation. I will then crystalise these generic features of how digitalization is affecting all industries and sectors. Finally, I will try to anticipate what such digitalization is likely going to do to the European railway sector.

The four features of digitalization

The digital transformation can be characterised by the four following features, which, all combined, make up for what we call today “digitalization”:

- The probably most basic feature is the fact that physical states or characteristics can be replicated digitally, for example by digitalizing voice or by taking pictures. By now, almost anything can be digitally replicated including sound, images, temperature, smell, etc. As a consequence, we produce digital data, which can then be stored as such.
- Growing computing power not only allows ever bigger amounts of such data to be stored but, more importantly, analyzed by ever more sophisticated algorithms. The growth of such computing power and analysis has been exponential ever since it started.
- The third key feature of the digital transformation pertains to so-called connectivity, i.e., the ability to access such (analyzed and non-analyzed) data ever more instantly and, more importantly, from any place on the planet (e.g., global access). Such exponential growth in connectivity of course results from substantial progress in telecommunications, first in the area of mobile telecommunications and more recently in the area of fiber optics.
- The fourth, and most recent feature of this digital transformation stems from the progress in the area of geo-localization, itself the result of significant progress in satellite technology. As a result, all movements can now also be digitalised, analyzed and accessed.

Industry transformation resulting from digitalization

These four features combined are now affecting all industries and sectors, and more generally all societies and cultures on a planetary scale. Let me focus, here, on industries and sectors, and briefly outline how they already and continue to be affected by digitalization. I will do this in the following three steps:

- As a first step, digitalization now allows for the (digital) duplication of any physical value chain, i.e., from production (supply) to distribution (consumption). Such duplication is simultaneously also a globalization in that this digitally duplicated value chain is now globally (and electronically accessible).
- As a consequence, the customer interface evolves from being physical (of course the products are still physically delivered) to becoming electronic. In other words, the customer is now before all a digital customer, even though he or she consumes a physical product.
- This, thirdly, changes the nature of the business: whereas the traditional physical business comes under pressure because it can be controlled and ever more optimised by the ones who control the electronic (global) value chain, new business models can now emerge at the interface of the owner of the electronic value chain and the (digital) customer.

This digital transformation of any physical value chain already has transformed and increasingly will have the potential to transform any industry, making any of the industries potential a global one, and degrading any of the local and physical activities to a simple execution of globally controlled data flows.

Towards a Digital Single Railway Area?

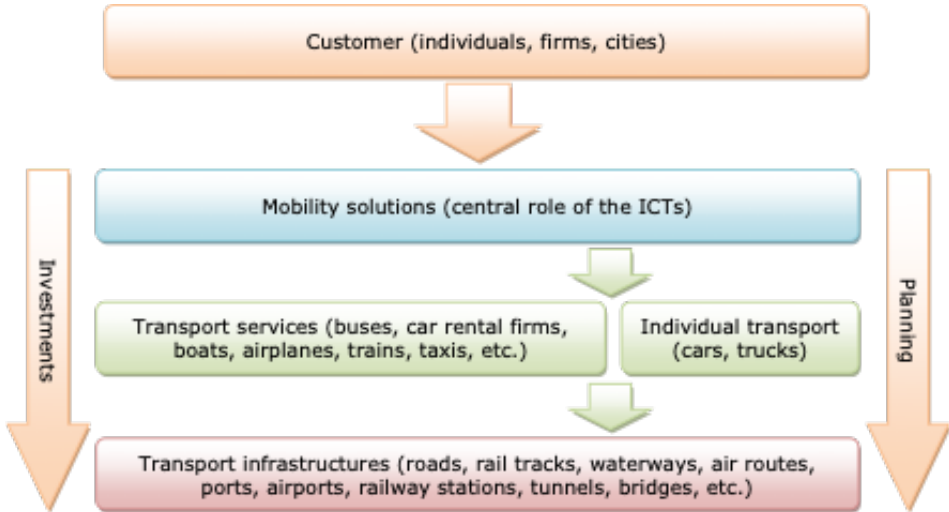
As said above, the digital transformation will not stop before the national and the European railway sector. The above features will inevitably also apply to the railway sector (industry) and transform it. Physical transport of persons and goods will be duplicated electronically, digital intermediaries will emerge and place themselves in between the traditional railway operators and the (now digital) customers, thus degrading railway operators to simple “transporteurs” of people and goods. Very concretely, companies with access to data will use these to offer customised mobility solutions.

This creates opportunities for European (and global) “digital intermediaries”, offering (digitally) integrated timetables, tickets and ultimately transportation services. This also constitutes the opportunity for creating a digital Single European Railway Area, something which can be actively favored by regulatory policies of the European Commission. Digitalization is a process that can reinforce integration supporting the European Commission’s goal of creating a digital Single European Railway Area, as digital transformation will likely require the different European Actors to act together in order to withstand competition from over the top service providers such as google..

However, this evolution will, most likely, not stop at the railway sector: indeed, digitalization has the potential to integrate all transport sectors and create integrated (digital) mobility solutions, in which railways will simply be one, unfortunately not particularly attractive transport mode. The following graph summarises this likely evolution, i.e., implication of the digitalization of transport.

This, finally, also raises the question at which level such digital mobility solutions will make most sense, i.e., will ultimately be offered. Will it be the urban (agglomeration), the national or the

European level? The answer to this question will ultimately determine the actions of the European Commission in matters of regulating (digitalised) railways in particular and transport in general.



Published in May 2015

Rail Freight Corridors: The Challenges Ahead

Matthias Finger

Rail Freight Corridors (RFC) are the backbone of the European Commission's vision for rail freight 2050, as laid down in the 2011 White Paper on Transport. Indeed, to achieve a reduction of 60% in GHG emission by 2050, the transport system should become more competitive and efficient in the use of resources. To do so, more than 30% of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050, facilitated by efficient and green freight corridors . The implementation of the RFCs should be consistent with the development of the Core Network Corridors introduced in 2013 to facilitate the coordinated implementation of the core network outlined by the new Trans-European Transport Network (TEN-T). Namely, the new Core Network Corridors are multimodal (rail, road, aviation, inland waterways and ports) corridors covering passengers and freight, their main role being to remove bottlenecks, build missing cross-border connections and promote modal integration and interoperability. The integrated development of the RFCs would strengthen the position of the rail transport mode within these corridors. Nine such RFCs have

been determined with the aim of offering customer-oriented rail freight services of quality with improved capacity and harmonised standards (full ERTMS deployment required by 2030) They are to be managed by a dedicated governance structure offering a Corridor One-Stop-Shop (C-OSS) to the customers.

The 10th Florence Rail Forum discussed the main challenges to the implementation of the RFCs and to making European rail freight more competitive more generally. The four following challenges were identified.

- The challenge of bureaucracy has indeed not yet been fully removed: inhomogeneous rules continue to exist between the different countries, creating unnecessary roadblocks to smooth rail passage. Such roadblocks – which are not by themselves political in nature – should in principle be removable, and a more active use of the information and communication technologies should indeed facilitate the exchange of data and information among the corridor operators (and ultimately among all network operators), as well as between the different infrastructure managers and their customers.
- It will become increasingly important and, at some point required, to develop performance indicators for the different corridors. This will automatically lead to the benchmarking of corridor performance. Measuring performance in infrastructure management has already been introduced in other sectors, the aviation sector, and especially air traffic control, being a case in point and perhaps inspiration for RFCs.
- RFCs, as said above are the backbone of a truly European rail network. The gradual Europeanization of RFCs is therefore another big challenge. Indeed, RFCs should not simply be optimised each for themselves; interoperability on these corridors should become European and there is strong need for a European body to oversee this process. The European Railway Agency, is probably the most likely candidate.

- This also means that we should move, over time, from a single (9) corridor-perspective to a European network perspective. This will of course raise further challenges in terms of governance (how to move from a governance of a single corridor to a governance of a network?) as well as in terms of regulation (how to move from the regulation of one corridor to a European wide freight network regulation?). This in turn will raise the question of the role of the national regulatory authorities, which will most likely have to collaborate more closely so as to ensure a coherent regulation of the European network.

In addition, the Forum raised, but did not fully discuss a series of other issues which will inevitably emerge as the RFCs are becoming fully operational. Among those are the issue of the multimodal interfaces of the rail corridors with ports and terminals. Inevitably, ports and terminals will have to be treated together with the RFCs so as to ensure a smooth customer experience in the future. Another core issue that remains so far little addressed is the question of conflicting demands between passenger and freight. Especially in densely populated areas passenger transport requests are prioritised over freight, thus contributing to freight's lack of competitiveness with road transport, a largely unaddressed issue so far. This in turn raises the question of dedicated investments for boosting rail freight. Finally, there is the issue of the growing role of digitalization of transport, passenger and freight. New operators exploiting transport data are entering the freight (and the passenger) markets bringing with them new business models with yet unclear consequences for rail freight operators. The deployment of IT infrastructures in RFCs therefore requires particular attention.

In this sense, RFCs can and must be seen as a laboratory or experiment, a testing ground for European rail coordination, integration, performance and ultimately competitiveness. An “intelligent deployment” of corridors, paying particular attention to standards (ERTMS), IT solutions and targeted investments is required. It is obvious that RFCs need to succeed in order to achieve the vision of a European rail network that is capable of competing successfully with road transport.

Published in December 2014

The 4th Railway Package: Further Challenges for the Regulator

Matthias Finger

The aim of the 9th Florence Rail Forum was to discuss the proposed 4th Railway Package, especially the aspect of the opening of the domestic rail passenger markets. Other elements of the package, such as the technical pillar and the financing components, had already been discussed previously in Florence.

To recall, the European Commission issued a Communication on the 4th Railway Package (COM(2013)25) in early 2013, only one year after the approval of the Recast. The European Parliament subsequently adopted its first reading position on the six legislative proposals in February 2014. But, as of today, a consensus on the different elements of the proposal has not yet been reached, and the Package is still in discussion with Council.

Still it appears that on the so-called "technical pillar" (safety and interoperability Directives along with a new regulation on the European Railway Agency) the Council is supporting the Commission's proposal which had already been voted by the Parliament. Overall, there seems to be a broad agreement on the need to remove existing administrative and technical barriers to enabling the Single European Railway Area.

However, opening up the market in domestic rail passenger transport is more controversial and two major issues are particularly under discussion, namely (1) the opening up of domestic commercial lines, where the main challenge is to guarantee fair and open access to the network (especially in those countries where vertically integrated railway undertakings operate) and (2) the complex relationship with services provided under Public Service Obligations (PSOs). Here, the 4th Railway Package actually amends Regulation 1370/2007 and the Commission foresees a differentiation between smaller scale contracts (which may be directly awarded to an operator) and larger contracts (which will have to be opened for competitive tendering).

In both cases, the national regulator will have to play a key role and will thus have to be considerably strengthened. Already in the Recast, the regulator had been given more powers and the 4th Railway Package is further strengthening its role, especially when it comes to overseeing the independence, the transparency, the impartiality and the non-discriminatory behaviour of the infrastructure managers, as well as of the services facilities managers. This role is even more important in the case of integrated railway undertakings. What is new is the constantly growing powers of the regulator in this matter.

However, in addition, the 4th Railway Package raises a series of new and unprecedented challenges for the railway regulators worth highlighting, namely:

- A first challenge is to **regulate “reciprocity”**: as a matter of fact, the European Commission supports a ‘verification clause’ according to which integrated railway companies could be banned from operating abroad, if they do not guarantee free access in their home country (COM(2013)29). It is not clear, how this provision can be dealt with by the regulators.

- A second challenge pertains to **the role of the regulator in competitive tendering**, notably when exclusive franchises (so-called “competitive contracts”) are awarded (as opposed to open access). In this case, does the regulator have to ensure competitive tendering (and how would he do that concretely?) or should he simply serve as an appeal body in the case of complaints?
- Related to this is the third challenge, namely the **role of the regulator in performing the so-called “economic equilibrium test”**. This test must be applied by regulators in order to decide whether competition in the market (open access) or competition for the market (competitive tendering) has to be applied.
- Furthermore, the idea has emerged that a **combination of competitive and PSO contracts** could be awarded. This constitutes the fourth new challenge for regulators and raises in particular the question of how to “package” such competitive and PSO contracts together: what role exactly will regulators have to play when competitive and PSO contracts are combined?

In addition to these four very concrete new challenges for regulators, further questions arise from the 4th Railway Package as to their future role. These questions will inevitably have to be addressed at some point by the policy makers. They are as follows:

- As regulators will, sooner or later, get involved in PSO contracts, the question arises as to whether they should also tackle PSO financing. And how concretely they would do that.
- Another related question pertains to the future relationship between railway regulators and Transport Authorities, as it is these Transport Authorities that currently award the PSO contracts.

- Furthermore, the question will arise as to whether regulators should play a role in transport plans, infrastructure developments and other planning instruments, as they all have the potential of being discriminatory.
- Another question will pertain to performance, especially the performance of the infrastructure managers: should regulators oversee their performance, a question which is in direct relationship with the costs of using the infrastructure.
- Finally, the question remains as to which role regulators should play in ensuring passenger rights, the enforcement of which, has, so far, not yet been explicitly attributed to rail regulators.

Published in May 2014

Financing Railways: What Role for Regulation?

Matthias Finger

- It is common knowledge that railways require substantial financing... traditionally, such financing has come from the national and regional public sector, but, in the context of the crisis of public finances, railways increasingly also look for innovative financing models such as the EU funds (either through the new Connecting Europe Facility and through regional funds), new involvement of national and supra-national banks (i.e., European Investment Bank), and greater contributions from the private sector. It is especially in this situation where regulatory policies and regulatory conditions are becoming paramount. This was the topic of the last Florence Rail Forum. Three considerations seem to me to be important in this respect:
- the need for a stable and coherent regulatory environment,
- the European Commission's philosophy on infrastructure financing, and
- the European Commission's vision on service financing.

Regulatory economics clearly states that a stable regulatory environment is key, namely because of the long-term nature and asset specificity of investments in infrastructures in general and in railway infrastructures in particular. In addition, the literature is clear about the fact that one also needs a coherent regulatory environment, notably when it comes to critical technical functions that affect the entire infrastructure system, such as interconnection and interoperability standards. But coherence is also important between national regulatory policies and supra-national (European) ones. In the railway sector, particular attention must also be paid to the alignment of incentives between infrastructure and services, both in terms of system boundaries (international, national and regional transport) as well as in terms of the relevant time period (e.g., investments into the tracks and investment into rolling stock). Finally, in order to strengthen fair competition, attention has to be paid to the alignment of incentives between the different involved actors, such as the public authorities, the investors, the operators and the manufacturers.

The policy or rather the philosophy of the European Commission in matters of network industries' financing is quite clear and straightforward, based as it is on resolute unbundling (vertical disintegration): on the one hand, there is the network infrastructure (railway tracks, electricity grid, gas grid, telecommunications grid, etc.) whose financing can be public or private. Subsidies are generally allowed for the development of particularly onerous network infrastructure elements. Cross-subsidies and distortion of competition is not considered to be a problem because of the (theoretically) clean ownership unbundling. In the railway sector, it is clearly admitted that financing of the infrastructure comes from the public sector. Ideally, there is a distinction to be made between the financing of the development of the tracks (which clearly depends on public financing) and the operations of the infrastructure which, should be financed by track access charges, but which can also be subsidised by the public sector.

On the other hand, there are the services (e.g., energy services, transport services, communication services), which, ideally, should be financed purely commercially. This, in theory, should not be a problem because the costs of the infrastructure has already been separated out. In the railway sector, things are a little bit more complicated, yet can still be conceptualised clearly by way of a distinction between commercial railway services (e.g., long-distance passenger services, high-speed rail services, cargo services) on the one hand, and services under public service obligations (PSO) on the other hand. The former – i.e., both rolling stock and operations – should be financed commercially, while the latter – again both rolling stock and operations – can be subsidised. This to the point that rolling stock may even be owned by the PSO authorities.

So, on paper, all is well, and it seems possible to apply the general considerations that are valid for financing other network industries to the railway sector as well. Finances will be provided by the public sector for the infrastructure and for the PSOs, whereas the market will provide the financing for the rest. Because of clear unbundling there are also no market distortion issues, even though there may be market dominance issues. Regulation, however, is needed in matters of access to the infrastructure, pricing of the infrastructure, interoperability, interconnection, and scarce capacity management. Regulation is assumed to be strong and stable, so that this will not be a problem either.

Our Florence Rail Forum, however, discussed the reality of investments and this reality relates to regulatory policy and regulation. Three problems appeared particularly striking:

- There is first the problem that regulation is not strong and stable, resulting in the overall argument and admission by the EC that regulators have to be strengthened so as to ensure the stable regulatory framework that is required for

this overall approach to work. Not to mention the fact that this beautiful conceptual system has not (yet) been implemented European-wide either.

- There is secondly the problem that there are significant inconsistencies between the European regulatory framework on the one hand and the national regulatory practices on the other. There is often little coherence between the infrastructure managers across Europe, as well as between the different national regulators, all adding to the insecurity for investors.
- There is thirdly the problem of intermodality: indeed, one may question whether a coherent, stable and strong regulatory framework in the railway sector even makes sense, considering that competition comes from the road. As everybody knows, there are huge incoherencies between the way the road is financed and the way railways are financed. Only an overarching financing or pricing policy (e.g., mobility pricing) across the transport modes will ultimately create the security needed by the private investors into the railway sector.

In conclusion, one may ask whether it is advisable to first focus on the perfection of the model (unbundling, financing, regulation) or to open the black box of interoperability and to reconsider railway financing again in this new light (e.g., mobility pricing).

Published in June 2020

PART III

Aviation: Facing the Dual Challenges of Decarbonisation and Competitiveness

A Resilient European Aviation Market: Lessons Learnt

Juan Montero and Matthias Finger

The COVID-19 crisis has unveiled the limits of competitive markets in aviation. New regulatory instruments are required to reinforce resiliency in case of shocks. Such instruments should protect the continuity of services, but not necessarily the continuity of specific players or established business models. These instruments should be systemic, taking into consideration the interdependency of the different actors of the aviation system (e.g., airlines, airports and ANSPs), they should always focus on Europe and not on a specific country, and they should be coordinated with general transport policy goals.

Aviation has already proven that it can deliver a single European market: aviation has shown that passengers can benefit from new services (more routes) and better prices thanks not only to competition but moreover to competition in a larger European-wide market. As such, aviation can serve as a model for other transport industries.

However, markets have limitations, particularly when it comes to ensuring the general interest, where service continuity is a must. Consequently, risk management is a fundamental chal-

lenge in a competitive market. If service continuity is required, public intervention might be necessary so as to reduce risks for the market players by assuming a part of it, at least those risks which are beyond the control of market players. COVID serves as an illustrative example, as public authorities have rushed to support market players.

It is widely acknowledged that the public intervention triggered by the COVID crisis has not reinforced a competitive single European market. The financial aid provided by Member States has unlevelled the playing field with obvious asymmetries, both geographically (North vs. South and East) and horizontally (network airlines vs. low-cost carriers; airlines versus airports). State aid control has been stretched to its limits, with interesting innovations such as the temporary framework, conditions on slots, aid linked to load factors, etc. Under the current framework, risk in a European market is managed at a national level, taking into consideration national interests. The COVID crisis has also shown that there is no mechanism to ensure that the necessary crisis management reinforces rather than weakens competition in the single European aviation market.

It is, however, interesting to see how the post-COVID recovery unfolds, sometimes with surprising results. Indeed, market forces seem to be gaining ground in shaping the industry after COVID. Despite asymmetries in State aid, continued vertical tensions between airports and airlines, and the flexibilisation of slot usage rules, there is evidence that the carriers which were better capitalised before the crisis have been able to better adapt to the shock. The most efficient carriers, even if they have not received financial aid, are growing and gaining market share, profiting from the new opportunities as the sector recovers. This is a trend to be supported, for example, by way of merger controls, as consolidation is reshaping the industry.

Still, anticipating new shocks in the future, it will be necessary to develop mechanisms which will allow for public intervention

to take some of the risks while minimally distorting competition in the single European aviation market. Also, the importance of State aid can probably be reduced, firstly, if market players are better capitalised, which, in turn, could be achieved by putting some conditions when licensing air carriers. Secondly, an EU financial instrument could be introduced to counterbalance the asymmetries created by national measures.

Such new instruments should reinforce a more systemic approach to crisis management. Indeed, public intervention should not merely consider the situation of isolated companies (either airlines or airports). On the contrary, one would have to take into consideration how the financial stress spreads across the industry and how the market power of some passes on the pain to others. One should also consider the weakest links in the system, which will require more support as they are more exposed to competition, particularly international competition. Furthermore, the new instruments should not play against competition, for instance, introducing new moral hazards, but reinforce competition, rewarding good practices and efficiency. The system relies on competition to govern the sector, so crisis management policies should reinforce the underlying systemic forces, not weaken them. Finally, the systemic approach should aim to take into consideration the broader European perspective. If the aviation market has grown beyond national borders, a systemic perspective must include the entire single market. A closer collaboration of national regulators, as it exists in other regulated industries, and a more active role for the Commission, can certainly lead to a more effective governance framework. ACER, the European Agency for the Coordination of Energy Regulators, was mentioned in this regard as a possible inspiration.

Overall, the goal of the new instruments should be to improve the overall resiliency of the European aviation system, not to protect the status quo. General interest activities require continuity. Public intervention, including financial support to service

providers, might be necessary to guarantee continuity in service provision in some cases. However, such public financial support should never have as its main goal to ensure the continuity of specific companies or specific business models, for that matter. In short, resiliency instruments should not fight against market trends but reinforce them, also taking into consideration the overall policy objectives such as the green and digital transitions, as well as more traditional objectives such as connectivity and passenger rights.

What Role for Competition Rules when Restarting Aviation?

Juan Montero and Matthias Finger

The pandemic has forced the aviation industry to an almost halt in 2020, at least when it comes to the provision of passenger services: the number of active routes, as well as frequencies were substantially reduced; passenger volumes drastically declined. State aid was massive but asymmetric, benefiting airlines more than airports, airlines in Northern Member States more than airlines based in Southern and Eastern Europe, and large network carriers much more than regional airlines and low-cost carriers. All this challenged State aid rules to the point that the Commission had to decide on a transitory framework for State aid rules in 2020, in force until 2022. But this may not be sufficient, and in any case, it is highly likely that mergers will ensue. Furthermore, this transformation of the competitive landscape in aviation must be placed against the background of the “decarbonisation imperative”, as well as in the context of pervasive digitalisation.

But the pandemic and especially its impacts are not over, and pre-COVID-19 passenger volumes may not return before 2024 or even 2025. What is more, the pandemic may well have accelerated certain underlying trends defining future air mobility, such as a substantial reduction in business trips as induced by digital-

isation, new traveling patterns by digital nomads, a certain “shift to rail” in European inter-city travel, etc. Overall, digitalisation will constitute an additional source of uncertainty for the industry: even if digital technologies may well increase efficiency in most value chains, a more efficient coordination within the sector but especially across the different transport modes will probably trigger new connectivity alternatives and changes in travel patterns. As a result, new habits and lifestyles might have an even more profound impact on aviation.

On top of this, decarbonisation may have an even deeper impact on aviation: the currently proposed basket of measures to reduce emissions (i.e., alternative fuels, ETS, electric aircraft etc.) will inevitably increase the cost of travelling by air, in turn profoundly impacting prices and therefore demand. There are even calls for “managing demand”, thus forcing the reduction in air travel through such means as the prohibition of certain routes when land transport is a viable alternative, etc.

In short, the aviation industry post-COVID will undoubtedly be different from what we knew. What does this mean for competition law to be applied in the air transport sector?

We think that these major transformations will have to be reflected in the application of competition law in aviation, and perhaps beyond: decarbonisation, digitalisation, new travel patterns, innovative business models, and many others more will require a more nuanced analysis and probably a review of the existing competition regulatory instruments. The role of competition authorities will be to foster, to the extent possible, a level playing field capable of ensuring that effective competition incentivises competitors to better adapt to the rapidly evolving challenges in an ever more turbulent environment. But what will this mean concretely for the regulation of competition in the air transport industry?

Clearly, the application of the rules on competition will need to be adapted to the new circumstances in the industry, and the different instruments (State aid, mergers, antitrust) will have to be applied in accordance with the new reality. But there is still a very high degree of uncertainty as to how the sector is going to evolve, and it may be advisable to simply extend the current transitory framework for State aid rules for another year or two. This will allow to better distinguish between structural and temporary changes. Already now, it appears that passenger reduction, for instance, is quite asymmetric, and it is not affecting all geographical areas and all types of travellers (business, leisure, etc.) in the same way, something that will call for a much more nuanced definition of markets.

Firstly, it is already quite obvious that much more public support will be necessary for the decarbonisation of the sector, probably in the form of investment aid for the decarbonisation of airports and aircraft, given that the COVID-19 crisis has dramatically weakened the financial capabilities and borrowing power of all industry players. Even though private investment has already started, public funds will be needed. Competition law instruments, and in particular the State aid rules, will have to take this phenomenal decarbonisation challenge into consideration. The inclusion of aviation in the proposed Climate, Energy and Environmental State Aid Guidelines is a short-term decision to be taken. Carbon contracts for difference is a tool to be considered. We think that competition should be a force leading the decarbonisation transition, rather than the transition being a reason to exempt the industry from competition and competition rules.

Secondly, the rules pertaining to operating aid to airlines in the form of start-up aid will have to be reconsidered. While the Aviation Guidelines define the conditions for start-up aid, these rules have hardly been applied in the past, given that start-up aid in normal times should indeed be exceptional. But these are not normal times, and airlines will need a more flexible approach to

start-up aid for the recovery period. And again, a more nuanced approach will be required, as not all airlines share the same business model. The type of aid for regional airlines serving smaller regional and remote airports is probably different from the type of aid required by low-cost carriers serving larger regional airports; routes serving large touristic destinations might benefit from incentive-based start-up tied to occupancy, whereas for routes serving remote areas start-up aid may be conditioned on the availability of service. Public Service Obligation (PSO) declarations and compensations, in turn, should also be analysed in light of the new circumstances of decarbonisation and alternative transport modes.

Thirdly, it seems clear already at this stage that the phasing-out in 2024 of State aid to regional airports, as defined in the State aid Guidelines, will have to be reconsidered, as COVID-19 has profoundly affected the financial capability of many regional airports to balance their accounts without State support. But, again, a more nuanced approach will be necessary: business travel, for example, seems to be recovering much more slowly than leisure; recovery also appears to be asymmetric in terms of geography. As the current temporary framework expires in mid-2022, new temporary rules for the recovery period will be necessary, and a more flexible approach to regional airport financing will have to be drawn up beyond 2024.

Finally, a new wave of post-COVID mergers can be expected during the coming months. These mergers, and perhaps even more so the response of the competition authorities, will shape the industry for decades to come. But in any case, further consolidation will be likely, making the EU aviation market increasingly resemble the US one.

Pressure to approve mergers in light of failing airlines will make the right definition of remedies even more relevant than in the past. However, the remedies of the past, namely making scarce slots available for newcomers, have not always proven

effective. Whereas in congested airports, slots are indeed a real bottleneck, making them available for other carriers is an effective tool. However, in most European airports, slots are not the real barrier to entry for newcomers. As a consequence, slot remedies were not taken up by alternative carriers even years after the remedy was adopted.

More innovative remedies might therefore be necessary, namely remedies focused on the market failures created or reinforced by the merger. For example, if a merger creates a situation of super-dominance on specific routes and powerful network effects, ensuing competitive advantages could be shared, temporarily, with competitors, for example, in the form of interlining agreements and share code flights.

The air sector has embarked on and will continue pursuing a very profound transformation. While some effects of the pandemic are only temporary, requiring temporary adaptations of the rules on competition, others are here to stay as they reflect profound decarbonisation and digitalisation transformations. In this case, competition rules must be adapted. Such adaptations, however, should not diminish competitive pressure but rather strengthen these competitors that better respond to the underlying trends. It is not the role of competition authorities to protect the status quo but to ensure a level playing field for competitors to face the new challenges.

Published in November 2021

Decarbonising Aviation...but how?

Matthias Finger, Juan Montero and
Teodora Serafimova

The debate about the decarbonisation of aviation has considerably evolved as of recently: indeed, today we no longer question the urgency or even the necessity to decarbonise, as this has been broadly accepted and recognised by the industry (i.e., manufacturers, airlines, airports and air traffic control). We have now moved on to the next stage, i.e., to the discussion about the best strategy to reach the goal: how to minimise the adverse effects along a transition path? How to orchestrate the necessary actions by the different actors involved in the most effective manner? What should be the role of the public authorities? As reaffirmed by the discussions of the 16th Florence Air Forum, consensus on these questions is yet to be reached.

The European Union has embarked on an ambitious transition plan to meet the goals set in its European Green Deal, i.e., to transform Europe into the first climate-neutral continent by 2050. Decarbonising transport is one of the cornerstones of the Green Deal, it is laid down in its subsequent Sustainable and Smart Mobility Strategy, and followed by concrete legislative proposals as part of the recent Fit for 55 Package.

Within the transport sector, aviation poses a challenge, as it is particularly difficult to decarbonise for technical reasons. In view of this, our 16th Florence Air Forum also debated whether aviation can substantially reduce its emissions without embarking on a significant curtailment of output. And if output were to be negatively affected, should this be promoted, considering Europe's strong commitment to the free movement of persons and goods, among others?

Still, it appears clearly that a smart combination of different measures can steer aviation to net-zero CO₂-emissions by 2050. Reaching this goal is seen as both necessary and doable. The commitment of the European industry has been made forcefully by the airlines, airports, manufacturers and air navigation service providers and is convincingly laid out in its report "*Destination 2050 – A Route to net-zero European aviation*". This report is only one of many publications from the industry signalling their commitment.

Destination 2050 clearly shows that aviation can continue to grow despite a basket of necessary measures. Already by 2030, net CO₂ emissions from intra-European flights could be reduced by 55% compared to 1990 levels through a combination of four types of measures, namely technological improvements of airplanes (e.g., aircraft design, engine efficiency, electric propulsion) and subsequent fleet renewal, sustainable aviation fuel (SAF), operational improvements, and market-based mechanisms such as the EU Emissions Trading System (ETS). Policies favouring modal shift (e.g., high-speed trains replacing some short-haul routes) can further contribute. The collective implementation of these measures, the industry report claims, could result in a peaking of absolute emissions from European aviation in 2019.

But all this costs and the bill is likely going to be hefty. It is widely understood that the industry cannot make the transition

without solid support from the public authorities, both at the EU and Member State levels. And it is not only that the transition will be expensive; in addition, uncertainty, especially when it comes to disruptive technological developments, such as electric- or hydrogen-powered aircraft, poses a level of risk which cannot be borne by the private sector alone. A conducive regulatory framework along with public financial support will therefore be necessary. And the EU has already established a Partnership for Clean Aviation **as part of the EU Horizon Europe framework programme for research and innovation**; Member States are also active in providing research and development funds. But, such funds should only reinforce private investment, which is already present and growing.

Most other measures, including SAFs, which are technologically already mature, will require “smart regulation”, to ensure that these fuels are truly sustainable and that the entire ecosystem evolves in a coordinated manner. Indeed, investment risks can be considerably reduced if the introduction of new aircraft technologies, new fuels, ATM measures, taxes and incentives is well coordinated. No private actor alone can take the lead, as the challenge is too massive for any company to carry on its own. For example, airlines would only be able to commit to sustainable fuels if these are supplied in a minimum number of airports. Conversely, airports and other players will only invest in making these new fuels available if airlines end up making use of them. Here, the Commission’s ReFuelEU Aviation proposal, which seeks to oblige fuel suppliers to blend increasing levels of SAFs in jet fuel taken onboard at EU airports, could be a step in the right direction. Different regulatory tools can and must be used to foster and even impose a coordinated transition.

Such smart regulation will also have to make sure that the competitiveness of the European industry globally is not damaged but, quite to the contrary, is strengthened in the long run. This means that Europe is well positioned as the continent where

the most efficient aviation technologies are developed, prototyped, and adopted first. Alliances, both public and private, must be built to convince, and perhaps even help, the rest of the world to embark on the same decarbonisation journey.

All this must be done in a way that ensures a level playing field inside the EU but also globally. The transition should not provide unfair advantages to certain companies against others, nor to certain transport modes against others. A coordinated transition is necessary, but coordination does not mean the preservation of the *status quo*. On the contrary, market mechanisms should reward the players that make the right investments and adopt the best business models. Regulation, including State aid rules and the EU taxonomy for sustainable activities, should ensure that incentives are correct and the transition is fair. There will inevitably be winners and losers, but the role of smart regulation is not to pick the winners but to let them emerge from competing on a level playing field.

Still, it is probably illusory to think that such an ambitious decarbonisation path can be achieved without reducing demand compared to business as usual. And some form of modal shift is not only desirable but in any case going to take place. Also, the higher costs of new fuels and new technologies capable of substantially reducing emissions will inevitably shift some demand to transport modes which are less challenged, such as railways (which already enjoy the lowest emissions per kilometer and unit transported in Europe¹²). Still, reducing overall demand for air transport should not be a policy objective per se. Air connectivity has always been an important element of European aviation policy, inside some Member States, but more importantly for the EU as a whole. Air is often the main (and sometimes in practice even the only) available transport mode (e.g., islands, remote areas, long-haul trips). As such, the overarching policy objective

12 European Environment Agency, (2021), Rail and waterborne – best for low-carbon motorised transport, <https://www.eea.europa.eu/publications/rail-and-waterborne-transport>

in this regard remains the mobility of European citizens, albeit now from a more systemic view by the always most environmentally efficient mode of transport.

A decarbonised aviation sector will be a different sector. There will be winners and losers as different technologies will be deployed, new companies will grow, and new business models will emerge. The role of the public authorities is to accelerate the reduction of emissions while ensuring a fair transition, both for industry players and for passengers.

Airports as 'Enablers' for the Aviation Sector's Take-Off Towards Net-Zero Carbon Emissions

Matthias Finger and Teodora Serafimova

About a year ago, the European Commission adopted its [European Green Deal](#), which sets the ambition of making Europe the first carbon-neutral continent. To this end, a 90% reduction in greenhouse gas emissions by mid-century would need to be delivered by the transport sector collectively, with all modes contributing their fair share. While in the meantime, the onset of the COVID-19 pandemic has brought about unprecedented challenges for most sectors of the economy, it has also become clear that the Commission's level of climate ambition remains unchanged. The recovery phase has been framed as an opportunity to accelerate the shift towards a more sustainable, smarter, and resilient mobility system. In its recently published [Sustainable and Smart Mobility Strategy](#), the Commission lays the foundation for how the EU transport system can achieve its green and digital transformation while becoming more resilient to future crises.

Aviation, in particular, has been among the most challenging sectors to decarbonise. This can be, at least partially, attributed

to the sector's fragmented nature, whereby the pieces that make up the sector are pursuing their own efforts to decarbonise and, at times, pulling in different directions. Unlike the other network industries, notably railways, electricity, and telecommunications, aviation has never been vertically integrated into one single State-owned company. Consequently, a systemic view has never been as pronounced in the aviation sector. A key message that resonated among participants at our [14th Florence Air Forum](#) was the need for a systemic approach to regulating the air sector. This becomes especially paramount when addressing the greening of air transport, where the efforts of the actors that constitute the aviation ecosystem will need to be coordinated, especially at its interfaces, to place the sector on a path towards net-zero emissions by mid-century. Below we take a closer look at one of these interfaces, namely the airports, and share some reflections on their role in aviation greening.

Low-hanging fruit for the greening of the aviation sector

While it is well known that the actual flight is responsible for the vast majority of the aviation sector's carbon footprint, airports themselves offer significant untapped potential for further and rather easy greening, especially when compared to airlines. Airports can make a sizable contribution to reducing aviation emissions by resorting to readily available technologies and practices. ACI's Airport Carbon Accreditation program, which has been in use for over a decade now, manifests airports' commitment to greening their assets in line with the net zero carbon objectives.

Greening efforts can touch upon many different aspects of an airport's construction and operation. The discussions revealed that numerous airports, amongst which Hamburg airport, are undertaking measures to boost their buildings' energy efficiency, renovating ventilation and lighting systems, and installing pho-

to voltaic facilities onsite. On the other hand, others, such as Geneva airport, are financially supporting ground handlers in their operations' electrification to reduce both emissions and operational costs. Airports are, moreover, seeking to improve public transport connections to city centers while promoting multi-modality and cleaner mobility forms. The AENA-operated Spanish airports, for instance, are electrifying shuttle bus fleets, installing the necessary charging infrastructure, and reinforcing electrical power grids. Schiphol airport is testing its taxi bot pilot, which allows aircraft to be towed from the runway with engines off, thereby saving kerosene and emissions.

Role models and enablers for sector-wide greening

But there is more to airports. Unlike airlines and air traffic management (ATM), airports are locally rooted, often locally owned, and generally subject to higher local pressures than airlines and ATM. In addition to mitigating the CO₂ impact of their assets and activities, airports have to manage local issues, including air and noise pollution, waste generation, and the potential damage to local wildlife habitats and water bodies. The above constitute good reasons why airports can and should act as role models and enablers for the greening of the entire aviation sector.

Schiphol airport's experience of electrifying its bus fleet back in 2011 is an illustrative example of how airports rely on the actual products available on the market to green their operations and services. We have seen from the discussions that 'early mover' airports have several ways of responding to technological bottlenecks in the supply chain, from boosting their research and innovation efforts to reaching out to suppliers outside Europe, and actually co-developing the demanded products themselves. What is more, larger airports are taking greening measures beyond their premises by supporting renewable energy projects and partnering with sustainable aviation fuels (SAFs) producers. Airports can leverage their unique position as an inter-

face between airlines, aircraft manufacturers, and developers of smart energy management systems to scale up SAFs production and deployment. Airports can accelerate the uptake of new aircraft technology related to electrification or hydrogen by securing the appropriate airport infrastructure, associated services, and, not least, set incentives.

What is more, we have seen that airports are increasingly becoming involved in the broader energy transition by procuring or self-generating carbon-neutral energy onsite. The enhanced cooperation between stakeholders from across the entire supply chain is key to enabling the uptake of SAFs and greening aviation. Of course, these possibilities will also depend on regional contexts.

A conducive regulatory framework for airports to act as enablers

While it is encouraging to see a handful of best practices today, shifting towards a more consistent effort across the airport community towards greening will necessitate enacting a conducive EU regulatory framework. One apparent market failure, and thus the need for intervention, was identified in ground handling: an industry marked by very low margins, rendering high upfront investments and greening considerations difficult. Greater involvement on the part of airports, through minimum CO₂ requirements in licensing calls for tenders, could accelerate greening in the sector. An overarching regulatory framework could also help to mobilise a collective effort towards greening, which is key to creating economies of scale and lowering the higher initial costs of newer technologies, such as electric vehicles.

Additionally, airports need to be encouraged and supported to act as enablers. Airports have several instruments at their disposal to stimulate cleaner and quieter aircraft, including airport charges, incentives, operational rules, and slot regulations.

Many airports are already modulating the charges paid by airlines based on environmental criteria, for example, by reducing charges for aircraft producing less noise and emitting less air pollutants such as NOx. However, airports' ability to modulate charges largely depends on the applicable legislation, which varies from country to country.

Given their global impact, CO₂ emissions from aircraft, on the other hand, are not considered under the direct control of the airport operator. Notwithstanding, because of their revenue-neutral nature, the modulation of airport charges could be examined for the CO₂ emissions from aircraft to potentially provide an incentive for airlines to replace older fleets with newer and greener aircraft powered by SAFs. This possibility for airports to incentivise cleaner aircraft based on CO₂ emissions could be explored in the context of a revision of the EU's [Airport Charges Directive](#) and the [Slot Regulation](#).

All in all, some fine-tuning and revision of the EU regulatory framework will be needed going forward. The challenge will be to ensure a systemic approach and coherence across the different legislation pieces, from airport charges and slots to the Single European Sky's implementation, State aid, the internalisation of the external costs, and the EU's Sustainable Finance workstream (e.g., EU taxonomy for sustainable activities, EU Green Bond standard), among others. All of these are interrelated and contribute in one way or another to the advancement of the European Green Deal agenda. Last but not least, the future regulatory framework needs to reflect the fact that airports are complex systems of interrelated facilities and assets, which, in turn, has implications for the measurement and management of their sustainability performance.

Published in June 2020

Air Services Regulation: Some Need for Review

Matthias Finger and Juan Montero

On 25-26 February 2020, the Commission, together with the Florence School of Regulation's Transport Area, has co-organised a workshop with the main stakeholders, where the different Policy Options were presented and critically discussed. In this *Observer* we will not go through each of the seven topics, nor will we discuss which options were favored or disfavored by the stakeholders. Rather, we will crystallise the main four lessons learnt from these two days of intensive discussions. Indeed, most of these lessons inform most of the topics, and we will highlight which ones of them in particular.

Lesson No. 1: "Back to the essence"

Overall, it appeared that, over the past 12 years, discussion about many of the provisions of the Regulation has become too convoluted, sometimes to the point that the initial intention of some of the provisions of the Regulation might have got lost in the process. Consequently, each of the provisions must be located back in its context 12 years ago; one must then ask what its intention was at that time, whether the Regulation's provisions have achieved their purpose, and therefore are still fit

for their initial purpose or may no longer be needed. In addition, one would need to reflect whether, in today's context, this very intention is still valid or has become obsolete or even "replaced" by new objectives. And this process is certainly applicable to all of the seven topics. For some topics – such as "Ownership and Control", "Traffic Distribution Rules" "Leasing" and "Public Service Obligations" – one may indeed ask oneself whether such rules can be relaxed or are even outdated today. But for other topics – such as "Principal place of business". "Temporary licenses", "Applicable labor law and competent jurisdiction" and "Price transparency" – one may ask whether the original rules are still adapted to today's much more competitive environment and much more sophisticated firm behavior. And again reflect to what extent the initial objectives may have been "replaced" by newer concerns/public policy questions.

Lesson No. 2: "Enforce existing rules before creating new ones"

It is not uncommon that EU Regulations take some time to be enforced. But for a legislation that is now over 10 years old, there are too many issues around enforcement. Some of these issues, maybe due to imprecise legislation to begin with, which is often the result of too many compromises in its formulation processes, itself the consequence of irreconcilable positions from the outset. These imprecisions should be addressed in the current revision, for example in the case of "Ownership and control", "Principal place of business" and "Traffic distribution rules". But it became clear from the discussions with the stakeholders that many of these enforcement issues were actually not the result of a lack of clarity, nor were they the consequence of some active obstruction by Member States. Rather they are the result of developments on the market and of a lack of powers, competence and resources of the respective regulatory authorities in the different Member States. A crosscutting focus during the current review

of the Air Services Regulation should therefore pertain to the strengthening of the national supervisory or regulatory authorities, including monitoring on behalf of the Commission that such strengthening actually takes place.

Lesson No. 3: “Consider the current revision to be part of an ecosystem of rules”

Aviation is a system, covering not only airlines, but also airports and air traffic management. And ultimately the system should deliver also for the EU citizens as passengers or consumers. This calls for an ecosystem approach to regulate these. In the case of Europe, the revision of the Air Services Regulation is by far not the only ongoing revision. Simultaneously, the Commission is revising the slots regulation, the regulation of airport charges, not to mention the 20-year old process of revision of air traffic management regulation so as to create, hopefully one day a Single European Sky. And indeed, it appeared clearly that many of the Air Services Regulation’s provisions actually relate or even directly impact other regulations, such as particularly those relating to slot allocation rules. This is particularly the case of “Temporary licenses” (important in the case of bankruptcies) or the determination who holds “Transport Operating Licenses” (in the case of takeovers). But airport slots, and the airport slot regulation, are also directly affected by “Traffic Distribution Rules” and “Public Services Obligations”. And this is just an example. It is therefore imperative that during this revision of the Air Services Regulation one asks oneself whether some of the existing rules should not better be placed in other aviation regulations. Sometimes these considerations go far beyond aviation regulation and pertain to State aid rules (e.g., “Temporary licenses” and “Public Service Obligations”), consumer protection (e.g., Price Transparency) or labor law (e.g., “Applicable Labor Law and Competent Jurisdiction” and “Principal Place of Business”).

Lesson No. 4: “Anticipate new challenges”

Aviation, like all the other infrastructures, face new challenges, namely decarbonisation and digitalisation. These challenges are in principle tackled separately, as the original focus of the Air Services Regulation, and of aviation regulation more generally, is on creating a Single European (internal) Market. There is the possibility to include in these revisions concerns stemming from digitalisation – such as for example rules about data sharing in the case of “Price Transparency” – as well as from decarbonisation, such as for example putting obligatory information on emissions onto websites, so as to have more transparency for the consumers.

Published in October 2019

Navigating Towards a More Efficient Airport Slots Allocation Regime in Europe

Matthias Finger and Juan Montero

Airlines have to obtain access to (or slots from) two different airports in order to be able to serve a given route. Yet, airports are under different national legal regimes, are owned by national or local authorities, are managed by these same authorities or by private operators and are otherwise very different one from another. Building a network of coordinated routes requires access to tens if not hundreds of very different airports. Slot allocation rules emerged at an international level in the early 1970s in the framework of IATA. Since then, regularly updated Worldwide Slot Guidelines are agreed in IATA and applied in almost 200 airports worldwide, which are declared to be congested. More than half of them are located in the European Union.

The rules regarding the allocation of airport slots in the European Union were introduced by way of Regulation 95/93, the so-called “Slots Regulation”, adopted in 1993. In other words, the currently still prevailing slot allocation regime was enacted more than 25 years ago. During the same period global passenger volumes have increased from 1,3 billion (1995) to 4,2 billion (2018). Minor amendments have been introduced over the years, but the last major review of the Slots Regulation, proposed in 2011, was

finally suspended. It could be time to review the European slot allocation regime.

The existing rules

At the center of the Slots Regulation are the so-called grandfather rights, which state that an airline can keep the slot indefinitely during the next same season, provided it uses it at least on 80% of occasions during that season. If the slot is used less than 80% during a season, the slot must be returned to the slot pool for a new allocation whereby the “new entrant rule” states that 50% of slots have to be allocated to newcomers. There are no restrictions as to what the slot can be used for (e.g., type of aircraft).

If an airport is declared “congested” (also called “level 3 airport”), i.e., when demand for slots outstrips supply, a so-called “slot coordinator” enters into function. This independent body is tasked with allocating the available slots in a transparent and efficient way.

It is important to note that both the IATA Slots Worldwide Guidelines and the EU Regulation 95/93 were created before air transport liberalisation unleashed its full dynamics, before the major flag carriers became privatised and before airports became really congested. At that time, all the big European airports were dominated by these national flag carriers. Consequently, the existing slots Regulation regime somewhat continues this situation into the liberalised and congested world.

Time for a change?

Since then, many new entrants, notably low-cost airlines, have entered the market with new business models and driven down air travel prices, thus leading to a huge increase in passengers. Incumbents, in turn, have become also more efficient, partly

thanks to alliances, mergers, joint-ventures, etc. The single European aviation market has undeniably delivered good results for passengers.

Astonishingly, the 25-year old slot allocation regime has managed to cope with these transformations. The existing rules have been able to accommodate new entrants, new business models as well as the increase in passenger volumes. However, the above outlined slot allocation rules have been extended to more and more airports, as they became also congested.

How to reduce congestion?

The most obvious way to reduce congestion would of course be to expand infrastructure capacity. Yet, this may be difficult because of lack of funds, limited availability of land, noise and environmental regulations and others more. But congestion can also be reduced by managing demand, as this is often done in other network industries. Road tolls can be a case in point. As is the case in many infrastructures, demand occurs at peak hours and expensive infrastructures are often built just to satisfy peak demand. By way of pricing peaks, demand could be shifted to hours and days with less demand or even to less congested airports. Here, regulation will typically have to be used to incentivise behavioral change.

And this would not be unprecedented in the air transport industry. For example, the most sophisticated algorithms are used to provide pricing incentives to balance demand by airlines themselves. Seats are available even below average marginal costs to attract demand when necessary, while the highest prices are proposed for the seats for which most demand exists. But such instruments – though prevalent in other network industries where access to infrastructures and pricing are linked – have not (yet) been applied when managing airport capacity.

Actually, congestion pricing was never used in airports in the past, most likely because airlines are particularly wary of price differentiation by airports, as it might cover up discriminatory strategies or, even worse, strategies to obtain monopoly rents from airlines. Pricing management techniques in the hands of actors with market power can indeed lead to abuse. Still, in our view, pricing of airport capacity (charging for the slot differently according to the hour) should be tried out, if it were only experimentally.

Pricing as way to promote a more efficient use of airport infrastructures

As a first step towards reducing congestion, some basic pricing measures could easily be introduced: indeed, airlines do not always use the slots they have originally requested. Incentives could for example be considered in the form of reservation fees or penalties in case slots requested are not effectively used or returned to the pool at the last minute.

One could also envision a secondary market for trading slots. The current Slots Regulation restricts the possibilities of slot trading, but there can be transfer of slots, one-by-one, between two carriers. However, despite such limitations, a market seems to be emerging, albeit today a quite secretive one. This is particularly the case when airlines are failing. Cases of using slots as collaterals in financial operations have also been reported.

A more flexible approach to secondary markets should indeed be envisioned. EU legislation already today encourages secondary markets for similar rights, such as frequencies in telecommunications markets. We think that, for example, access to slots from the secondary market by new entrants should be allowed, provided that there is transparency in the allocation process and that slots do not end up in the hands of incumbents with deep pockets. One could be inspired here by the anti-hoarding provi-

sions which are applied in the case of spectrum allocation.

We think that secondary trading can indeed lead to a more efficient use of airport capacity, at least when the market is liquid, as high prices will deter the use of certain slots by airlines extracting little economic benefit from them, such as freight services, services provided with small aircrafts or non-profitable routes. Rights over such slots should go to airlines with more ambitious strategies.

Exploring the synergies between slot allocation and airport charges

But secondary trading will still not increase airport capacity supply. Since revenue derived from slot trading will not revert to the airport infrastructure manager, it cannot be used for capacity expansion. As a matter of fact, it cannot even be used as a signal for much needed capacity expansion.

Actually, auctioning slots would be a more appropriate mechanism to introduce market incentives for a more efficient use of airport infrastructure. Slot auctioning has indeed been discussed by academics¹³ and proposed by competition authorities¹⁴. Still, implementation may be difficult and a very sophisticated design for the auction appears to be necessary in order to avoid overbidding and other exploitative practices.

But one does not need to go as far as auctioning, as price differentiations can already be introduced by some administrative measures, whereby an airport is defining different prices based on the scarcity of slots. As a matter of fact, price differentiation, based on objective criteria, is already possible under the existing Airport Charges Directive 2009/12 and is not always an illegal discriminatory practice.

13 Czerny, A. I. (ed.). (2008). *Airport slots: international experiences and options for reform*. Ashgate Publishing, Ltd.

14 Competition and Markets Authority, Advice for the Department for Transport on competition impacts of airport slot allocation, December 2018

In any case, any substantial evolution of the Slots Regulation in the direction of economic incentives will need to look at the synergies between the Slots Regulation and the Airport Charges Directive. The procedures for both slot allocation and for setting airport charges would have to be closely coordinated. Similarly, authorities regulating airport charges and slot coordinators would have to be similarly coordinated, if not integrated into one single authority altogether. As a matter of fact, this is the most common arrangement across the other network industries.

Published in June 2020

PART IV

Modernising European Air Traffic Management

The European Economic Regulator, a Catalyst for an overdue Change in ATM Governance

Matthias Finger and Juan Montero

The Commission is trying to reform the European Air Traffic Management (ATM) sector (not yet an industry) since 1999, with Single European Sky (SES) I in 2004, SES II in 2009, and now (2021) with the amended SES II+ proposal, which was originally presented already in 2013. The 15th Florence Air Forum focused on an important aspect of the SES project, namely economic regulation, and especially the institutional structure of economic regulation of air navigation service providers (ANSPs) in the SES. As a matter of fact, an EU ATM regulator could well constitute a catalyst for a long overdue change in ATM governance, and a boost for the SES.

To recall, already in 1998 Eurocontrol established a so-called “Performance Review Commission” (PRC). The PRC itself used the data gathered by Eurocontrol and is supported by its internal “Performance Review Unit” (PRU). With SES II in 2009, the PRC was designated to act as the Commission’s “Performance Review Body” (PRB). In 2016 the Commission created an own expert

group and designated it as the PRB, which has, since, supported the Commission in managing the performance scheme of the Single European Sky (during part of Reference period 2 (2015-2019) and for Reference period 3 (2020-2024)). At the same time, the PRC continues to serve Eurocontrol's Member States and both, the PRC and the PRB, use, at least partially, the same set of data provided by Eurocontrol.

In October 2019, we held a Florence Forum (actually in Budapest) to assess the progress made (or not made) towards a SES. Among others, the idea of creating an EU economic regulator for ATM was floated ... and pursued since. During this Florence Forum (virtual), we discussed the two key elements of the current amended SES II+ proposal. These are actually quite commonsensical, namely (1) to transform the PRB (which is currently simply an advisor to the Commission) into a full-fledged independent EU level regulator and (2) to place this new regulator within EASA (whereas EASA is only the host). Let us comment on each of those separately.

An EU ATM economic regulator

Creating sector-specific EU economic regulators is a logical evolution, which makes sense in all the network industries. And it would certainly make even more sense in ATM, as aviation is the most international of all the network industries. However, some of these European network industries are clearly more advanced along this process than is aviation. This is the case of the telecommunications industry, where an independent Body of European Regulators in Electronic Communications (BEREC) exists since 2009 and has been considerably strengthened in 2018 with a supporting permanent secretariat. It is also the case of the Agency for the Cooperation of European Energy Regulators (ACER) which was established in 2012. Since then, ACER has been considerably strengthened. For instance, this is evident in

the evolution of the Agency's voting rules over time, whereby today qualified majority voting rules apply for various decisions instead of unanimity.

But let us nevertheless note that the process that led to the creation of these EU regulatory bodies was somewhat different: in telecommunications and energy EU legislation had already led to strong and independent economic regulators at national level. Consequently, the Europeanisation of economic regulation was a somewhat natural bottom-up process with harmonisation of regulatory practices as the strongest argument in its favor.

In aviation, however, the situation is somewhat different: national "regulators", called "National Supervisory Authorities" (NSAs) are institutionally not as well established as in the other network industries. NSAs are often not separate and even less so independent from government, which often owns the ANSPs. Sometimes, NSAs are not even properly separated from the ANSPs. Independent regulators – both independent from government and from the operators they regulate – are however a necessary condition for infrastructure markets to properly function. And even more so in ATM, as competition is non-existent in many countries, and the monopolistic service providers are almost exclusively State-owned. But so far, the Commission has shied away from pressuring Member States too much about the independence and power of their respective economic regulators.

This does not make the creation of a strong and independent EU economic ATM regulator easy, as the support from the Member States is anyway weak for a variety of reasons (national sovereignty, employment, income). Quite to the opposite, the national regulators being so close to the regulated ANSP are often captured and might well oppose the process.

On the other hand, the Commission does not start from scratch: it already has the PRB, which simply needs to evolve, and more

concretely to become independent from the Commission. This has already taken place in another than the economic domain, namely in safety where the European Aviation Safety Agency (EASA) has been created in 2002, and, since then, acquired a solid reputation of a competent, professional and independent EU regulator for aviation safety.

Hosting the EU economic ATM regulator inside EASA

There is no real precedent at the EU level for the proposed integration of the economic regulator into EASA, as both the telecommunications and the electricity sector have a less strong focus on safety, even though there is a lot of technical regulation.

Ideally, certainly, the economic regulator should be independent from the safety regulator, but this seems to be challenging in the light of the abundant landscape of already existing EU agencies. The danger could be that regulator loses over time its economic focus, or, the other way round, safety becomes secondary to economic considerations.

In conclusion, and if the ATM economic regulator cannot be a self-standing agency, EASA seems to be institutionally the more proper option, if one does not want to consider the creation of EU 'network' regulators dealing with multiple sectors. But independence must be paramount and enshrined in law.

Context and History of Air Traffic Management Data Services

Matthias Finger, Teodora Serafimova and Engin Zeki

Rather than commenting on the [Online Workshop on enabling ATM Data Services](#), we thought it to be more fruitful to put our workshop into a historical perspective and to recall the broad context which has led us to the current debates, as illustrated in the summary of the workshop below.

How it all started (1999 – 2012)

Conceived back in 1999, the Single European Sky (SES) initiative was the European Commission's response to reducing delays, increasing safety, mitigating the environmental impact and reducing costs related to service provision in the aviation sector. The SES sought to address these challenges by promoting the de-fragmentation of the European airspace and by creating a more efficient ATM system.

Historically, airspace structures and ATM infrastructures have been developed along isolated national blocks within the territorial and aerial borders of sovereign states. Because ATM

operates national legacy systems with little interoperability and develops capacity in isolation from one country to another, internationally available airspace capacity is severely restricted and resilience/redundancy between the many ATM providers is almost inexistent. In 2013, the Commission estimated that the lack of standards and differences in procedures leads to roughly **€5 billion in unnecessary costs each year**, not to mention millions of tons in wasted jet fuel and excess CO₂ emissions due to inefficient routes. Seven years later, today, this figure has more than tripled to €17.4 billion per year due to the continued absence of a seamless airspace structure¹⁵. Most of these costs are being passed on to passengers in the form of higher ticket prices.

In 2004, the Commission set four high-level objectives, committing itself to tripling airspace capacity in order to reduce delays, both on the ground and in the air, halving the costs of ATM services, improving safety tenfold, and reducing by 10 percent the impact of aviation on the environment by 2035. To achieve these goals a framework of five pillars was established based on technology, safety, performance, airports and human factors.

From the very beginning, it was evident that technology would play a key role in this process, not only as an enabler of a more efficient ATM, but also as a way to facilitate the transition to a more logical organisation of the airspace without compromising the politically undesirable closure of control centers. In view of this, in 2007, the **SESAR (Single European Sky ATM Research) Joint Undertaking**, was set up to manage the technological and industrial dimensions of the SES. While SESAR has been largely successful and technology is no longer considered to be a barrier, progress on the political side has lagged behind¹⁶. We will discuss the specific barriers to the deployment of virtual centers in greater depth further down.

15 ICCSA-University of Bergamo for A4E, Cost of Non-Europe in Aviation (CONEA), February 2020

16 Finger, M., Bert, N., and Kupfer, D., (2014), Making effective use of technology in SESAR deployment, https://cadmus.eui.eu/bitstream/handle/1814/39128/ETR_Observer_2014_04.pdf?sequence=1&isAllowed=y

The second SES package of 2009 created a so-called “**performance scheme**”, along with concrete indicators, as well as a refined **Functional Airspace Blocks** (FABs) concept. The FABs were set up so as to enhance the cooperation across national boundaries and to lower the costs of ANS. Nine FABs were created in total, each of which was to set up common operating procedures, technologies and fee structures. This was initially seen as an intermediate step towards a fully integrated Single European Sky. But the plan was met with resistance from national governments wary about sacrificing too much sovereignty over their airspace and giving up authority over their ANSPs. Also, and contrary to their initial intention, FABs have engendered an additional layer of bureaucracy, thus creating an additional obstacle to realising the SES.

As a result, people produced a series of novel ideas about how to centralise some of the services ANSPs are providing, all somewhat based on the assumption that the various activities of the ANSPs could be decoupled and that some of them could be centralised and tendered out to private services providers. In parallel, the emergence of digital platforms – e.g., Google, Facebook, Amazon – has created an intellectual climate, which led some people to ask whether the same evolution could not also happen or being actively promoted in ATM.

In 2012, during the SES Conference in Limassol, Cyprus, the then Transport Commissioner Siim Kallas expressed his frustration as to the slow, if not absent progress of the SES project, despite all the legislative, financial and institutional efforts to promote it (e.g., SESAR, performance scheme, FABs).

Virtual centers: a Swiss solution to a “European” problem

Enter the virtual center model which had originated from Skyguide’s local need to consolidate its two Air Traffic Control Centers (ACCs: Zurich and Geneva) into a single virtualised center in 2012. Previously, cloud-based services and service-oriented architectures, the founding technologies of virtual centers, had already been extensively used to increase cost-efficiencies and performance in other IT and network industries. Even though the virtual center model is not revolutionary from a technical point of view, it is nevertheless ground-breaking for the ATM sector. This is due to fact that it implies a paradigm shift from legacy and geographically-based ATM systems to service-oriented and virtual, i.e. location-independent architectures. As Skyguide’s systems were at the end of their life cycle, the question arose whether the company should invest in existing (outdated) technologies or take the riskier path of the pioneer. The internal strategy discussions lasted over two years. In the end, the decision was clearly in favor of the virtual center.

The key elements of such a virtual center include a service-oriented architecture (SOA) for data services, a wide area network (WAN), and a harmonised controller working position (CWP), operating on the basis of open standard interfaces. In addition, a virtual center implies (what was previously called) an ANS Data Service Provider, which provides positioning, planning, and environment data services (to a virtual center). In order to set up its virtual center for Switzerland (“One Sky by One System”), Skyguide identified the following three phases: during the initial phase lasting between 2014 and 2016 Skyguide designed and planned the various components for the required changes, namely common flight plans and harmonised ACCs (Zurich and Geneva), Phase 2, which continues through 2020, standardises the data between the two ACCs based on a full-fledged service

oriented architecture (“one system”) and defines location-independent ATC and ATM services (“one airspace”). Phase 3, which will last until 2024, will lead to a full-fledged location-independent concept of operation for the upper airspace in Switzerland. This can then be further enhanced by the inclusion of external services, such as flight trajectories, flight data management, and route extraction.

Elevating the idea to EU levels

During the same period, but often at less advanced stages of development than the virtual center, a series of other disruptive ATM operational concepts also started to be discussed in EU circles, and even to be developed by some of the established ATM players, such as “remote towers”, “sector-less ATM” and “flight-centric operations” as well as new upcoming “drone technologies”. While some of these technologies and operational concepts have the potential to disrupt operations, others may lead to the disruption of the entire aviation industry. But among all these new technologies, the virtual center clearly offered the most immediate and most obvious solution to Europe’s fragmented airspace, something that became rapidly obvious to many of the actors involved in European ATM. Consequently, both in parallel and in collaboration with Skyguide, other ANSPs also started to explore its virtues. SESAR, furthermore, was investigating where use cases could be explored. Many of the stakeholders, including major European ANSPs such as ENAV, NATS, DFS, ENAIRE, DSN and COOPANS (a group of ANSPs), started projects to rationalise their infrastructure or to modify their flight data planning systems (FPDS) so as to adapt to cloud server functionality and to offer FDP services. Within the SESAR framework, the idea of a virtual center was and continues to be explored by way of three distinct types of use cases, specifically adapted to the operational and business needs of each ANSP. These are the rationalisation of the infrastructure, the delegation

of airspace, and contingency. Additionally, these use cases all rely on the definition of an ADSP, providing data and services to multiple ATSU (Air Traffic Service Units), thus enabling cross-border operations. In addition, Eurocontrol and the A6 Alliance of ANSPs joined the effort by working on a “digital Backbone”, a shared data exchange infrastructure for the European ATM. This, among others, and together with SESAR helped and continues to push stakeholders to move towards virtualisation. It goes without saying that the levels for both safety and (cyber) security have to be kept at least.

The importance of transitioning towards virtualisation and towards progressively increased levels of automation in ATM made its way into the Commission’s [2015 Master Plan](#). Subsequently, in 2017, a [joint European industry declaration](#) stressed the need for a digital transformation of aviation. Virtual centers were particularly mentioned as a tool to enable the progressive decoupling of ATM service provision from the physical infrastructure. This, it was argued, could create both enormous efficiency and resilience gains, since data and infrastructure can be shared between different centers, thereby enabling better use of existing resources and reducing investment costs. As a matter of fact, Skyguide’s virtual center had already demonstrated important cost-saving potentials thanks to the elimination of systems’ and data centers’ duplication. However, efficiency gains for a single ANSP are limited. As we learnt during the virtual workshop, these benefits would grow exponentially on a European scale. They can generate significant ‘system-wide’ efficiency gains in ADS provision, boosting, in addition, the system’s resilience.

However, many of these new technologies are not compatible with the current fragmented and nation-based institutional system of actors. For example, flight-centric operations, despite being at a mature stage of development today, are only efficient in larger airspaces, thus calling for a cross-border approach. In short, and even though the virtual center and other technological

ATM innovations, can lead to significant gains, notably in terms of efficiency, safety and resilience, they have direct and immediate economic, political, social, and legal implications. On the social side, the resistance might come from Air Traffic Controllers (ATCOs) and operational staff due to their fear of losing jobs, change in work practices and salaries. Also, the virtual center implies significant long-term investment, which typically only makes sense at the end of a legacy technology's life-cycle. Additionally, at a political level, location-independent ATC could be perceived by Member States as a threat to national sovereignty over their airspace. Finally, the legal framework of European ATM must be modified in order to allow for data sharing and service provision among ANSPs. No doubt, ATM is a conservative sector in which technological modernisation can be implemented, at best, in an evolutionary manner. And such evolution, if it ever is to take place, must thus be accompanied and facilitated by a corresponding evolution in EU regulations.

Lessons from the Florence Forums

And this is where the different Florence Forums came and come into the picture, the recent workshop on ATM data service provision being just the latest example. Indeed, introducing new technologies is always challenging, but even more so in the case of a complex and fragmented network industry such as ATM. It was during the 4th European Air Transport Regulation Forum, held in Spring 2013, that "Virtual Centers" were put forward on the agenda of a broader European audience for the first time. We remember well that the concept of sharing services had not convinced everyone. While important advances have been achieved in recent years, with ANSPs and the suppliers' industry today collaborating in the context of developing virtual centers, just seven years back ANSPs and the major players of the manufacturing industry argued against it. However, the topic was set and from there on it appeared from different angles in every Flor-

ence Air Transport Forum. In its [8th Florence Air Forum](#), back in 2016, we finally were mature enough to professionally discuss the potential of these new technologies for European ATM with all the important stakeholders. The virtual center, as proposed by Skyguide, emerged during the discussions as having the biggest potential for improving European ATM, but also for creating disruption at the institutional level. And the [previous Florence Forums on ATM](#) had indeed already alerted us to the numerous sources of resistance vis-à-vis the Commission's project of a Single European Sky, namely financial disincentives, the industry's current structure, and the so-called "social question".

Firstly, all ANSPs in the EU are still state owned entities. With governments as their owners, ANSPs and their owners, at present, lack the financial incentives to push for reforms which in turn could decrease their revenue stream. Moreover, for the full benefits of the new technologies to be reaped, deployment has to be system-wide, as opposed to piecemeal. In the world of ATM it is difficult to imagine the entire system closing down, therefore a transitional period is to be expected, marked by overlaps and duplications of systems, translating into a sub-optimal use of both during this period. This, in other words, means that the introduction of new technologies in ATM will likely entail high transition costs both to network providers and to users. On the other hand, it was argued already during the [8th Florence Forum](#) in October 2016, that the introduction of cross-border competition in the field of data provision could help overcome this obstacle, namely by enabling ANSPs to reduce their own infrastructure costs. Indeed, the storage and collection of data by every individual center separately creates costs that can easily be avoided.

Secondly, the very structure of the industry makes it inherently inhibitive to technological change. It is no secret that ATM is a highly protected sector, whereby collusion between providers and suppliers of ATM equipment is observed at least to some extent. ANSPs, manufacturers and regulators form a microcosm that is

hardly ever confronted with the entry of new market players. The technology used has to undergo several years of testing and certification before it can be deployed. Regulation is very detailed and leaves little room for entrepreneurial initiative. The combination of these factors has contributed to making ATM a highly conservative technology sector. Moreover, whereas disruptive changes in other network industries were largely the result of customers' demand, the focus on customers has been traditionally missing in ATM. As monopoly businesses, ANSPs have not had to depend on "customer satisfaction" to stay in business. On the other hand, it was argued that data and data services had the potential to more actively involve the airspace users, notably the airlines, and to perhaps create new partnership between airlines and ANSPs as a possible driver of change.

Thirdly, the "social question" remains a central consideration in the development of any new ATM technology. Unlike in other industries, the level of automation in ATM is still relatively low. Increasing automation naturally raises concerns regarding the creation of redundancies. Impact assessments conducted by SESAR JU, have reassured that automation would change the nature of the work and the training of ATCOs, though it would not create redundancies and layoffs could be prevented by long term planning. On the other hand, looking at the history of technological progress, it seems unlikely that innovation in ATM would not eventually lead to reducing the number of work places in this sector. The involvement of ATCOs in all stages of the process, it was argued, would thus be key to ensuring that the solutions are socially acceptable, practicable and lead to an overall improvement of working conditions.

Clearly, ANSPs and their management are in a central position to drive technological change. Yet getting these actors to proactively embrace new approaches will be pre-conditioned on having the right incentives in place. Currently ANSPs are faced with costs and risks that are not sufficiently outweighed by the

corresponding ensuing benefits. This can be overcome by putting in place a conducive EU regulatory framework and corresponding incentives schemes. But, in parallel, the potential of rapidly evolving technological developments should be explored and discussed.

And this is what we did during the [10th Florence Air Forum](#), held in Budapest in October 2018. As a result, the Forum emphasised the need for a new model for ATM services, with location-independent data services at its core. The mechanism to create momentum, it was argued, would be by creating incentives for the early adopters of ADS, where service providers would work in a virtualised environment and could provide specialised and standardised services, independently of their location.

Digital platforms and the prospect of 'platformisation' in aviation

Despite the initially lukewarm reception, the idea of virtual centers and of digitalising ATM more generally started gaining traction during the past few years, aided as it was by the emergence of parallel debates on digital platforms and the prospect of a 'platformisation' of everything, including aviation¹⁷. Indeed, digitalisation is transforming all industries, including the network industries, and it will not stop at ATM. As such, digitalisation is creating a new model of industrial organisation, whereby platforms are becoming the new intermediaries between the infrastructure services providers and the customers, thus exploiting the network effects of multi-sided markets. Such digital platforms benefit consumers by fulfilling unmet needs, often more flexibly, more efficiently and at a lower cost. They do this mainly by exploiting the inefficiencies of the underlying existing network infrastructures.

As such, digitalisation also holds great potential for the avia-

17 Montero J. J., and Finger M. (2018), 'Platformed! Network industries and the new digital paradigm', *Competition and Regulation in Network Industries*: <https://journals.sagepub.com/doi/full/10.1177/1783591718782310>

tion industry, and it is therefore not astonishing that the idea of a centralised data layer across and above the fragmented ANSPs has been gaining attention. Also, and in parallel, ANSPs have noticed the pressure from players outside the traditional ATM community, such as for instance, the emerging Unmanned Aerial Vehicle (UAV) industry which is actively developing new ways to provide air navigation services¹⁸.

Airspace Architecture Study

Enters the [Airspace Architecture Study \(AAS\)](#) in March 2019. Developed by SESAR-JU, it aims at reaching a Single European Airspace System thanks to digitalisation and virtualisation of ATM, along the lines initially proposed by Skyguide's virtual center. In order to implement such a Single European Airspace System, the current airspace architecture is to be modified, more precisely duplicated by the addition of data and application services layer in between the ground infrastructure and air traffic services. Ultimately, decoupling the provision of raw data and air traffic services, it is argued in the study, will improve airspace organisation, notably thanks to higher levels of automation and the active use of common ATM data services. This new model for ATM data service provision would be supported by the creation of dedicated ATM data services providers (ADSPs), who would provide flight data, Aeronautical Information Services (AIS), Meteorology (MET) and Communication, Navigation and Surveillance (CNS) services to Air Traffic Service Units (ATSUs) regardless of flight information regions (FIR) boundaries.

The AAS considers virtual centers as one, if not the key technology in order to enable a Single European Airspace System. Specifically, virtual centers, it is argued, make a geographical decoupling between ADSPs and ATSUs possible. This, in turn,

18 Finger, M., Bert, N., and Kupfer, D., (2014), Making effective use of technology in SESAR deployment, https://cadmus.eui.eu/bitstream/handle/1814/39128/ETR_Server_2014_04.pdf?sequence=1&isAllowed=y

allows for location-independent ATC service provision: in its virtualised configuration, a single ATSU might use ATM data services from multiple ADSPs, and, inversely, one ADSP might be able to serve multiple ATSUs. Such flexibility is expected to increase competition for the provision of services, hence increasing cost-efficiency and scalability. The AAS anticipates that the implementation of virtualised services could be implemented by 2030.

Wise Persons Group: elevating ADS to the EU's policy agenda

2018 saw the creation of the Commission's "Wise Persons Group" on the future of the SES. Motivated by the persistence of airspace inefficiencies and their negative impacts on the travelling public and the airspace users, the group was charged with producing recommendations as to the direction that European ATM should take. In April 2019, the group published its Report, issuing a [set of ten recommendations](#).

The report reinforces messages of the AAS, among which, the need to optimise airspace by embracing new technologies and automation. Building on the AAS, the Report calls for transforming its recommendations into an actionable roadmap to be reflected in the ATM Master Plan, thus lifting the concept of ADS on to the EU policy agenda. The Report underlines the need to ensure that the right governance be put into place to drive this transformation, which in turn is to be overseen by the European Commission.

Of particular interest here is recommendation number four on the creation of a new market for ADS providers, as already recommended by the AAS. The Report reinforces the need to transition towards common ADS provision in support of several ATS providers simultaneously. While the Report notes that the existing regulatory framework does not prevent the creation of

ATM Data Service Providers (ADSPs), it draws attention to a number of issues that would require particular attention, such as the organisational and certification requirements that would be required for ADSPs, taking due account of safety and security issues, as well as the possible need for clarification or regulation on the issue of access to, and ownership of, data. Given the transnational dimension of their potential market, ADSPs, it is stated in the report, will need to be certified by EASA, in compliance with the SES regulatory framework. In order to address “social aspect”-related barriers to the uptake of ATM data services and the virtual centers, the Report calls for the establishment of a “human dimension roadmap” as part of the evolution towards the Digital European Sky.

... and now in the hands of the Commission

The European aviation sector needs a high-performing European ATM system to cope with traffic fluctuations and ever-increasing global competition, while facilitating cost-efficiency and environmental benefits. Clearly, important momentum has built up over the past years, notably through the AAS, and the subsequent Wise Persons Group Report, on the need to overhaul European ATM with a key role attributed to digitalisation. Not least, in its European Green Deal, the von der Leyen Commission pledges to progress work on its proposal towards a truly Single European Sky in order to help achieve significant reductions in aviation emissions. After having developed a clear vision, however, the Commission now needs to steer the different technological actors into the right direction.

Enormous technological progress has been achieved to date, as made clear during our [Virtual Workshop on Enabling ATM Data Services](#). However, technology alone will not suffice in getting us to this efficient European ATM system. Rules and institutions will have to evolve to accommodate or simply to allow these technologies to be deployed. Indeed, the pursuit of the SES has

been a big European laboratory which has given rise to all kind of technological innovations, but if the rules of the game do not change now and do not allow at least some of these technologies to be rolled out, this will hamper the development of many innovative European firms and ultimately the European air transport industry altogether¹⁹.

ANSPs, in particular, will be decisive in driving the technological change, yet the barriers and risks they currently face will have to be addressed. While it is becoming increasingly clear that public funds will not be used for incentivisation purposes, early adopters will have to be rewarded by means of direct financial support or via links to the performance and charging regimes. Conversely, disincentives for late movers will also have to be envisaged. A future performance scheme should only allow cost levels that are equal to or below that of the corresponding data services in Europe. ANSPs whose systems are at the end of the life cycle should be motivated to switch to service based technology. This could be encouraged by supporting the purchase of services (OPEX) more than the investments in own systems (investments). The European Commission will have an important role to play in overseeing progress and in ensuring interoperability. In this respect, the performance and charging schemes along with the role of the Network Manager will have to be revisited, with a view to facilitating new capacity for on-demand services and improving the system's efficiency and resilience. Lastly, but very importantly, ACTO recruitment and training would have to be examined to ensure these are future-proof and consistent with an increasingly digital ATM environment.

Back in 2010, air travel across western and northern Europe was severely disrupted as a result of volcanic eruptions in Iceland. The absence of a coordinated European response to the crisis, leaving millions of air travelers stranded, was a clear illustra-

19 Finger, M., Bert, N., and Kupfer, D., (2014), Making effective use of technology in SESAR deployment, https://cadmus.eui.eu/bitstream/handle/1814/39128/ETR_Server_2014_04.pdf?sequence=1&isAllowed=y

tion of the insufficient progress towards an efficient ATM system and a truly single European airspace. While the event built up momentum for an overhaul towards a unified ATM system, it was short-lived in nature. Ten years later, today, the COVID-19 crisis offers a second chance to redesign the system, by taking advantage of the low traffic period to invest in the necessary technological and infrastructural changes and, most importantly, to put into place a conducive regulatory framework.

Published in March 2020

What can Air Traffic Management Learn From Electricity?²⁰

Matthias Finger and Ivan Arnold

The 12th Florence Air Forum was based on the idea that the regulation of Air Traffic Management (ATM)²¹ can learn from the regulatory experiences of some other infrastructure sectors. In this opinion piece, we would like to make the case that the challenges of regulating electricity flows at European level come closest to the challenges of regulating European air traffic flows. This is not to say that one could not also learn from other infrastructure sectors such as rail or telecom, but we argue that electricity comes closest to air in both technical and institutional design and therefore should serve as an analogy, if not as a framework structuring future regulation of ATM. We will proceed in three steps: we will first compare electricity and air at an infrastructural and technological level; indeed, if there are such similarities between electricity and air, the case can be made that there should also be institutional similarities. In a second step, we will therefore compare the institutional setup between the two sectors. In a

20 The authors would like to thank Marc Baumgartner for his valuable comments of an earlier draft of this document.

21 ATM, includes all the services related to air navigation, i.e., Air Space Management (ASM), Air Traffic Services (ATS) and Air Traffic Flow Management (ATFM). ATS, in turn, includes the various flight information services, alerting services, air traffic advisory services and ATC services (area, approach and aerodrome control services).

third section, we will identify the respective challenges in the two sectors and discuss what is done about them institutionally, especially in regulatory terms. Finally, we will draw some lessons as to what ATM regulation could learn from the electricity sector and especially from the way it is regulated.

Before entering into technology, let us state that the political objectives at EU level, as well as the ways to reach these objectives, are almost identical in air and electricity. They would also be identical when it comes to rail, road and inland water transport, but their implementation is comparably much further advanced in electricity. In all the infrastructures the goal of the EU is to create a Single European Market, be it for electricity, air transport, rail services, etc. The reasoning is that a Single European Market would be economically more efficient than the current fragmented and nation-based system. This is to be achieved by way of unbundling of vertically integrated national public monopolies, thus distinguishing between the monopolistic infrastructure on the one hand and the competitive services on the other. Subsequently, the different national infrastructures need to be interconnected, harmonised and otherwise transformed into a seamless EU-wide infrastructure. In electricity this political project is called “Copper-plate Europe”, whereas in air it is called, since 1999, “Single European Sky” (SES).

The technological level

There is a technological but not a conceptual difference between electricity and air: in electricity, the infrastructure is composed of electricity cables (and transformers), namely high-voltage and distribution cables, whereas in air no such physical transport infrastructures exist. But one could argue that airspace structures complemented with Communication, Navigation and Surveillance (CNS) technologies, which include, among others, radars, towers and other ATC technologies, could be considered to be the infrastructure that “transports” airplanes, just like cables

(and transformers) “transport” electrons. As we are mostly concerned with the European-wide infrastructure, let us focus on the high-voltage grid crossing the different EU countries, whose equivalent would be ATM, and leave aside the electricity distribution grid.

High-voltage cables determine where electricity flows. They have been built in Europe over the past 80 years or so, mainly from a national perspective and as such are not necessarily best placed and even less so best dimensioned for accommodating a fully integrated and coherent EU-wide grid. In order to achieve this copper-plate Europe, and even though cable technologies are pretty much standardised across Europe, they have to be upgraded, developed and interconnected, especially when it comes to crossing national borders. This is costly and often meets popular resistance. Electricity flows and corresponding capacity are thus not so much a technological but rather a grid design and of course an investment issue. Things are different in air: although airspace structures and ATM infrastructures historically were developed along isolated national blocks within the ground and aerial borders of sovereign states, ATM cannot itself determine where airplanes “flow”.²² But because ATM operates national legacy systems with little interoperability and develops capacity in isolation from one country to another, this overall restricts available airspace capacity internationally. Notwithstanding the fact that the airspace is a scarce resource and airspace capacity cannot be infinitely increased, capacity shortages caused by fragmentation have an adverse effect over the whole network. The lack of standards also leads to the fact that all investment, up to today, are made into improving relatively isolated national legacy systems, a trend that is further exacerbated by vendors’ lock-in strategies.

Just like with air, where airplanes are “produced” by airports

22 This is decided by the airlines on the basis of several considerations, such as firm strategy, overflight costs, security considerations and others more.

that scattered around Europe (and beyond), electricity is produced by power plants that are equally scattered around Europe. Power plants produce according to demand, whereby supply and demand are matched either by bilateral contracts (sometimes generators even sell their own electricity to consumers) and, increasingly, by trading platforms. Matching takes into account the available transport, i.e., (high-voltage) grid capacity, in particular the capacity across national borders, where most of the congestions occur. Today, day-ahead and intra-day electricity markets (but not long term markets, which could be seen as the equivalent of the time-table in the case of airlines) are “coupled”, meaning that electricity and capacity are sold together. The price of transport thus also includes congestion, i.e., the right to transport (in addition to transporting the electricity). In air transport, the decision to let the aircraft “flow” (fly) is taken by as a result of a complex process between the Network Manager (NM) at EU level and the National Air Navigation Services Providers (ANSPs). In some cases even the airspace users (e.g., airlines) along with other service providers participate in such a complex collaborative decision making process. The ultimate decision where an aircraft flies is based on the availability of airspace, available capacity in the network, weather conditions, unplanned events, etc. However, unlike in electricity where producers are restricted by the available grid capacity, airspace users may have the choice to take longer or more expensive flight routes or fly at a lower altitude if they are willing to pay the price for higher fuel, operating and ATM costs.

In other words, while airplanes are “guided” to their destination along their flight trajectories by ANSPs, electricity is flowing according to the laws of physics and will always flow to the closest consumption point. One of the defining features of electricity is that it cannot be stored and thus, once produced, must be consumed. This leads to the fact that the load in the grid constantly needs to be balanced at 50 Hertz, as the system can tol-

erate very little deviation without leading to a blackout. This is not totally identical, yet still similar in air: airplanes, once airborne, must land at some point, even though there are some reserves in the system. Balancing the electricity would be analogous to Air Traffic Flow Management (ATFM) in ATM, whose function it is contribute to a safe, orderly and expeditious flow of air traffic by ensuring that air traffic control capacity is utilised to the maximum extent possible and that the traffic volume is compatible with the capacities declared by the respective ANSP.

Overall, it can be said that the technological features in electricity and air are quite similar, notably (1) the fact that we are dealing with a European grid and with European airspace structures, flight routes and traffic flows, even though national technological legacy systems still exist in electricity and such systems and national airspace structures still prevail in ATM; (2) the fact that these systems and structures determine the capacity of the network; and (3) the fact that both electricity and airplanes cannot really be “stored” and must be guided to their destination so as to avoid blackouts and crashes. The (only) major difference, however, is that airlines, unlike electricity generators, do have some choice when it comes to selecting the routes they want to fly. It is thus justified to compare how the two sectors are governed from an institutional point of view, given that, at least according to theory, governance somewhat needs to follow the infrastructural and technological setup.

The institutional level

While there are many similarities in the technical structure, electricity and air differ very much when it comes to their institutional history: the electricity sector was characterised by vertically integrated national public monopolies, with the exception of federalist countries, where we had regional vertically integrated monopolies. A significant portion of EU electricity regulatory efforts thus pertains to unbundling and non-discrimination of new entrants.

This was and is not the case in air, where the sector has always been mostly unbundled:²³ ATM service providers were national public monopolies, while airports were local or state monopolies and airlines national public flag-carriers. As we will see below, this means that there must be less to no concern about regulating discrimination when airlines want to access the airspace. However, history also means that airlines have never been linked with the infrastructure (i.e., ATM) and therefore usually they have no understanding of the nature, the functioning and the limitations of infrastructures. And this is somewhat reflected in their behavior (past and present), notably in the principle “first-come-first serve”, meaning that airlines basically do what they want and expect the infrastructure (ATM) to accommodate.

Furthermore, electricity historically had a much more national focus than air, which, at least in Europe, always had an international dimension. But even in electricity there were European flows very early on and collaboration and coordination among European countries in matters of electricity took place since the 2nd WW. On the other hand, ATM also has always been very national, owing to national sovereignty and the important role of the military in matters of airspace structure and airspace use. While the declared intent is to manage military and civil airspace jointly, this has mainly remained an intent in most of the countries. In other words, electricity and air infrastructures, like most other infrastructures, have, because of their history, originally been very national. However, much progress has been made in matters of harmonizing the high-voltage grid across Europe, in part because of EU regulatory pressure and action, but also because the transport of electricity has already been quite standardised from the very beginning. This is different in ATM, where ATM technologies differed significantly from country to country and where little progress had and is being made towards their standardization. While the SES initiative, and especially its technology

23 In some countries, ATM and airports have been part, in the past, of the same public entity.

component SESAR (Single European Sky ATM Research), were to remedy this situation, the results are disappointing. In its special report on the SES, the European Court of Auditors observed that the policy objectives of the SES initiative have not been achieved, and that the benefits of the SESAR project were overestimated.²⁴

But let us start with the basic building blocks, i.e., TSOs and ANSPs: in electricity, the so-called Transmission Systems Operators (TSOs) had to be created at the national level – by way of EU regulations and pressure – by unbundling, i.e., by separating them out of the national vertically integrated electricity companies. In some federalist countries, the TSO even had to be created from scratch by assembling bits and pieces from the different regional electricity companies. This was a painful process, which is however now more or less complete. In ATM, Air Navigation Services Providers (ANSPs) evolved in an analogous manner. They were gaining independence from state administrations through corporatization and subsequently had to be functionally separated from policy and regulatory functions. One of the fundamental principles of the Single European Sky initiative is the separation of service provision from regulation, at least at the functional level.²⁵ All the EU member states have implemented such functional separation as a result of the Single European Sky regulation. At the same time, in some cases, ownership rights over ANSPs are exercised by the authority also responsible to some extent for ATM policy making and regulation and there are some cases where the ANSP itself is embedded in a civil aviation authority. Proper design would also require an institutional separation between policy functions on the one hand (which remain with the government) and regulatory functions on

24 European Court of Auditors – Special Report: Single European Sky: a changed culture but not a single sky VI, 21, 51, 78, https://www.eca.europa.eu/Lists/ECADocuments/SR17_18/SR_SES_EN.pdf - December 2017.

25 Article 4.2 of 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 (the Framework Regulation).

the other (which should evolve into an independent regulatory authority at the national level). While this important institutional change has taken place in electricity as a result of EU pressure, the full separation of the policy from the regulatory function has not been properly achieved in most EU member states, because there has been no EU legislation and pressure in this matter so far. Furthermore, several national supervisory authorities struggle with the lack of financial resources and proper expertise and therefore have difficulties in fulfilling their roles properly. As we will show below, this will remain a problem, when moving towards or trying to establish an EU ATM regulator.

The main functions of the TSOs are to provide an efficient and safe high-voltage grid, which includes planning, developing (investing in) and operating the grid, as well as to ensure the grid's stability, notably by providing so-called balancing services. All this at a national level. The three main functions of the ANSP are (1) to manage the national airspace (which is the equivalent, in electricity, of defining available grid capacity, planning to increase that capacity), (2) to manage air traffic flows at the national level (which could be seen as the equivalent of real-time balancing in electricity) in collaboration with the Network Manager who does the same at European level and (3) to provide air traffic services, among which air traffic control (i.e., separating aircraft in real-time) is the perhaps the most important. The equivalent of this function, in electricity, is the operation of the grid.

As for international coordination, this is typically a gradual process by which the national TSOs and the national ANSPs collaborate more and more closely with one another. In electricity the European Commission has stepped in in 2009 so as to speed up and to organise this coordination by way of regulation. In the beginning there was first a collaboration among the different national vertically integrated monopolies, called UCPTÉ (European Network of Transmission Systems Operators), which evolved into UCTÉ (Union for the Coordination of the

Transmission of Electricity) once they got unbundled. From there things evolved further, because of EU regulatory pressure, into the pan-European ENTSO-E (European Network of Transmission Systems Operators for Electricity) in 2009 and has stayed so until today. ENTSO-E is the body that coordinates – under EU mandate and under EU regulatory supervision (see below ACER) – the electricity flows across the continent, develops and maintains the European operational framework through operations network codes/guidelines, agreements and standards and coordinates measures for the protection of critical infrastructures. In broad terms, this would be the equivalent, in air, of Air Traffic Flow Management (ATFM) at EU level, currently one of the functions of the Network Manager, complemented by the coordination of airspace management,²⁶ which is today still a national function. Balancing however – which is similar to capacity management by the ANSPs --, as well as operations – the equivalent of Air Traffic Services – remain with the national TSOs.

The process of international coordination in air is less straightforward. While, international co-operation has always been an operational requirement for ANSPs operating neighboring airspaces, several layers of complexity are added as a result of the following factors. First, EUROCONTROL, an international organization and its legal framework, operates in parallel with the EU institutions and their legal framework. Second, there is a proliferation of institutions and decision-making bodies with sometimes overlapping decision-making powers. Third, as if the system was not already complex enough, some decision-making powers were furthermore delegated to industry stakeholders. Finally, much of what is happening at the operational level is based on the process of “collaborative decision-making”, in which all operational stakeholders are involved in various decision-making and advisory processes and bodies, for example in the case

²⁶ ‘Airspace management’ is a planning function, whose primary objective is the maximization of the utilization of available airspace by dynamic time-sharing and, at times, the segregation of airspace among various categories of airspace users on the basis of their short-term needs.

of deciding about airspace structures. This level of complexity makes it difficult to understand the system, to drive into a desired policy direction or simply to change it. There is a good deal of uncertainty involved and there is definitely a lack of transparency in current European ATM.

Besides the cooperation between neighboring ANSPs, so-called “free-route” airspaces overarching several states are increasingly set up at a regional level. At the European level, the creation of an overarching air traffic flow management function was achieved when the Central Flow Management Unit (CFMU) of EUROCONTROL was established in 1995. EUROCONTROL can thus be viewed as a facilitating platform, whose role it is to reduce complexity by mitigating the negative effects of airspace fragmentation. Still, and unlike UCPTÉ or ENTSO-E for electricity, EUROCONTROL is an international organization, established by treaty among participating States (the so-called Eurocontrol Convention), and not an association of ANSPs. Also, EUROCONTROL encompasses several non-EU member States and has today 42 member States. However, as part of the Single European Sky process, the Commission has created in 2011 the equivalent of the mandate it gave to ENTSO-E for air in the form of the so-called Network Manager. This is an EU function first assigned to EUROCONTROL in 2011, then again in 2019 for a 10-year term. EUROCONTROL as the Network Manager essentially does what EUROCONTROL as an international organization had been doing from the creation of the CFMU, namely coordinating European air traffic flows as well as a few other functions called the network functions, but now by mandate of the European Commission.

But the most important and the defining institutional difference between the electricity and the air transport sector is as follows: in parallel to giving ENTSO-E a clear mandate regarding the coordination of the EU electricity grid, the Commission has also created ACER in 2009, the European Community of Energy

Regulators (see Pototschnig's paper in this issue). ACER is a strong European regulator which instructs and supervises the different national electricity market regulators, as well as ENTSO-E. ACER is a clear example of the Europeanization of regulation and as such only comparable to BEREC, the Body of European Regulators for Electronic Communications, also created on 2009. ACER has several functions: most importantly, it must ensure harmonization of both grid operations and electricity markets, including unbundling in each of the member states. Its main function would be the equivalent of the supervision at European level of air traffic flow management, which, in ATM, is carried out by the Network Manager. When it comes to grid operations (i.e., what ANSPs do), it works closely with ENTSO-E, but ultimately has decision-making power. Also, the ATM equivalent of ACER should have decision-making powers, whereas the Network Manager currently only has a coordinating role. Such decision-making power does not exist in ATM today. ACER also supervises and ensures the independence of the national electricity regulators. In ATM, the National Supervisory Authorities (NSAs) are responsible for certifying and overseeing ANSPs and for the preparation of national performance plans. But ANSPs do not have the equivalent of a European coordinating body similar to ENTSO-E. Indeed, EUROCONTROL is not an ANSP collaboration, but an intergovernmental organization established to carry out some functions on behalf of its Member States, and there is no operational and infrastructural oversight over ANSPs nor is there a final decision-making authority at the European level. Finally, ACER sets the rules for the economic regulation of the grid, of course based on EU regulations. But the equivalent of ACER does not exist in ATM, and the question whether it should exist was precisely the topic of the 12th Florence Air Forum.

What are the real challenges?

But in order to answer the question whether the equivalent of ACER should exist in ATM, we still have to examine what challenges ATM faces, and whether these challenges are indeed comparable with the challenges of the European high-voltage transmission grid. To recall, the infrastructural and technological setups in electricity and ATM are somewhat similar and so are the institutional setups with the exception of ACER and EUROCONTROL. The differences are, on the one hand, that the equivalent of air traffic flow management is done at EU level in electricity (by ENTSO-E under the supervision of ACER), whereas this is done at the European level by EUROCONTROL and at national level by the ANSPs. At the same time, airspace management (the equivalent of which is done by the ENTSO-E at the European level in electricity), remains at the national level today, under the responsibility of each Member State. While ENTSO-E has a role in shaping the grid, there is no equivalent function in ATM for shaping European ATM infrastructure.

As we will argue in this section, air traffic flow management and to some extent airspace, infrastructure and capacity management should be done at the EU level within a much simplified regulatory framework, inspired by the electricity sector. Air traffic flow management could continue to be done by the Network Manager as part of EUROCONTROL. Airspace, infrastructure and capacity management should also be done by a (new) body at European level in a collaborative arrangement with the Member States and the ANSPs similar to ENTSO-E, again within a regulatory framework that is much simpler and has more transparent processes than the current one. This new body would then be overseen by an EU regulator similar to ACER, capable of supervising the operations of the network, driving its evolution and making decisions in individual cases when collaborative arrangements are insufficient.

So what are the challenges? They are actually quite different when it comes to electricity and ATM:

- In Electricity, today's main challenge is to keep the high-voltage grid stable in Europe, i.e., to avoid blackouts: with the phasing out of fossil fuel and nuclear based power plants, Europe is turning more and more to renewable energies, which are volatile, i.e., dependent upon sunshine and wind. This requires ever bigger efforts by the TSOs to keep the grid stable, thus increasing the needs of balancing electricity, including the needs for redispatch of electricity across national borders. Furthermore, electricity is no longer produced by big power plants and dispatched to the end users in a capillary system. Rather, it is increasingly also produced in a decentralised manner and consumed much more closely to the producers, thus increasing the challenges for the high-voltage transportation grid. Finally, and because of the above-mentioned developments, member States are increasingly concerned by security of supply issues and set up all kind of mechanisms to prioritise their national supply over pan-European exchanges, thus threatening the European electricity market over the "copper-plate Europe". The EU Commission responds to these challenges by numerous regulatory measures. These are mainly measures to ensure that electricity can flow freely across Europe, notably by means of rules regarding the coordination between the different TSOs, as well as between suppliers and TSOs (embodied in so-called "network codes"). Such norms are set among the TSOs via ENTSO-E and then approved and enforced by ACER at the European level. These rules are both about technological harmonization and standardization, but even more so about institutional harmonization across TSOs. This is mainly an internal market issue, and regulation by ACER is mainly geared at a better functioning of the internal (Single European) electricity market.

- The challenges are very different when it comes to ATM: here, the challenge is not necessarily one of a dysfunctional internal market (the demand for air transport is constantly growing), but more obviously the challenge of a lack of ATM capacity, caused by fragmented and non-standardised infrastructure, as well as by suboptimal airspace structures following national borders instead of operational needs. The Airspace Architecture Study published by the SESAR Joint Undertaking in March 2019,²⁷ in its assessment of the situation, has clearly spelled out the reasons why ATM lacks capacity and is congested, namely the fact that actual demand far exceeds expected demand. In our view, this is (1) because airspace is a finite resource just like water and soil, (2) because capacity is managed at the national level, (3) because airspace structures follow national borders rather than operational needs, thus limiting interoperability and adding to airspace complexity, (4) because the technological infrastructures are partly outdated and are capable only of limited interoperability, and (5) because the current lack of capacity is at least partially also the result of a prior policy focus on cost efficiency, as opposed to capacity development (when traffic was low). As a result, for example, there is now a chronic lack of controllers in some key areas.

What does that all mean for ATM regulation and an ATM regulator?

Indeed, it is not at all clear whether this challenge of ATM capacity can be addressed by ATM regulation and an ATM regulator. Still, we might be inspired by the regulation of the European electricity sector. Let us discuss the most relevant aspects of the ATM sector one by one and examine what can be learned from electricity for each of them:

²⁷ A proposal for the future architecture of the European airspace; SESAR Joint Undertaking, 5 March 2019, related to the Delegation Agreement between the European Commission and the SJU with reference MOVE/E3/DA/2017-477/SI2.766828 for developing a proposal for the future architecture of the European Airspace.

- The most straight forward function is certainly Air Traffic Flow Management (ATFM): this function is already Europeanised and taken care of by the Network Manager as part of EUROCONTROL. This function is clearly needed, and needed at a European level, and EUROCONTROL is probably the only organization capable of providing it, at least today. Here, actually, electricity could learn from ATM, as this function of balancing electricity flows is still done at a national level by the TSOs. But ATM can certainly also learn from electricity as to how this function is regulated, namely at a European level for non-discrimination and cost efficiency. The corresponding rules are set by ACER and the implementation of these rules is delegated to the national independent regulatory authorities. Once properly regulated, it could even be imaginable the Network Manager to also evolve into a platform for allocating the available capacity (slots), as determined by an EU Air Space Manager (see next point).
- A little less straightforward is how the European airspace is structured and how network capacity and network infrastructures are developed. In the case of electricity, a similar function has been delegated to ENTSO-E, while being supervised and regulated by ACER by way of so-called “network codes” and other rules pertaining to interconnection, interoperability and congestion management. In ATM, although there are some common EU rules and principles, airspace design and airspace management is carried out at the national level by the ANSP. The development of network infrastructures and network capacity also involves various forms of coordination, but, at the end and most of the time the development of the network infrastructure and capacity remain fragmented. This could be changed, if an ENTSO-E-like technocratic and cooperative platform of States and ANSPs is established with the objective of defining how European airspace should be structured and the network infrastructures and capacity

should be developed. This entity could be called an EU Airspace and Infrastructure Manager (AIM). As a second step, it will then be necessary to invest into the harmonization of the upgrading of the national ATM legacy technologies along principles of technological standardization and harmonization as mandated by this new EU Airspace and Infrastructure Manager. This could even include the development of an EU ATM infrastructure, such as for example an EU-wide digital ATM platform.

- This very process, along with activities of this new EU AIM body, should in turn be supervised and regulated by an EU ATM Regulator along the model set by ACER. This task should not be delegated to the national regulatory authorities, but should be handled exclusively by the EU ATM regulator. Once the structuring of the European airspace has taken place, as well as network infrastructures and network capacity have been harmonised, a corresponding EU Airspace and Infrastructure Manager created and its regulation enshrined and embodied in a new EU ATM regulator, one can then (and only then) envision to set EU rules about airspace usage, such as for example congestion pricing or slot allocation rules according to political priorities. But such rules would have to be politically defined at EU level.
- Some activities carried out by ANSPs today, may in turn, be decoupled; especially those related to the collection, transfer, analysis and storage of data. Some of these activities will have to be regulated, while others may become market-based activities. Air Traffic Control (ATC), i.e., basically separating aircraft, will remain a monopolistic activity performed by the national ANSPs and thus will have to be regulated. However, the technology used to perform this activity will have to evolve towards harmonised and interoperable standards set by the above-mentioned new EU Airspace and Infrastructure Manager and supervised in turn by the new EU ATM Regulator.

As a monopolistic activity, ATC will have to be regulated for efficiency but also for security of supply, just as in the case of TSOs. Such regulation will not change, even if ATC may be performed through virtual centers and digital ATC platforms, rather than by ANSPs themselves. This regulatory task can be delegated to the national regulatory authorities, which, in turn, apply regulations set by the new EU ATM Regulator. But it could also be imaginable – especially if virtual non-nation-based centers and other digital ATC platforms emerge – that this new EU ATM Regulator will regulate the ANSPs', the virtual centers' or the digital ATC platforms' activities directly, without passing via national regulatory authorities, which will then become redundant. Actually, many of them have never been properly enabled to carry out their tasks in an efficient and independent manner.

Conclusion

The European ATM infrastructure is reaching its limits in capacity and cannot guarantee sustainable operations (longer routes than necessary, lower flight altitudes, more emissions). It is quite clear that the European ATM system (which includes airspace structures as well as physical infrastructure) needs an extensive overhaul to increase its resilience and efficiency in the face of the challenges of growing but potentially volatile traffic, cyber threats and a deteriorating environmental performance. We suggest that this is best done by reducing the complexity and increasing the transparency of the current legislative framework. Like this has happened in EU railways and in EU electricity, we would like call for an “Recast” of EU ATM legislation and regulations. We have argued that the regulation of electricity can be a source of inspiration for a new, leaner regulatory framework facilitating more efficient co-operation and at the same time providing tools for efficient decision-making and achieving policy objectives. Improving airspace structures for the benefit of the whole net-

work, developing infrastructure and modernizing technology on a European scale, all call for regulation at the EU level. This, in our view, could be achieved by creating two new entities. First, a collaborative platform of States and ANSPs – we have argued for a EU Airspace and Infrastructure Manager – as inspired by ENTSO-E, so as to drive the reorganization of European airspace and the development of the European ATM infrastructure. Secondly, we argue for a new EU ATM Regulator as inspired by ACER, overseeing the processes driven by the EU Airspace and Infrastructure Manager and exercising decision-making powers where necessary. Like ACER, this regulator would have several regulatory functions, many of them technical (harmonizing legacy systems), some of them economic (regulating the monopolistic activities of the ANSPs), some of them processual (supervising national authorities and the gradual transfer of some functions to the EU level).

Published in January 2019

Incentivising the Evolution Towards Interoperability

Matthias Finger

The Budapest air forum produced a quite clear analysis of the situation in European ATM; at least it seems to me that the situation had rarely been as clearly analysed so far. This may also be due to the fact that we had, for the first time, an academically informed analysis of the situation prior to the Forum, which helped structure the discussion: there we had distinguished between institutional, economic, legal and political impediments to realising the SES, assuming that technology was a given, i.e., that technology was automatically driving this change. This assumption may have been somewhat naïve, though.

In his conclusion, Filip Cornelis, Director of Aviation in the Directorate General Mobility and transport of the European Commission, structured the challenges to the realisation of the SES along four issues, namely (1) the technological path towards the SES, (2) the conceptualisation of the airspace architecture, (3) the economics of ATM, and (4) actor relations. Let me elaborate on each of these. While the structure is Filip's, the responsibility for the content is solely mine.

The technological path towards the SES

Technology is clearly driving, but is it driving into the right direction? Is at the end of this technological evolution a coherent ATM technology, that makes everything smoother, more efficient and more performing? What, if this is not the case? We did indeed see that there are different maturity stages, that there are different technologies, with huge interoperability issues, owing to the commercial interests of the suppliers involved.

So it is clear that technology will not automatically get us there. Technology is costly and therefore the ones who invest into particular technologies have interests to promote “their”, as opposed to their competitors’ technologies. This leads to the issue of interoperability or even interconnection. Obviously we cannot let technology unfold its path and wait and see what comes out. The path needs to be managed and for that a clear vision of where we want to get to is needed. This vision can only come from the Commission, perhaps in concertation with Eurocontrol for its technical expertise and its different geographical coverage. But a clear vision is not enough: the Commission will also have to steer the different technological actors towards achieving this direction. Clearly, SESAR JU is doing the right things but the problem is, that the different industry players push for their own technologies to be included in the masterplan. Some of the technologies researched are actually already in use by some of the ANSPs, as could be seen in Florence. This leads to an increased fragmentation. Also, acquiring research financing has become a business in itself.

In other words, after having developed a clear vision, the Commission needs to steer the different technological actors into the right direction. This is best done by way of a carrots and sticks approach: rewarding these actors that collaborate in the right direction and not rewarding or even punishing the actors that

don't. And the right direction is clearly the one that is increasing the interoperability among ATM technologies. The clarification of the status of intellectual property rights created through publicly funded research could also support this policy objective.

The conceptualisation of the airspace architecture

We all know that the European airspace architecture is highly fragmented and that this is one of the main causes of all the problems. Earlier on, the Commission tried to create FABs along the idea that an intermediate step of collaboration would lead, sooner or later to a Single European Sky. It turned out that this was a wrong assumption and that FABs have created an additional layer of bureaucracy and actually an additional obstacle to realising the Single European Sky.

This was followed by a series of ideas about how to create centralised services, all somewhat based on the assumption that the various activities of the ANSPs could be unbundled and that some of them could be centralised and tendered out to private services providers. And this approach has been fuelled more recently by technological developments, especially in the area of digitalisation, which, like in the case of many other network industries, has given rise to the possibility of creating a (centralised) data layer above the various (activities of) ANSPs. This is where the current airspace architecture study of SESAR JU comes in.

It is now clear that this data layer (and this new architecture) will sooner or later exist; if it is not created by the EU as an EU prerogative, as a PPP or by a joint effort of the industry – ANSPs and suppliers at a minimum – it will come from outside of the industry and probably disrupt the industry altogether. Some operational issues will have to be solved, such as the questions of capacity planning and real-time capacity management. But the main challenge will be to provide the network manager with the necessary "powers" vis-à-vis ANSPs.

The economics of ATM

The current economics of the ATM sector is clearly an impediment to the realisation of the Single European Sky, as ANSPs receive no market signals. Their signals come from the performance regime which is substituting for the absence of market signals like in every other monopolistic infrastructure. Ideally the pricing of airspace usage should reflect its costs much more directly and much more immediately and ultimately tend towards something like congestion pricing or nodal pricing to use the concepts from the electricity industry. Furthermore, pricing should increasingly reflect the externalities of aviation.

Clearly, this will not be achieved by way of a performance regime, no matter how sophisticated. Rather, it will be made possible thanks to the above-mentioned new airspace architecture, especially the new data layer as well as innovative forms of regulation. And so we are back to incentivising the evolution towards technological interoperability which ultimately will allow for the introduction of a more efficient pricing of more sustainable airspace usage. There is also the necessity to start to discuss the charging scheme, as the current scheme does not provide the right incentives to support the technological evolution and the emergence of infrastructure related services for the next decade.

Actors and actor relations

Everybody agreed at the Budapest air forum that there are too many institutional actors involved in the (absence of the) Single European Sky, leading to increased coordination among one another and/or even lobbying against each other. This has a huge cost and generates inefficiencies, which will ultimately lead to the entry of outside digital platforms into airspace management. If the airspace community wants to remain in charge (and not simply react to outside pressure in the future) the structure of

the actors must be simplified, something which also will have to be done by the Commission, for example, by way of a systematic analysis of all the actors currently involved and by favouring in the future only those actors that work towards interoperability.

How to Better Align the Performance Scheme?

Matthias Finger

Air Traffic Management (ATM) is – at least until now – a monopoly, and as such it needs to be regulated. The European Commission has come up with a so-called performance scheme to regulate this monopoly. The Performance Review Body (PRB) advises and supports the Commission in setting up binding performance targets and thereby, in a way, acts as the regulator for ATM at the European level²⁸.

The performance scheme has itself a long history: its origins go back to the first Single European Sky (SES) package in 2004, which had four pillars, namely technology (which was delegated to SESAR), safety (delegated to EASA), capacity and performance, for which the then called Performance Review Commission (PRC) was created. This Commission issued a report in 2006, in which it recommended the creation of a performance scheme with concrete indicators. This performance scheme was subsequently integrated into the second SES package of 2009. To recall, this second package strengthened the Func-

²⁸ Tasks of the PRB are defined in [COMMISSION IMPLEMENTING REGULATION \(EU\) No 390/2013](#)

tional Airspace Blocks (FABs), which later turned not to be that functional at all. It also created the central network management function which was delegated to Eurocontrol (see below), and it created an airport pillar with an Airport Capacity Observatory. And finally, as said, it set up the first reference period (RP1) of the performance scheme (2012-2015). In 2013, a new document entitled “*Accelerating the implementation of the Single European Sky*” was issued by the Commission, which later resulted in the SES II+ proposal. In it, the Commission aimed at strengthening the national supervisory authorities, at reinforcing the network manager (Eurocontrol) and at enforcing the existing rules. But it became obvious that the European airspace could not really be defragmented and that the SES project had somewhat ended up in gridlock. Yet, in the absence of competition, everybody agreed that the performance scheme was the right regulatory approach for. It was therefore agreed to engage in a second reference period (RP2, 2016-2019).

This 9th Florence Air Forum thus comes at the mid-term of the RP2. This is the time when the Commission is now planning for the third reference period (RP3, 2020-2025), for which some of the indicators chosen can be revised and the reference scheme can still be improved. The role of the Forum was, therefore, to critically look at the past and to highlight some perspectives for the next RP3. The following four considerations are especially worth mentioning and have to be taken into account during in the next RP3:

- To recall, the performance scheme has four dimensions: environment, cost, delays (capacity) and safety. It would be worth examining whether the performance targets of each of these four dimensions are actually aligned, so as to give a coherent message to the regulated Air Navigation Service Providers (ANSPs). For instance, there is a correlation between cost savings and capacity improvements, as reducing delays by

improving capacity normally creates additional cost. Furthermore, some data presented at the Forum seem to suggest that ANSPs are increasing their revenues without investing further into capacity.

- More generally, not only ATM is regulated but so are also airlines and especially airports, which are the other monopoly in the air transport system; it would be worth thinking about aligning the regulation of ATM or ANSPs with the regulation of airports. For instance the provision of tower services by national ANSPs is a way to cross subsidise regional airports. Auctioning of tower services could make this more transparent.
- The performance scheme is one of the incentive mechanisms for ANSPs; but there are others. For example, SESAR is creating all kind of incentives by supporting technological developments. Are these incentives aligned with the incentives that the ANSPs are receiving from the PRB? Perhaps a closer link could be provided by directly incentivizing the application of SESAR technologies in collaboration with other ANSPs. This could be done by somehow changing the focus from individual ANSP performance to system-wide performance.
- During the RP2, the activities of the network manager (Euro-control) were included into the performance scheme. However, the activities of an ANSP and the activities of a network manager are quite different, and it would be worth examining whether to differentiate the performance scheme for these two types of actors.

Everybody agrees that competition in ATM is the right tool to achieve the SES. However, there is gridlock of the SES, and competition will rather come from technological developments than from institutional changes. Furthermore, SESAR and other forces are promoting important technological developments in

ATM, leading to new ways of providing ATM. The performance scheme must take these technological dynamics into account, namely by creating incentives that adopt such technologies, rather than stifling them.

In my opinion, the performance scheme could set further incentives for ANSPs to invest in modern technology, and it should actually incentivise technological developments in general.

Namely, it should establish a rewarding mechanism for those ANSPs that make a shift from CAPEX to OPEX. This would steer ANSPs towards procuring services rather than investing into physical infrastructure. More precisely, the performance scheme should incentivise the sharing of ATM infrastructures to ultimately make progress towards at least some centralised services across the EU.

Air Traffic Management: Why a Technological Disruption is needed – and why it is coming

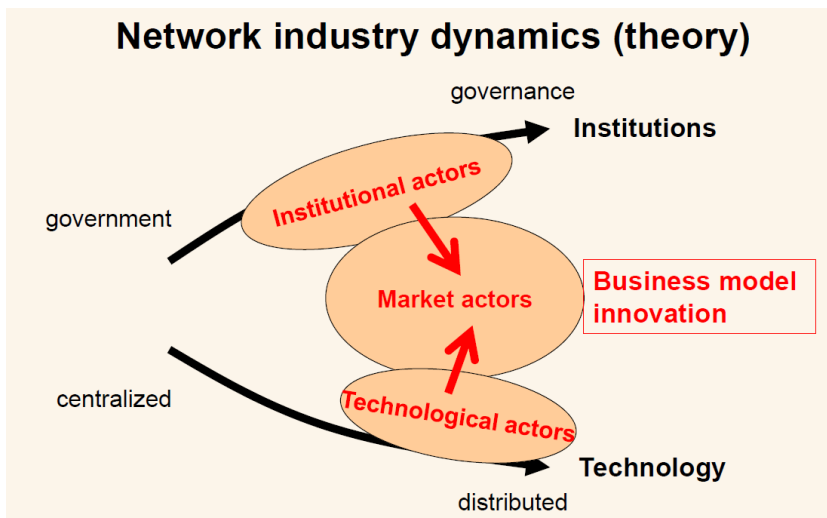
Matthias Finger

Air Traffic Management (ATM) is only one, yet a very crucial, element of the air transport value chain. Almost all elements of this very value chain have been optimised by now, ranging from aircraft producers (airplanes are now standardised products) to highly efficient air transport operations, to optimised aircraft maintenance, to yield management techniques, to increasingly better airport operations, and many others more. ATM is probably one of the last, if not *the* last element of the air transport value chain waiting to be optimised in turn.

The European Commission (EC) has recognised this since long, launching its Single European Sky (SES) initiative already back in 1999. But, despite of all the various efforts undertaken by the EC and many others, the SES has not delivered and actually, to quote a general feeling, has ended in gridlock. The introduction of Functional Airspace Blocs was never completed successfully, and the latest update of the legislative framework (SES2+) is far from reaching the necessary support of Member States.

But, because the current – nation- and sector-based – ATM system is rapidly reaching its limits, i.e., producing capacity crunches, and because drones (Unmanned Air Vehicles or UAVs) are rapidly filling the airspace, it is simply not possible to improve the current ATM system any further without a qualitative, i.e., disruptive change in the technologies applied. Yet, to implement this urgently needed technological upgrade in ATM, the SES gridlock needs to be overcome.

But, just before talking about the concrete ATM technologies, especially disruptive ones, let me make a brief detour via theory or rather conceptualization. We, at FSR, are indeed working since a long time with a conceptual framework called “*co-evolution between technology and institutions*” (institutions being formal and informal rules). Both technology and institutions need to evolve somewhat in parallel so as to produce the best results. If there is no coherence between the two, their combination will lead to suboptimal outcomes; and if the discrepancy between the two is too big, i.e., producing unsatisfactory outcomes, disruption on either the technological or the institutional side is likely. The following graph illustrates this basic idea:



And this is precisely what is happening today in ATM: on the one hand, the fragmented situation of the institutions in charge of ATM has fundamentally remained unchanged. On the other hand, substantive technological progress in satellites, communication and digitalization – some of which actively promoted by the EC itself thanks to Galileo and the Single European Sky ATM Research (SESAR)– is leading to new, potentially disruptive innovations for ATM, such as virtual centers and corresponding centralization of some of the ATM services, remote towers for Air Traffic Control (ATC), flight-centric operations, sector-less ATM, and probably other disruptions more in the not so distant future. As a matter of fact, drones and UAV more generally are themselves the result of disruptive technological progress, and are now pushing for a disruptive change in ATM.

Everybody agreed at the 8th Florence Air Forum, that, while disruptive technologies can push for a (potentially radical) transformation of the way ATM is currently done, technology alone cannot just substitute rules. In other words, rules or institutions will have to (radically) evolve to accommodate or simply to allow these technologies to be deployed. Indeed, the battle around the SES is a big European laboratory which has given rise to all kind of technological innovations, but if the rules of the game do not change now and do not allow at least some of these technologies to be rolled out, this will hamper the development of many innovative European firms and ultimately the European air transport industry altogether.

So, besides the urgent need to adapt European ATM regulations to the newly emerging technologies in ATM and elsewhere, the European Parliament (EP) and the EC also need to learn how to “effectively regulate” technological disruptions: maybe something like “regulatory heavens” (i.e., exemptions from certain regulations for a limited period of time) or “regulating experiments” (under full respect of existing procedural and safety rules) are needed so as to be able to test such newly emerging tech-

nologies in ATM and beyond. Maybe entire countries can offer themselves as a place of experimentation. This will be needed in order to allow disruptive innovators to deliver proof of concept and ultimately to develop the technologies and corresponding productions. Once such experiments turn out to be successful, it will be necessary to change the overall (ATM) regulatory framework so as to allow and eventually facilitate these technologies to be rolled out in Europe and commercialised beyond Europe. Such considerations are of course valid far beyond ATM. Yet, ATM is currently the laboratory where disruptive innovations are urgently needed and where new technological solutions such as virtual centers, remote towers, sector-less ATM or flight-centric operations need to be encouraged so they can ultimately be rolled out on a cross country scale.

Regulating Drones: What is the Right Approach?

Matthias Finger

The proliferation of drones – everybody agrees – poses a series of new challenges to aviation, civil and military (e.g., safety), as well as to society more generally (security, privacy). Regulation, in Europe and elsewhere, lags behind. Yet, such regulation should be proportionate to the risks posed by drones and we should neither over-, nor under-regulate. Also, the phenomenon is still rapidly evolving, making it difficult to anticipate what kind of regulation is actually needed: on the one hand, regulation needs to frame the phenomenon, while, on the other hand, it should not stifle the development of drone technologies and the emerging drone industry. It is therefore essential that the regulation of drones is properly conceptualised from the very beginning.

The 7th Florence Air Forum wanted to achieve precisely that, i.e., define a series of consensual principles along which the regulation of drones can and should be thought and developed in Europe in the near future. And astonishingly consensus emerged, at least about the following aspects:

- Everybody agrees that there is an urgent need to regulate drones. Equally, everybody agrees that Europe is the appropriate level to develop drone regulation, even though imple-

Published in June 2020

mentation of such regulation can and even should be delegated to countries and interestingly also cities. Of course it would be desirable especially for the industry to have global rules but with the drone market exponentially growing (in the absence of appropriate regulation) there is no time to wait. Europe – together with the US which are more advanced at least in certain aspects – could actually lead the way to a more global approach.

- Everyone also agrees that such regulation must respond to the main concerns of the different involved groups, among which the different airspace users (safety), but also the drone producing industry (innovation), the ATM industry (innovation), the flying public (safety, security) and citizens more generally (environmental protection, privacy, safety on the ground).
- There was furthermore consensus that appropriate regulation must be based on a relevant categorization, according to the risks posed by the different types of drones. At the Forum, EASA presented a categorization that had been the basis of the Riga declaration and is already supported by most stakeholders. This categorization essentially makes a differentiation among drones according to the different levels of risk they pose.

Low Risk – open category:

This open category includes small drones that fly at a maximum altitude of 150m and need to remain in the visual line of sight of the pilot at all times maintaining a safe distance to airports and restricted airspace. Drones in the open category should be regulated lightly, probably by way of inbuilt technological solutions, namely geo-fencing. Aviation Authorities should not be involved here. Yet, as this category will see a massive increase in numbers, it will be up to local authorities to define some rules that will increase safety such as mandatory registration of drones and a further subcategorization according to weight and range. The open category will certainly pose more problems when it comes to enforcement: even simple rules such as maximum allowed flight height are hard to be controlled from police forces. Adding to that is the problem that the drone users that are now massively increasing in numbers are to the largest part newcomers and not members of the aviation community: they may neglect rules or even knowingly break them. Their compliance and dedication to safe operations cannot be taken for granted by regulators.

Medium Risk – Specific category:

The real challenge in drone regulation is thus this specific category, which includes a wide variety of professional (commercial) uses of drones, such as parcel delivery, inspection of infrastructures, surveillance (environment, agriculture, people), filming, and others more. Most important for this category is to develop technologies that will allow the integration of these drones into the current system of air traffic control. In fact in order to reap the full potential for new services based on the use of such drones, a system of air navigation for unmanned autonomous aircraft needs to become available. Unmanned Traffic Management

(UTM) is indeed a key technology that would provide for planning and monitoring of flight paths and assure separation from obstacles, other vehicles and geo fenced areas for drones.

High Risk – Certified Category:

For drones in this category a regulatory regime equal to the one in place for manned aviation should be adopted. Accordingly, EASA should be the agency in charge of certification and authorisation.

On the basis of this categorization a typical methodology of developing regulation can now be applied. The methodology goes as follows:

- Which problem does the regulation need to address? Typical such problems in the context of drones are safety, security, privacy, environmental protection and noise, and innovation (R&D).
- At this point, one needs to ask whether regulation is the most appropriate tool to address the problem, as, in some cases, technologies directly built into the drones (and regulated again), may well also do the job.
- As a next step, the question of the exact object of regulation must be asked: are we regulating the owners and operators of drones (e.g., licenses for drone pilots), or are we regulating the technology (e.g., technical standards, product safety standards) or are we regulating the usage of drones (e.g., restricted airspaces, times of day, etc.)?
- Next comes the question of the regulatory instruments, such as prohibitions, prescriptions, incentives and corresponding sanctioning mechanisms. What are the most appropriate tools to achieve the different goals?
- There is furthermore the question of the appropriate level of regulation; while everyone seems to agree that the Euro-

pean Commission – or EASA for that matter – defines the broad rules, and interesting question arose as to the growing of cities, especially when it comes to regulating the open category of drones.

- Finally, there is the question of the costs and subsequently of the financing of regulation: who, for example, is bearing the costs increased safety regulation of the airspace? It would be unfair to burden the existing airspace users (via ATC costs) with the increased costs caused by drones.

In any case, it will be essential to develop flexible (or as it is now called smart) regulation. Drone technologies are evolving rapidly and the drone industry is just at its beginning. Regulation will have to evolve with the technology and be as innovative as the technology itself. Nevertheless, this cannot be taken as an excuse not to regulate, as there is indeed urgency, especially when it comes to the safety of the airspace users and citizens.

Published in November 2014

Which Governance for SESAR Deployment?

Matthias Finger

The Single European Sky (SES) was from the very beginning a political project that would need substantial support from the technological side to become a reality. Thus, technological innovation is a central pillar of the SES. The programme that facilitates the corresponding research is SESAR (Single European Sky Air traffic management Research). In spite of its relatively big budget, SESAR was never really contested, as everybody was convinced that it would deliver results benefitting both the European ATM system and the industry. While the research programme has been successful and technology is no longer a barrier to a more unified ATM system, the political progress has, however, lagged behind. With the so-called Pilot Common Projects six ATM functionalities are now at a stage where they could be deployed. Yet, on the political side there is not enough agreement between the involved parties to allow a large scale, cross-national deployment that would deliver the benefits of these technologies.

The SESAR project was divided into a definition, a development and a deployment phase. While the first two phases unfolded with few problems, the transition from the development

to the deployment phase has been far from smooth, owing in particular to complicated interactions among the numerous involved stakeholders.

And the stakes are high. Apart from the taxpayer, manufacturers have also invested heavily: 700 million of SESAR's 2.1 bn € budget is made up of industry contributions and only a successful deployment would prevent these from being lost. In many cases, airlines will also need to invest to equip airplanes with new technology. Furthermore, and as new ATM technologies become ready for deployment, they will confront the realities of air traffic control and controllers. Especially the influential unions and other staff representatives will have to be convinced of the new ATM technologies' usefulness.

To recall, the structure of actors in the SES is complex: not only the industry, airlines and air traffic controllers but also Member States, Air Navigation Service Providers (ANSPs), Functional Airspace Blocks (FABs), Eurocontrol and the military will have to be involved in the process. It is clear that conflicts will inevitably ensue and will have to be managed, thus raising the question of the governance of SESAR deployment.

Which role for the Commission? Which role for industry?

The idea that currently underlies the deployment phase is to give industry, i.e., the operational stakeholders, a central role in SESAR's deployment phase. There are first the manufacturers, who have crucial operational knowledge, but who also have a clear conflict of interests, given that they are developing the very technologies to be deployed. Airlines and ANSPs are likely to play a key role in managing deployment, yet they also display diverging interests. Bearing in mind the complexity of the issues, along with the large amount of possible technical pitfalls, it is of course advisable to give industry a central a role in SESAR deployment.

Yet, the question remains as to the role of the Commission. To recall, the Commission played a leading role in both the definition and in the development phases. Can it “let go” in the deployment phase and rely on industry self-regulation alone? What happens if something goes wrong? Who will take the responsibility? Who will step in? Let us not forget that, in aviation, the Commission has always relied on other bodies, mainly Eurocontrol and EASA. In doing so, it was able to build up its political weight in spite of its relative lack of technical expertise and personnel. Throughout the SESAR programme the Commission has had significant influence on the main ATM research and development projects, notably thanks to the so-called SESAR Joint Undertaking. However, during the deployment the SESAR-JU will no longer be in the driver’s seat. The main challenge will be to bring the developed technologies into use and to avoid costly failures because of lack of coordination and political steering.

In short, a decision making structure is needed that allows for making optimal use of the stakeholder’s expertise without being biased towards their interest. Only this can avoid scenarios where the combined powers of sovereign states and incumbent service providers lead to an overall failure as happened in the “data-link case”.

The Deployment Manager, the key to successful SESAR deployment

To somehow overcome all the above mentioned difficulties, the Commission has invented the concept of a so-called Deployment Manager. Yet, both its organisation and its accountability are still unclear. What is clear, however, is that its institutional role will be unique. The Commission has launched a call and soon the winning consortium will be announced.

On paper, at least the division of labour is clear: while the Commission (with its advisory bodies) will remain in charge of

defining the “common projects” (the policy level), the Deployment Manager will preside over “how to deploy” (the management level). In other words, the selected industry consortium will be in charge when it comes to implementing the different SESAR projects (implementation).

The vagueness of the Deployment Manager’s task description may well allow the Commission to pass difficult (political) decisions on to the “management level”, such as the question of the level of deployment. Indeed, the optimal geographical level of deployment of each ATM functionality will be one of the most crucial decisions the Deployment Manager will have to make. This means nothing less than how fragmented or unified the European ATM system will ultimately be. There are of course different types of functionalities and not all of them require centralised deployment; yet, in many cases, central deployment would bring significant efficiency gains.

Most SES technologies and innovations already exist, but they are not yet used because they require a high degree of coordination, and even harmonization, which is not easy to achieve within the current fragmented institutional system. Building the deployment phase on a solid governance architecture, and, most importantly, overcoming the national sovereignty barriers that are hindering the application of existing technologies, will be *the* challenge not only for the Deployment Manager but also for the Commission which is ultimately responsible for delivering the SES.

Published in April 2014

From Single European Sky Gridlock to Air Traffic Control Markets to Evolving the Role of EUROCONTROL

Matthias Finger

The 5th Florence Air Forum marked, at least conceptually, a significant step forward. Building on the previous Forum and on a general agreement that the current gridlock of the Single European Sky (SES) is unsustainable, the Forum addressed the question of competition in Air Traffic Control (ATC) services and what such competition would ultimately mean for the evolving role of Eurocontrol.

There indeed seems to emerge a certain acceptance, especially among smaller Air Navigation Services Providers (ANSP) confronted with problems of economies of scale and corresponding costs for investments, that some of the ATC services (such as Meteorological Services, Flight Service Stations, Automatic Dependent Surveillance Broadcast, ATC training, as well as Data Communications Services) could be unbundled and outsourced to specialised providers, thus leading to reduced costs and overall efficiency gains. Some of these services could be provided by ANSPs specializing in them, as well as by privates

entering this ATC market. Everyone agrees that this is a gradual process whereby services outsourcing and services provision will phase in parallel to internal transformations of the ANSPs, basically reflecting national dynamics and emerging market opportunities.

The next logical question then pertains what needs to be coordinated at the European level so as to make such ATC services markets work, considering that we are dealing with imperfect infrastructure markets that will need supranational coordination and corresponding regulation. The question also is whether there are some basic infrastructure services that can actually not be opened to competition, such as radars, flight data processors, ground infrastructures bound to the airports and others more.

This is where Eurocontrol comes in: to recall, Eurocontrol pre-dates the SES project. Yet, in the context of the creation of the SES, it has been tasked by the European Commission to become the network manager, thus providing some sort of infrastructure function for European ATC. Clearly, Eurocontrol is therefore not a regulator. Rather, the regulatory function is located somewhere in the European Commission, or in a body it may designate as being/becoming the regulator, such as the European Aviation Safety Agency (EASA). Already today, EASA is the safety regulator of Eurocontrol.

But what does managing the network mean? Is this primarily coordinating function (e.g., the coordination of the different network managing activities of the different ANSPs) or is it (evolving into) an operational function, whereby Eurocontrol gradually takes over network managing functions from the respective ANSPs? And which of these network managing functions are actually monopolistic in the sense that they constitute a necessary infrastructure for other services that can then be provided commercially and competitively?

If Eurocontrol is to become the infrastructure provider of the monopolistic network managing functions, two specific questions arise: first, can it then also be an ATC services provider? The problem here is that it would provide ATC services in competition with other ATC services providers, yet it would be at the same time the infrastructure monopolist, something which is known from other sectors to lead to potential market distortion. At the least, this would lead to the need for an economic regulator, which would have to make sure that Eurocontrol does not discriminate against its competitors. But even if Eurocontrol was precluded from also providing competitive ATC services, there would still be a need for regulating its monopolistic activities from an economic point of view (efficiency).

Historically, Eurocontrol is an intergovernmental organization, whose role it is to coordinate between the different national ANSPs and their respective owners (i.e., the governments) in terms of interconnection of airspace and (common) standards of interoperability. These coordinating functions can be and, to a certain extent, are already partially replaced by the European Commission. This is at least the case for the 28 EU Member States and could evolve as well through the bi-lateral agreements with the other non-EU States that are members of Eurocontrol though. Yet, on the other hand, the EC could also explicitly outsource these coordinating functions to Eurocontrol (on a contractual basis).

The above considerations can be boiled down to the question as to what the network managing function really is: is it a genuine infrastructure services provision (notably the management of scarce airspace in terms of flows and safety), on the basis of which all other ATC services can exist? Or is it just a transitory function of coordinating the national ANSPs, which will disappear once all (national) ATC services are unbundled and competitively offered? In the first case, Eurocontrol will most likely, and over time, evolve into *the* European (and beyond) monopolistic ATC

infrastructure services provider, to be regulated by a European agency, most likely EASA. In the second case, Eurocontrol is just another inter-governmental organization that will gradually become obsolete as unbundling and outsourcing of ATC services progresses.

Whether it will be one or the other - i.e., the answer to the future of Eurocontrol - probably lies in technology, as technological developments ultimately will decide whether (or not) and for how long monopolistic ATC infrastructures services will be necessary for operational and safety purposes.

PART V

When the Modes
Come Together:
Towards Increasingly
Intermodal
Transport Regulation

Multimodal Ticketing: What Kind of Regulation is Necessary?

Juan Montero and Matthias Finger

Digital technology enables multimodality at previously not possible levels, notably by identifying and implementing complementarities between transport modes, which in the past were too complex to be coordinated. Different traveling options can be displayed to potential passengers, who can then acquire their tickets for through-journeys in multiple formats, and subsequently be accompanied along the trip in case of disruption.

Corresponding technology is mature and continues to evolve rapidly. Global Distribution Services have been managing aviation reservations for decades. Application Protocol Interfaces (APIs) allow the interaction of the various systems used by different companies. Algorithms are already capable of personalising traveling options.

However, little progress has been made when it comes to implementation. Passengers still have to navigate through the different modes on their own, often with scant information, bearing the risk of missing connections. This gets worse when crossing borders. So what is missing?

Discussions in Florence made it clear, once more, that the necessary governance models, i.e., the incentives for the involved actors as well as the underlying business models supporting multimodal digital mobility services (MDMS) are not yet in place. The fact that something like this is technically feasible, does indeed not mean that it will automatically happen. As a matter of fact, the real difficulty is to align the interests of all the involved actors in the ecosystem, namely the providers of physical transport services, the digital platform services providers and the public authorities. Together, they have to define the governance framework that allows for the best services to customers, while at the same time incentivising all the relevant actors to actively participate.

There is the tendency to simplify the discussion around buzz words such as “data sharing”: if only we were able to standardise data exchange protocols and by doing so to increase data sharing, SDMS would happen almost miraculously.

But the fact of the matter is that not all the participants in the ecosystem are equally interested in coordinating, or rather being coordinated by digital platforms, as there can be winners and losers. Also, data are not just “data”. The digital intermediaries’ and mobility platform providers’ business model precisely is to coordinate transport service providers. So, they are obviously in support of regulation so as to accelerate standardisation, data sharing and new MDMS channels. The higher the quality of “data” to be accessed (e.g., real-time information and ticketing information), the better for them. And small physical transport services providers (e.g., micro-mobility providers) see clear benefits in using such new distribution channels which will bring more passengers to their services.

Other players see “digital coordination” with suspicion. They have heavily invested resources and time to coordinate complex systems (such as hub-and-spoke aviation networks, cadenced

rail networks, dense urban networks) themselves, including investments in their own digital distribution systems. They see a limited potential for further growing passengers and revenue and see no gain by losing control over the access to their customers, as others increasingly coordinate their services. They also anticipate threats to their financial stability, as digital intermediaries will extract value from their already strained systems.

Regulatory intervention could certainly accelerate data sharing and even ensure the right to the digital intermediaries to distribute third party services and issue multimodal tickets. However, it is not advisable to build such a complex ecosystem against the will of some of the most relevant players, especially the ones that will ultimately deliver the physical services. Experience in multisided markets, as derived from the traditional network industries, shows that the so extracted value has to be evenly distributed across the ecosystem so as to keep all the involved players actively engaged in maintaining and even developing the (mobility) system.

The ultimate aim of such regulatory intervention should be to benefit the users. And such regulatory intervention should be proportionate to the market failure that results from the discrepancy between what is technologically possible, yet not happening because of lack of coordination. The challenge is to identify the right and proportionate measures to enable transport to reap the benefits of digitalisation.

We therefore see a clear role for regulation as an enabler to facilitate data sharing. Yet, one has to clarify beforehand what exactly is meant by “data”. Clearly, the “richer”, i.e., the more real-time and the more analysed the data, the more strategic it is for the actors having invested in it, and the less likely these actors are willing to “share”. And this principle is valid for both physical and digital operators, as well as both for incumbents and new entrants, a reality that has to be taken into account when regulating “data sharing”.

The adoption of standards through public intervention is an already well-established practice. There is also a recognised role for public authorities and regulators to guarantee safe environments in terms of infrastructure (generation, transmission, storage), security, privacy, and others more. The creation of mobility data spaces, as foreseen by the EU in its Digital Governance Act is certainly a step in this direction.

Compulsory data sharing requires a solid legal base. Local authorities are building such a legal base around licensing for the provision of services (taxi, micro-mobility, shared vehicles). Regional and national authorities are building it around public service contracts. Competition authorities are becoming more active in the elimination of illegitimate bottlenecks created by dominant firms. The EU, in turn, is developing data sharing obligations across transport modes (maritime single window, ITS Directive, and so on). We think this is the way forward.

Some Member States are currently experimenting with the compulsory sharing of already quite enriched data, such as real-time travel information or ticketing (e.g., Finland, France). However, the legal base for such a strong public policy intervention at the EU level is not obvious. Furthermore, such an obligation would require a coherent and comprehensive framework for effective enforcement. As described along the Forum, detailed rules have been enacted in the past to support similar arrangements (i.e., rules governing liability in the case of through-ticketing in the UK), including rules to determine access conditions to such information. We are afraid that a mere reference to FRAND conditions is too vague to be effective. A significant body of rules as well as case-law have been developed over the past 30 years on access to telecoms, energy and transport infrastructure (i.e., slots regulation and access charges in aviation, track access regulation in rail, etc.). And it became clear that sophisticated institutional arrangements are always necessary to enforce such regulations. We think that this will be no different in the case of

access to operational and commercially relevant information.

In short, beyond mere data sharing obligations, a more balanced approach has to be developed in order to evenly distribute the gains derived from digitalisation across the ecosystem of involved actors. Data sharing by transport service providers might be the first step, but it cannot be the last. Rules on the use and compensation of such “data” are necessary. In particular, we think that some kind of reciprocity will be necessary, for example the obligation for digital intermediaries to pay back with their data. Also, obligations will have to be imposed upon digital platforms pertaining to transparency, self-preferencing, non-discrimination and pro-competitive behavior will help ensure a more balanced digitalisation of the transport industry, and in this way, a more active engagement by all actors involved in the ecosystem.

Published in September 2021

How to Think the Greening of European Cargo Operations?

Matthias Finger and Teodora Serafimova

The greening of European cargo operations requires actions at numerous levels, each of them having a different time horizon, which itself stems from the very nature of the investments needed. This is best conceptualised in terms of a layered model. All these actions will, of course, have to be coordinated across time and across the different layers. We suggest to distinguish the following four layers:

Infrastructure layer: shifting towards greener modes, while rendering *all* modes continuously greener

The bottom layer is constituted by the infrastructures, which are needed for greening cargo operations. Infrastructure investments required for greening have several dimensions, and include those targeted at further improving the greenhouse gas (GHG) efficiency of all transport modes with a particular focus on electrification and the uptake of other sustainable fuels but also investments into transboundary corridors and rail infrastructures more generally.

Rail and waterborne transport have the lowest emissions per kilometre and unit transported in Europe ([European Environment Agency, 2021](#)). In recognition of their superior environmental qualities, the Commission has reaffirmed its commitment to boosting the uptake of sustainable multimodal transport through a set of concrete policy actions laid down in its [Sustainable and Smart Mobility Strategy](#) (e.g., revising the [Combined Transport Directive](#)).

Notwithstanding, it should be noted that there are still many rail tracks in Europe that are not yet fully electrified. Shifting an increasing volume of goods onto railways will only make sense if these remaining lines are electrified or powered by other renewable fuels, such as hydrogen. This will have to go hand-in-hand with continued efforts to reduce the carbon intensity of the EU's electricity mix. Similar principles apply to inland waterways and short-sea shipping.

In parallel to the pursuit of modal shift objectives, investments should accelerate the uptake of efficient zero-emission trucks, but also newer concepts such as electric highways, which entail connecting electric trucks to overhead power lines. It goes without saying that the renewal of existing fleets will have to be accompanied by investments into the relevant recharging and refuelling infrastructure.

There is also a need for investments into rail freight corridors, especially transboundary investments where the corridors are not yet fully equipped. Furthermore, investments will be necessary into rail more generally, if we also want to shift to rail at a more local level. In fact, whereas the [European Green Deal](#) stresses the role of rail above 300 kilometres, the experience of Belgium illustrates that there is significant potential for modal shift also over shorter distances. All these investments necessitate the commitment of financial resources and time, i.e., need to be planned and then approved, etc., which, in turn, underscores the need to start acting immediately.

Intermodality layer: boosting transshipment infrastructure, and pursuing standardisation

The second layer pertains to intermodality and consequently investments into transshipment infrastructure. Indeed, inter- and multimodality pertain to transferring goods from first-mile trucking to rail or inland waterways and there again onto to last-mile trucking. Multimodality needs to be made easy and this requires dedicated transshipment terminals, which in turn require investments. But such investments are not just into infrastructures, i.e., mainly buildings, but also, for example, into containers or semi-trailers that are easily transferred from road to rail and backwards. Containers and semi-trailers, in turn, need to be standardised. Finally, there are still investments needed into equipment for interoperability between trains and tracks.

Data layer: investing in digitalisation to improve economic and ecological efficiency

The third layer is constituted by the digital level. This data level is the new interface between the physical – multimodal – transport on the one hand and the user/customer on the other. In our case, customers are the intermediaries, i.e., shippers.

Shippers today continue to face a lack of reliability, especially when it comes to cross-border rail services resulting from fragmentation and the prevalence of national rules. Data about the state of the infrastructure, its level of congestion, available transport capacities, prices, timetables, routing options and many other more need to be made available to digital platforms, which subsequently can develop services. At the same time, these platforms can also be used for the operations and management of the multimodal infrastructure as an integrated system. The goal is to operate this system in the most efficient way, optimising simultaneously economic and ecological efficiency.

The digital layer also requires investments, mainly into sensors, data-centres, but also analytics. Investments in digital infrastructure are, in fact, said to deliver up to 30% of potential capacity increase thanks to a more efficient capacity utilisation (CER, 2020). Not the least, these will have to be complemented by standardisation efforts along with a secure and trusted framework for data exchange.

Regulatory layer: creating conducive framework conditions for sustainable multimodal transport and logistics

The fourth layer is constituted by policies and regulations pertaining to the planning, investments and operations of this integrated multimodal cargo system. We have already mentioned the policies regarding data sharing and standardisation. One also needs policies pertaining to physical standardisation, congestion management and pricing. All these policies and regulations set the incentives at the three preceding levels that are infrastructure, interoperability and data. As confirmed by the discussions of our [8th Florence Intermodal Forum](#), one also needs policies about the underlying taxonomy and measurement of the operations' environmental footprints. Only an unambiguous taxonomy and a precise measurement can generate the data that are needed to set science-based targets, monitor improvements in environmental performance over time, as well as steer modal shift and decarbonisation efforts altogether.

In all of this, we need a systemic view, as well as a local articulation in time. The first layer will take longest to produce its decarbonising effect and the fourth layer will take least of the time. Yet all of them need to be considered simultaneously in a very coherent approach. Obviously, digital platforms will play a key role in all this.

To conclude, let us state that all these actions need to produce real effects on decarbonisation, as opposed to merely shifting the costs, the emissions, the subsidies or the responsibilities to some other place. Indeed, it is easy to make someone else pay (e.g., future generations), to shift the emissions to someone outside of the European system (e.g., China), to subsidise in an inequitable manner, making decarbonisation a burden for some and a profit for others. Finally, responsibilities need to be properly attributed in a balanced way.

Most logically, this will be a European system, optimised at a European level, while at the same time, leaving room for subsidiarity where it makes most sense. The approach should be pragmatic and no time should be wasted with perfectionism. Rather we should inbuild into such an approach a learning mechanism, by which this multi-layered system can rapidly adapt to changing situations.

Placing Governance Considerations at the Core of the Sustainable Urban Mobility Indicators' Design Process

Matthias Finger and Teodora Serafimova

European Commission President von der Leyen's [State of the Union address](#) unequivocally signaled the need for accelerated and ambitious climate action with its proposal to tighten the EU's 2030 emissions reduction target to 55% as compared to 1990 levels. All sectors of the economy will have to do their fair share in fulfilling the objectives laid out in the [European Green Deal](#) and the [Climate Law](#), namely to achieve net zero CO₂ emissions in Europe by mid-century. The transport sector will have to become drastically less polluting, especially in cities, where a combination of measures will have to be adopted to address emissions, urban congestion, and to bolster public transport.

Cities, or rather metropolitan areas (FUA or Functional Urban Areas in EU parlance), where the implications of the COVID-19 pandemic have been particularly strongly felt, will have to play a central role in leading the green recovery and implementing the necessary measures to bring transport emissions on a firm path to climate neutrality. The adoption of an EU-wide framework for [Sustainable Urban Mobility Indicators \(SUMI\)](#) stands to

assist cities in meeting both of these challenges: by safeguarding a more efficient spending of public finances in the budget-cautious COVID-19 aftermath, while fostering the implementation of SUMP and smart mobility strategies.

SUMI: concept vs. reality

As local authorities pursue efforts to align with EU policy goals, it becomes increasingly evident that uniform systems for the monitoring and reporting of progress need to be put into place. The discussions during the [7th Florence Intermodal Forum](#) brought to light the numerous prospective benefits linked to SUMI implementation. A standardised, methodically sound and practically feasible indicator set can enable public authorities to gain a better understanding of the current status of the city with regard to sustainable urban mobility. More specifically, SUMI can serve as an important tool for cities to identify deficiency areas where additional action may be required, to track progress towards set policy goals, and to evaluate the effectiveness and overall impact of urban mobility policies. SUMI can also enable cities to benchmark against other cities and compare against national and international data sets, while facilitating the replicability of the best practices across cities with similar characteristics. The benchmarking attribute of SUMI can, thus, be used to build political pressure and to 'set the agenda' for required policy implementation and actions. Not the least, alignment of the indicators' scaling system with EU policy goals can support cities in advancing the EU's climate and sustainability agenda, while ensuring that scarce resources are channeled towards smart and sustainable projects and policies.

The experience gathered in the course of the EU-funded [SUMI project](#), however, shows that the concept has met frictions when it comes to its practical implementation: while SUMP consider the whole functional urban area and foresee cooperation across different policy areas, across different levels of government, as

well as with local residents and other principal stakeholders, data availability and the subsequent calculation of indicators turns out not to be up to that ambition.

Confronting the mismatch between cities and their administrative boundaries

In practice, the definition and calculation of the indicators has proven to be a complex exercise. The SUMI project has rightfully targeted the 'functional urban area' (FUA) as the geographical scope for the collection of data and calculation of indicators; according to the European Commission's definition, the FUA comprises the city and its commuter catchment area. However, the participating cities' experience shows that the FUA does not always correspond to the political-administrative reality and therefore not to the available data. This is because normally data tend to be available both at the city and national levels, whereas the FUA often falls somewhere in between. This mismatch between cities and their administrative boundaries has not only created a challenge on the data collection level, it of course also constitutes a challenge at the policy level.

As a result, the data collection efforts conducted in SUMI have shown that a combination of city- and urban area-level data have been used, as each city has had to make an explicit decision as to which definition of 'urban area' to use, based on its own administrative boundaries and data availability. This inconsistency in the geographical areas used as the basis for the calculation of the indicators, however, risks distorting the results and undermining the possibility for comparison and benchmarking, which are at the heart of the SUMI exercise. For instance, a city's indicator score for 'Air Quality' could become artificially inflated (i.e. thus exaggerating the city's performance with regards to curbing air pollution) if the entire urban area is considered, given that air quality tends to be lower in the city centres as opposed to its suburban areas.

=The discussions of the Forum seemed to largely point in the direction of using the 'city level' as the default geographical area for data collection. Here, the need to have a uniform and well-understood definition of EU urban areas will be key to safeguarding the integrity and comparability of the data. In the future, however, the need to collect data also on the larger functional urban area may become increasingly important in view of accommodating urban sprawling trends.

The need for inter-institutional backing and private sector involvement

Another challenge has been the unavailability of certain types of data, which had simply not been collected by city governments previously, such as for example data on accessibility of public transport for mobility-impaired groups (Indicator 2). In order to fill these gaps, local authorities have had to either initiate costly and often difficult to implement data collection activities, or, alternatively, involve external organisations for the procurement of this data. In the case of the latter, however, we have seen that inter-institutional problems (between the city government and the municipal police for example) can deter the swift exchange of such data. Data collection at the FUA level has thus proven challenging in the absence of institutional backing and political support. In other cases, the necessary data may be owned by private companies. Here the need for data sharing obligations, as well as a clear narrative regarding the intended use and the expected outcome of data sharing with public authorities, will be key to building the needed trust to facilitate the exchange of data. Needless to say, data sharing obligations need to be accompanied by rules on data privacy, ownership, and governance.

Getting national governments to support and own the SUMI process

Indicators must be widely applicable across Europe, irrespective of city size and local characteristics in order to enable cities to benchmark and compare. The enormous heterogeneity across European cities, in terms of data gathering and monitoring capabilities, however, renders this exercise particularly challenging. Due to financial and technical staff constraints, cities may be obliged to prioritise data collection and reporting requirements vis-à-vis national- or regional-governance levels. In light of this, ensuring the full support of national stakeholders for SUMI, is crucial to their large-scale take up at urban levels. In fact, important synergies can be exploited if the indicators are incorporated into national level reporting cycles. A greater involvement from national and regional governments, who already collect and dispose of large amounts of relevant and reliable data, should come in support of cities' data gathering efforts. Not the least, bridging the gap in the different data collection and monitoring capabilities across European cities, will require some sort of EU capacity building mechanism, so as to help cities acquire data, develop corresponding tools, as well as foster cooperation with data gathering organisations.

Designing a future-proof and adaptable indicator set

Lastly, the indicator set needs to be future-proof and adaptable to the rapidly evolving urban mobility technologies (e.g., electrification, automatisisation and digitalisation), as well as to changing travel habits. The COVID-19 crisis serves just as the latest reminder of how quickly urban mobility systems and environments can transform. The indicator set needs to reflect this reality and be able to take into account changing demand, behaviour and technologies.

For example, the COVID-19 period saw many governments reconsider space regulations and adopt policies in favour of pedestrians, micro-mobility and other types of clean urban mobility. The increased recognition of the importance of 'public spaces' and their use should also be reflected in the indicator set. Multimodality, another trend of growing significance in urban mobility, should be included in the definition of modal-split, which in turn, is an important parameter for the calculation of a number of core indicators.

While the need for a common framework and definitions are paramount, these will have to each time take into account local needs and specificities. Ensuring sufficient room for flexibility will, thus, be key to ensuring that the cities will ultimately own, understand and make use of the SUMI process, at both political and administrative levels.

COVID-19: An Opportunity to Redesign Mobility Towards Greater Sustainability and Resilience?

Teodora Serafimova

Highlights

The Mobility-as-a-Service (MaaS) concept has recently attracted considerable interest among policy makers and the industry for its potential to improve the overall efficiency of the transport system and to reduce reliance on private cars in urban centers. By doing so, MaaS can contribute to the reduction of both CO₂ emissions and pollution, thereby supporting the advancement of the European Green Deal agenda. While the Covid-19 pandemic has brought about unprecedented challenges for the whole transport sector, it has also highlighted the importance of an agile and resilient transport system in ensuring an uninterrupted supply of goods and people. This, in turn, may present important opportunities for accelerating the rollout of MaaS. As a direct result of the crisis, we have seen transport users adapt their travel and working habits, companies expand their functions beyond the transport of people to deliver medicine and food, as well as a more systematic effort by companies to share data to help

inform governments' response to the pandemic. Building upon this momentum, by means of a rethinking of public authorities' governing approaches, can help to translate these innovative practices into long-lasting and disruptive changes for the sector.

Introduction

With over 70% of EU citizens currently living in urban areas, achieving sustainability of cities has become one of the defining challenges of our times. While urban areas can enable access to important social and economic opportunities, they have also brought about new challenges related to traffic congestion, air- and noise-pollution, and inefficient transport systems. The shift towards smart and more livable cities therefore places a particular responsibility on the transport sector, which accounts for a quarter of the Union's total greenhouse gas emissions and which is a significant contributor to health-damaging pollution in cities. Achieving the European Commission's objective of making Europe carbon neutral by 2050 will require a 90% reduction of transport emissions with sizeable contributions across all modes. In its Green Deal communication, the von der Leyen Commission underlines that the shift to a truly sustainable transport sector would entail "putting users first and providing them with more affordable, accessible, healthier and cleaner alternatives to their current mobility habits"²⁹.

In parallel to its pursuit of the EU's sustainability agenda, however, the transport sector is confronted with unprecedented challenges triggered by the Covid-19 pandemic and the social distancing strategies implemented to curb its spread. These have not only drastically reduced public transport services but inevitably also act to disadvantage the use of public- and shared-transport, at least in the short-run. In fact, according to data from the urban mobility application Moovit, ridership on major public

29 European Commission (2019), The European Green Deal, https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf

transportation systems in European cities has dropped by more than 80% since the onset of the outbreak in January 2020. In the hard-hit Italy, public transport ridership has seen decreases in the range between 80% and 90% in every major city³⁰. In the short- to medium-term the most urgent priorities will therefore be to address the financial viability of the affected businesses across the industry as well as to ensure the safety of the travelling public once lockdown measures have been phased out.

Notwithstanding, it is precisely during times of emergency as we are facing today, that the paramount nature of a resilient and agile urban transport system, based on Mobility-as-a-Service (MaaS), becomes increasingly obvious in enabling access to health care facilities, while safeguarding an uninterrupted supply of food, medical- and emergency goods. This article discusses current challenges to urban mobility and argues that the Covid-19 pandemic may, in fact, serve as an opportunity for the advancement of the MaaS ecosystem and the demonstration of its true value in supporting the Commission's Green Deal objectives.

The emergence of the MaaS concept

It is widely acknowledged that personal and goods transport entail a significant societal and economic cost in the form of environmental and human health impacts, but also accidents, congestion, and infrastructure wear and tear. In fact, the overall size of transport-related external costs is estimated to be around €1 000 billion annually, the equivalent of as much as 7 percent of EU28 GDP³¹. Cost-reflective pricing, regulation and behavioral changes will all have a role to play in internalising these external costs and placing the transport sector on a firm path to climate neutrality. The desired changes, thus, cannot be brought about

30 Moovit Public Transit Index 2020, https://moovitapp.com/insights/en/Moovit_Insights_Public_Transit_Index-countries, accessed on 17 April 2020

31 European Commission, Directorate-General for Mobility and Transport (2019), Handbook on the external costs of transport, 2019, <https://ec.europa.eu/transport/sites/transport/files/studies/internalisation-handbook-isbn-978-92-79-96917-1.pdf>

by the development of a single transport mode or by means of a technological-shift only. In addition, a closer integration of the different transport modes and services will be needed, including both public and private solutions, which, in turn, is at the heart of the MaaS concept.

The MaaS concept dates back to the 2014 ITS Europe Conference in Helsinki, where it was first used to describe an entity offering a mobility package as a subscription service. Subsequently, Finland has pioneered research and financed pilots into the concept. MaaS can be defined as the integration of various forms of transport services into a single mobility service accessible on demand. To meet a customer's request, a MaaS operator facilitates a diverse menu of transport options, be they public transport, ride-, car- or bike-sharing, taxi or car rental/lease, or a combination thereof. For the user, MaaS can offer added value through the use of a single application to provide access to mobility, with a single payment channel instead of multiple ticketing and payment operations³². As such, MaaS represents a shift towards a more user-centric mobility paradigm given that users are enabled to plan and book their door-to-door intermodal and multimodal trips thanks to a single application which provides real-time journey information and takes into account individual preferences in terms of time, comfort or cost of the trip (Goodall et al., 2017).

A combination of societal and technological trends can be credited for the emergence and growing popularity of the MaaS concept. Firstly, continuous population growth and urbanisation are translating into a growing demand for mobility, which needs to be reconciled with the EU's sustainability and climate objectives. Furthermore, the simultaneous availability of wireless connection, 3G, 4G, and 5G networks and interfaces, such as smartphones and tablets, enable ubiquitous access to shared

32 MaaS Alliance (2020), <https://maas-alliance.eu/homepage/what-is-maas/>, accessed on 19 April 2020

mobility services for consumers (Nikitas et al., 2017). This rapid penetration of ICTs in the transport sector is increasingly blurring the boundaries between the different transport modes and is, in fact, creating an intermediate level between the different means of transport and their users, notably thanks to a new data layer. For the users the focus is therefore no longer on the transport mode, but rather on the mobility. Society itself is changing and so are mobility patterns. Driver's licenses and car ownership have seen a downward trend, as it is becoming generally less attractive for citizens to own a car and the motivation for buying one is primarily based on necessity rather than prestige (Finger, Bert and Kupfer, 2015).

The role of MaaS in achieving the Green Deal objectives

Although a relatively novel paradigm, MaaS holds potential to boost both social and environmental sustainability in cities, while enabling cost-savings for local authorities. The environmental benefits stem from the ability to tackle urban mobility challenges, namely traffic congestion and the consequent air- and noise-pollution, given that MaaS encourages more sustainable transport choices and improves overall system efficiency (Audouin and Finger, 2019). It should, however, be noted that the emission reduction potential of MaaS has been met with reservations by some scholars on grounds that it may lead to an overall increase in vehicle kilometers travelled in lower-occupancy vehicles (Pangbourne et al., 2018). In view of this, to ensure the environmental integrity of MaaS, it should be accompanied by data-led regulations which seek to increase average vehicle occupancy and thus reduce the number of vehicles in circulation (Voegel, 2018). In parallel, the adoption of bold emission reduction targets and climate policy for transport, is another key instrument to ensure that MaaS contributes to the advancement of the climate and sustainability agenda.

According to a study based on the pilot project of the UbiGo MaaS initiative in the city of Gothenburg, Sweden, a majority of UbiGo users reported that they would want to continue their subscriptions and become more positive towards shared urban mobility options as well as public transport, and less positive towards private cars. The study has also shown that the overall number of journeys, performed by private cars, reduced in the city, which in turn, could mitigate traffic issues. MaaS, furthermore, stands to improve social cohesion and inclusiveness by supporting healthier and more active lifestyles. Not least, smarter and more livable cities tend to attract more investment, thus creating new businesses and employment opportunities (Nikitas et al., 2017).

In recognition of these benefits, in its European Green Deal, the Commission promises to develop smart systems for traffic management and MaaS solutions, through its funding instruments, such as the Connected Europe Facility. What is more, the communication stresses that automated and connected multimodal mobility will play an increasing role, together with smart traffic management systems enabled by digitalisation. Evidently, the MaaS concept has been elevated as a priority on the EU policy agenda, and discussions on elements crucial to enabling it, such as EU-wide multimodal ticketing and payments systems, are underway. Notwithstanding, a number of regulatory, technological and cultural barriers remain to be addressed in order to achieve a truly integrated and multimodal mobility architecture based on MaaS. While the emergence of Covid-19 might be stalling progress on some of these fronts, the paragraphs below argue that the pandemic may unveil new opportunities and act as a catalyst for the deployment of MaaS solutions.

Covid-19: an opportunity for MaaS?

The global economy is projected to contract by 3 percent in 2020 as a result of the Covid-19 crisis, according to the International Monetary Fund's latest annual World Economic Outlook.³³ Significant reductions in transport usage caused by the pandemic are set to negatively impact many industries in the short- to medium-term, with MaaS being no exception. Companies, governments and individuals are, in fact, already suffering the economic toll of the crisis in the form of loss of sales income, tax revenue and wages. As it is, transport and logistics already account for a significant share of company costs and household expenditures. On average, each person spends €1900 on transport per year, which represents 13 percent of their spending. In light of this, budget cautiousness will certainly increase in aftermath of the crisis. On the flip side, MaaS and personalised mobility could enable transport users to optimise expenditures. By creating a new service layer, MaaS leads to a more efficient use of existing transport infrastructure which in turn stands to benefit both public authorities and private companies. From a local administration perspective it means making better use of existing services by connecting them better with their users, which, in turn, offers important cost-savings.

Covid-19 has, in fact, already generated new ways of thinking and of moving both people and goods around. Industry stakeholders have demonstrated a high degree of creativity by reinventing their business models in response to the drastic drop in mobility demand. To name a few, the Italian sports car manufacturer, Ferrari, has shifted production to make respirator parts, while France's national state-owned railway company, SNCF, has been operating 'hospital trains', i.e., high-speed trains trans-

33 International Monetary Fund (2020), World Economic Outlook, The Great Lockdown, 2020, <https://www.imf.org/en/Publications/WEO/Issues/2020/04/14/weo-april-2020>

porting Covid-19 patients and medical supplies³⁴. Ride sharing companies and taxis are expanding their functions beyond the transport of people to deliverers of food, medicine and other goods.³⁵ New technologies such as drones and automated vehicles are proving their suitability in carrying out tasks with the minimum human contact that the present situation calls for.³⁶

Transport users, too, have broken their usual habits as manifested through the rapid uptake in teleworking and cycling. Consequently, over the past few weeks, numerous studies have indicated improved air quality and reduced emissions in major metropolitan areas around the globe. According to projections by the OECD's International Transport Forum, greenhouse gas emissions from transport are set to be 20% lower in 2020 than under normal circumstances. What is more, a growing share of people are relying on local supply chains and communities, as they take advantage of e-commerce and delivery services. Albeit unintentionally, the implementation of lockdowns has also led to the sudden creation of space, which, in the busy and congested urban areas of today, is a valuable resource. Some cities have gone on to enhance space allocation to cycling, as a greener and more individual way of travelling in line with social distancing regulations.³⁷

A rethinking of urban mobility governance models

In order to ensure that these short-term benefits translate into long-lasting and disruptive changes for the sector and city life in

34 International Railway Journal (2020), <https://www.railjournal.com/passenger/main-line/sncf-to-further-reduce-services-to-combat-coronavirus-spread/>, accessed on 11 April 2020

35 Covid-19: impact on shared mobility, (Movmi Shared Mobility Thoughts, 2020) <https://movmi.net/covid-19-shared-mobility/>, accessed on 14 April 2020

36 Kim., Y. T. (2020), Transport in the face of the pandemic, (International Transport Forum, 2020), <https://www.itf-oecd.org/covid-19/paradigm-shift-transport>, accessed on 12 April 2020

37 Covid-19: impact on shared mobility, (Movmi Shared Mobility Thoughts, 2020) <https://movmi.net/covid-19-shared-mobility/>, accessed on 14 April 2020

general, this calls for a careful evaluation of urban mobility governance models. Congestion issues coupled with the fact that cars are only used for an average of 5% during their lifetime, have already mobilised support among a growing number of cities for a transition “from ownership to usership” (Finger, Bert and Kupfer, 2015). Helsinki has gone as far as planning to make it unnecessary for any of its residents to own a car by 2025, which in turn, is to be achieved not by means of mandates, but rather by rendering the alternative modes of transport more attractive for residents (Goodall et al., 2017). Covid-19 is an opportunity to act upon this momentum.

Urban mobility policy has traditionally been the responsibility of local authorities. However, our experience with MaaS points to a growing role for the private sector, namely innovative car- and ride-sharing companies as well as e-scooter providers, in driving its development. Therefore, new governance structures involving both the public and private sectors are needed for MaaS schemes to be successful (Audouin and Finger, 2019). The more developed “service layer” integral to the MaaS ecosystem, also implies a shift of certain powers away from the transport providers to new actors. Yet the network operators need to make the investments as well as to generate the profits to make them. In view of this, it should be noted that the MaaS concept is not fully compatible with (and may even compete against) transport services provided through public service obligations, i.e., services of general interest, which receive state subsidies. Governments would thus need to define the business model of MaaS regarding public transport services. Furthermore, it is well known that employer strategies can be a powerful tool for encouraging the use of public transport, through the provision of subsidies or tax reductions to employees choosing public transport over their private car for their daily commute. The same advantages, however, are currently not guaranteed for commuters choosing MaaS. In view of this, a recognition of the benefits of MaaS by

local authorities and the enactment of similar corporate or government subsidies and tax reductions can enable MaaS to be successfully implemented (Li and Voege, 2017).

Given its multimodal nature, MaaS enables alternative ways of moving both people and goods about, from public transport to taxis and rental services to micro-mobility, thus enhancing the flexibility and reliability of the mobility network and the community it services (Sochor et al., 2015). Reaping these benefits calls for, among other things, a strategic integration of physical infrastructure so as to enable the seamless transfer between transportation services, such as bus and rail interchanges, or bike and carsharing spaces at stations. This increased integration of the different transport modes in a MaaS ecosystem raises some important questions relating to passenger rights and liability issues. In a multimodal reality, the insurance status of the traveler varies depending on the mode they are using and on the respective passenger right scheme. This can significantly complicate things in the case of interruption at any point of the travel chain for travel offers that are purchased in packages. Whereas the airline industry has successfully managed to overcome this issue by clarifying liabilities and rights of travelers that book via online platforms or travel agencies, more work remains to be done when it comes to integrating completely different systems such as rail, air taxi and urban public transport (Finger, Bert and Kupfer, 2015).

A catalyst for data sharing?

Transport companies and operators will, furthermore, have to undertake sufficient safety measures (e.g., cleaning, protective screens and spacious seating) with a view to safeguarding the safety of passengers in the transition period towards the 'new normal'. This, once again, presents an opportunity for the uptake of MaaS by enabling access to detailed real-time information on the relative "safety" of alternative trips (e.g., crowding levels,

time-in-transit and frequency of cleaning) in order to guarantee that passengers can make informed travel decisions. Though the need for operators and authorities to share high quality and standardised data has long been acknowledged as a precondition to making MaaS a reality, the arrival of Covid-19 has acted to amplify the requirement for data while facilitating its sharing.³⁸

Access to various types of mobility data enhances public authorities' visibility over their territories thereby allowing them to better target policies. The sharing of data across transport service providers is also key to enabling multimodality, allowing passengers to fully benefit from the available public and private offerings, and ultimately reducing infrastructure costs. Thus far, however, an important barrier for MaaS has been the lack of trust and willingness to cooperate and share data among public transport operators, providers of shared urban mobility as well as providers of digital interfaces and electronic applications. In part, this can be explained by the fact that transport service providers have been cautious about their services becoming increasingly "commoditised", thus diminishing their ability to build a closer relationship with travelers (and to gather data on them), thereby resulting in missed opportunities for more efficient pricing (Montero and Finger, 2018).

Interestingly, since the start of the outbreak, we have started witnessing a more systematic effort by private companies to share data with governments. In the UK, for example, the Department of Transport and ITS UK have worked together to collect data on traffic flow, traffic movements, parking, cycling and pedestrian movements to help inform the Government's policy response to

38 Witzel, S., (2020), From lockdown to lifeline: how overcoming COVID-19 can kick-start the Mobility-as-a-Service revolution, (Skedgo, 2020), <https://skedgo.com/from-lockdown-to-lifeline-how-overcoming-covid-19-can-kick-start-the-mobility-as-a-service-revolution/>, accessed on 14 April 2020

the pandemic.³⁹ This is just one of many examples of public-private partnerships formed to foster evidence-based decisions to help combat the pandemic.⁴⁰

Having said that, outstanding issues remain to be addressed in relation to data sharing. These include the standardisation of data exchange formats, while, at the same time, securing sufficient flexibility to incorporate new systems as they are being developed. Public authorities have a clear role to play in facilitating data sharing by establishing the necessary standards. Standards are key to guaranteeing the quality of data while bringing down the costs linked to its exchange. The increase in the use of ICT-based transport services also carries risks which need to be addressed. Those who have access to the data and thus control the information, have immense power. This, in turn, means that the data and information are at risk of abuse which can result in market distortions, security risks, and diminished privacy protection, among others. This, of course, touches upon the controversial question of who should be entitled to set up digital platforms. To achieve a fully transparent and equal system an independent body would have to be in charge of this task in the future (Finger, Bert and Kupfer, 2015).

While EU action has clear limits in the local and municipal spheres, where the subsidiarity principle safeguards Member States' competence to take legislative actions and decisions, reaping the full benefits of MaaS rollout calls for a coordinated approach continent-wide. In view of this, Sustainable Urban Mobility Plans (SUMPs), as the cornerstone of the Commission's urban mobility policy, can be a powerful tool to aid this by incorporating wider current and future technological developments, such as automation and ITS, MaaS, and shared mobility.

39 Seymour, T. (2020), DfT urgently collects UK transport data to support COVID-19 response, (Smart Transport, Connecting Policy to Solutions, 2020) <https://www.smarttransport.org.uk/news/latest-news/dft-collates-transport-data-to-support-covid-19-response>, accessed on 14 April 2020

40 Kim., Y. T. (2020), Transport in the face of the pandemic, (International Transport Forum, 2020), <https://www.itf-oecd.org/covid-19/paradigm-shift-transport>, accessed on 12 April 2020

Conclusion

Only an agile mobility system that can serve a diverse set of needs will be resilient and sustain its ability to transport people and goods even at times of emergency – be it a pandemic, an environmental disaster or other. By matching mobility ‘supply’ with ‘demand’, MaaS operators can optimise the use of transport infrastructure and the overall efficiency of the transport system. This, in turn, translates into numerous socio-economic and environmental benefits such as a reduction of congestion, higher productivity, lower emissions and better air quality, fewer traffic accidents, and a smaller urban footprint for parking.

While the Covid-19 crisis has profound implications for the global economy and transport network, it has also resulted in a high degree of creativity in responding to the crisis, as manifested through changes in business models across the industry, altered habits of transport users, as well as the more concerted effort by private companies to share data so as to help shape evidence-based government policies and decisions in response to the pandemic. Building upon this momentum can help to pave the way towards a more sustainable, integrated and reliable mobility system, while helping to advance the Commission’s decarbonisation and digitalisation agendas. MaaS represents a paradigm shift, and this calls for a departure from the silo-approach in regulating mobility, to reflect the much closer integration between transport modes and services.

References

- Audouin, M., and Finger, M. (2019), Empower or Thwart? Insights from Vienna and Helsinki regarding the role of public authorities in the development of MaaS schemes, Science Direct, Elsevier, <https://www.sciencedirect.com/science/article/pii/S2352146519304144>
- Covid-19: impact on shared mobility, (Movmi Shared Mobility Thoughts, 2020), <https://movmi.net/covid-19-shared-mobility/>, accessed on 14 April 2020
- European Commission (2019), The European Green Deal, https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf
- European Commission, Directorate-General for Mobility and Transport (2019), *Handbook on the external costs of transport*, 2019 (Brussels: European Commission), <https://ec.europa.eu/transport/sites/transport/files/studies/internalisation-handbook-isbn-978-92-79-96917-1.pdf>
- Finger, M., Bert, N., and Kupfer, D. (2015), Mobility-as-a-service : from the Helsinki experiment to a European model?, (Technical Report, 2015/01, European Transport Regulation Observer), <https://cadmus.eui.eu/handle/1814/38841>
- Goodall., W. et al. (2017), The rise of mobility as a service, Reshaping how urbanites get around, (Deloitte Review, Issue 20), <https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/consumer-business/deloitte-nl-cb-ths-rise-of-mobility-as-a-service.pdf>
- International Monetary Fund (2020), World Economic Outlook, The Great Lockdown, 2020, <https://www.imf.org/en/Publications/WEO/Issues/2020/04/14/weo-april-2020>
- Kim., Y. T. (2020), Transport in the face of the pandemic, (International Transport Forum, 2020), <https://www.itf-oecd.org/covid-19/paradigm-shift-transport>, accessed on 12 April 2020
- Li, Y., and Voegelé, T., (2017), Mobility as a Service (MaaS): Challenges of Implementation and Policy Required, (Journal of Transportation Technologies, 2017, 7, 95-106), https://www.scirp.org/pdf/JTTs_2017031315562863.pdf
- MaaS Alliance (2020), <https://maas-alliance.eu/homepage/what-is-maas/>, accessed on 19 April 2020

- Montero J. J., and Finger M. (2018), 'Platformed! Network industries and the new digital paradigm', *Competition and Regulation in Network Industries*: <https://journals.sagepub.com/doi/full/10.1177/1783591718782310>
- Moovit Public Transit Index 2020, https://moovitapp.com/insights/en/Moovit_Insights_Public_Transit_Index-countries, accessed on 17 April 2020
- Nikitas, A. et al. (2017), How Can Autonomous and Connected Vehicles, Electromobility, BRT, Hyperloop, Shared Use Mobility and Mobility-As-A-Service Shape Transport Futures for the Context of Smart Cities?, (*Urban Sci.* 2017, MDPI), <https://www.mdpi.com/2413-8851/1/4/36/html>
- Pangbourne, K., Stead, D., Mladenović, M., & Milakis, D. (2018), The Case of Mobility as a Service: A Critical Reflection on Challenges for Urban Transport and Mobility Governance, <https://www.emerald.com/insight/content/doi/10.1108/978-1-78754-317-120181003/full/html>
- Seymour, T. (2020), DfT urgently collects UK transport data to support COVID-19 response, (Smart Transport, Connecting Policy to Solutions, 2020) <https://www.smarttransport.org.uk/news/latest-news/dft-collates-transport-data-to-support-covid-19-response>, accessed on 14 April 2020
- Sochor, J., et al., Implementing Mobility as a Service Challenges in Integrating User, Commercial, and Societal Perspectives, (Transportation Research Record 2536), <https://journals.sagepub.com/doi/pdf/10.3141/2536-01>
- Voege, T. (2018), Data-Led Governance of Self-driving Vehicles for Urban Shared Mobility, https://link.springer.com/chapter/10.1007/978-3-319-96526-0_5
- Witzel, S., (2020), From lockdown to lifeline: how overcoming COVID-19 can kick-start the Mobility-as-a-Service revolution, (Skedgo, 2020), <https://skedgo.com/from-lockdown-to-lifeline-how-overcoming-covid-19-can-kick-start-the-mobility-as-a-service-revolution/>, accessed on 14 April 2020

Published in October 2019

Integrated Multimodal Ticketing Will Not Happen Without Clear Rules About Data Sharing

Matthias Finger and Juan Montero

Europe has a long tradition of public transportation, not only in long-distance travel (airlines, but also railways and now high-speed railway services) but also in local mobility. Most European cities have well developed bus, tram and subway networks, and now more and more micro-shared-mobility networks of bikes, motorbikes, scooters and others more. Still, all these public transport networks work mostly independently from one another: passengers have to navigate through non-coordinated transport services, reducing the overall attractiveness of public transport vis-à-vis private cars. And public authorities have turned out to be quite helpless in this matter.

But, technology might now change this. Indeed, transport is now being digitalised these days in exactly the same way as all other services: smartphones and Internet-of-Things-sensors are being installed in the infrastructure/vehicles, ubiquitous access to the internet at very low prices becomes a reality and artificial intelligence in the form of self-learning algorithms is increasingly applied. Like everywhere else, digitalisation reduces coordina-

tion (transaction) costs and makes a more efficient coordination of the different transport modes a very real possibility.

Without data-sharing, ticketing and payment systems will not be integrated

For digitalisation to improve intermodal transport – i.e., for ticketing and payment to become multimodal –, data will have to flow across transport operators and across transport modes. Of course, each national, regional or local transport system can already significantly improve its efficiency thanks to digitalisation. But there are many more efficiency gains possible if one integrates across transport modes. Yet, this is only possible if the different actors share their data, as algorithms can only coordinate transport if they are fed with quality data generated by the different transport systems. Data sharing is thus a pre-requisite for integrated ticketing and payment systems, and more generally for digitalisation to deliver its results.

There are already many successful experiences where data sharing has enhanced the coordination of traditional network industries: Computerised Reservation Systems (CRS), for example, have helped airlines to pool their data into a single system, so that travel agents can navigate through the existing offers and prices. Amadeus and Sabre were probably the first such integrated transport platforms, created decades before Silicon Valley entered the scene. And regulation was thus adopted already back in the 1990s, both in the US and in the EU, to impose data sharing on airlines, as well as to force transparency and neutrality in the display of information by these platforms.

Nowadays, when data is considered to be the “new oil”, actors appear to be more reluctant to share their valuable asset (data). Other transport actors, without necessarily being opposed to data-sharing, are taking a more cautionary approach, before sharing their data about schedules, ridership, vehicle locations,

incidences, and others more, as they think that such sharing might undermine their future competitive position. Newly emerging (mobility) platforms, they think, might just use their data to create new powerful network effects on top of their own existing transport offerings, thus commoditising their services and monopolising the relationship with passengers. Quite understandably, traditional transport players do not want to be “platformed”.

Time to act

Consequently, many voices are calling for the regulation of data sharing. This is not only the case of the newly emerging mobility platforms, which promise seamlessly integrated transport solutions if only they were given access to data. It is also the case of the various transport operators themselves, who would like to better coordinate their offerings with other related transport services. But it is thirdly the case of the public authorities – many of which at the local level – who want to have access to the various mobility data so as to have better visibility of what is happening in their territories and to improve their policies. They also want data to be shared across transport service providers so that multimodality can be enhanced, passengers can fully benefit from the available public (and private) offerings and ultimately infrastructure costs can be reduced.

For all three good reasons, data sharing in transport so as to allow for multimodal ticketing and payment systems will have to be regulated. It is almost 10 years ago – with the ITS Directive back in 2010 – that the European Commission has started to look into the regulation of data-sharing. But now, after the year of multi-modality (2018), it may be time to act, but how exactly? We think that three types of action will be necessary for integrated ticketing and payment systems to become a reality in Europe, namely standard setting, some compulsory data-sharing, and consumer protection.

Standardisation

Before anything else, there is a clear role for public authorities to facilitate data sharing by creating the necessary standards. The sharing of non-standardised data can be costly or simply impossible. It is thus necessary to define standards for the development of common Application Protocol Interfaces (APIs), i.e., standards for the software that allows the interaction of the different systems used by each actor.

Standards are also necessary so as to define the relevant data that has to be exchanged, and the quality of the data. And probably everybody agrees – the public authorities as well as the transport services providers – that clearly defined and publicly enforced will save time and money to everyone, not to mention the fact that will power the exchange of data. Also, standard setting is a fairly classic public intervention into the market and actually not a very intrusive one.

Some compulsory data sharing

There will be however less consensus as to the next step, namely regulating the sharing of some data among transport operators, between transport operators and newly emerging platform and between operators and public authorities. As said above, some data-sharing will have to be declared compulsory if we ever want to make progress towards multimodal ticketing and payment systems.

Today, the strongest voices calling for data-sharing regulation come from aggregators and platforms that want to build their “data services” on top of the services provided by traditional transport operators (service providers). They claim that market power enjoyed by legacy carriers, sometimes with exclusive rights or large market shares inherited from historic monopolies, makes it impossible for them to roll out their (digital) mobility

offerings. Local public authorities often join their calls, convinced as they are that the traditional transport operators simply want to perpetuate their monopoly positions.

In reality, these calls for data-sharing regulation often hide the fact that these new platforms would like to access or even substitute the traditional transport operators' ticketing distribution systems. In other words, the digital platforms – by way of asking for data-sharing – are in reality asking for the legal right to become the distributors of the tickets of the physical transport service providers, in such a way that passengers can directly acquire their tickets from platforms and aggregators, thus bypassing the historical physical transport service providers. The most ambitious of these platforms want to become fully integrated “Mobility-as-a Service providers”, whereby passengers can use one single app to acquire a single ticket or a subscription for a flat fee, allowing them to use all kinds of public transport services, shared-mobility solutions and even shared-cars and car-rentals.

Many transport service providers oppose such requests for compulsory sharing of data and ticketing systems. They claim that distribution agreements should be the result of commercial agreements ensuring a balanced distribution of value and liabilities across the actors involved in the agreement. Compulsory data-sharing and distribution agreements, they claim, will simply strengthen the position of platforms and of the aggregators vis-à-vis the transport service providers. The experience of other industries (media, hotels, etc.) shows that, overtime, digital platforms tend to become the entities with market power in the relationship with the traditional players. In our view, data-sharing regulation should not accelerate the rise to power of digital platforms, a process that may well lead to a winner-takes-all dynamics.

Yet, at the same time, it is undeniable that digital platforms lead to substantial efficiency gains, because of the powerful network effects they entail. And both passengers and public authorities should be able to benefit from such efficiencies. Compulsory

data-sharing (including ticketing) might indeed be necessary in order for such efficiencies to materialise. However, we would advocate a more balanced regulation of data-sharing: indeed, data-sharing should not be a one-way street, where transport services providers feed the platforms and lose the contact with their customers in the process. Rather, it should be reciprocal, whereby platforms have to give some of their data back to the transport services operators, notably data about passenger behavior which in turn will allow the transport operators to improve upon their services. In this way, their direct distribution systems could also benefit from the data generated by the indirect channels (the platforms).

In short, compulsory data-sharing will be more easily accepted by the traditional transport services providers if, in return, they get “repaid” with information about their customers, i.e., if data-sharing regulation will be a two-way, rather than a one-way street.

Liability

Another important dimension of a more-balanced relationship between the transport services providers on the one hand and the digital platforms on the other will be a fair regulation of liability.

Firstly, it is necessary to harmonise the different liability regimes across transport modes. In other terms, the rights granted to passengers across the different transport modes have to be harmonised. In this way, integrated service providers will be subject to a clear liability regime.

Secondly, the liability of the integrator has to be clarified. Many platforms are reluctant to take full liability for the sale of an integrated ticket. This is particularly the case when local transport is integrated with long-distance and thus more expensive services. Of course, it is risky for any provider of integrated ticketing to take on the liability of missing link in the mobility value chain.

There might be commercial solutions for this problem, as the contracting of insurance to cover the risk. This is already a reality for some integrators of flights provided by third parties outside interlining agreements. These kind of solutions could be exported to other transport modes.

In any case, the passenger rights legislation will have to be adapted to take into consideration multimodality and the new role of platforms and integrators. At the least, the Commission would have to come up with a more harmonised passenger-rights regulatory framework, than is currently the case, so as to create a fairer level-playing field.

Pricing, Regulation and Rethinking of Mobility Needs is Required for Transport to Fully Account for its External Costs

Matthias Finger and Teodora Serafimova

In its Long Term Decarbonisation Strategy '[A Clean Planet for All](#)', the European Commission paints a clear picture of the vast transformations that will have to take place across all sectors of the economy for Europe to reach net-carbon neutrality by mid-century. For transport, which accounts for a quarter of the Union's total greenhouse gas emissions and which is a major contributor to urban air- and noise-pollution, this will require a systems-based approach with significant changes across all transport modes. With this in mind, the [5th Florence Intermodal Forum](#) was suitably themed around the Internalisation of the External Costs of Transport: a topic that is poised to rank highly on the incoming European Commission's list of priorities.

To kick-start the discussions, the Commission's DG MOVE used the occasion of the Forum to share fresh findings from their soon-to-be-published report on 'Sustainable Transport Infrastructure Charging and Internalisation of Transport Externalities'. A clear conclusion can already be drawn from the study, in that,

in the EU, the principle ‘society pays’ prevails of the ‘the user pays’ and ‘the polluter pays’ principles. In fact, the study calculates the overall external costs of transport to be worth around €1 000 billion annually, the equivalent of as much as 7% of EU28 GDP, whereas users are only paying for roughly half of these directly generated transport costs.

This mismatch between external and infrastructure costs, on the one hand, and taxes and charges levied, on the other, is one of the main reasons for the inefficiency of the transport system. The ultimate aim of internalisation is therefore to get the users to pay for the true societal costs of transport. While there is long standing agreement over the importance of cost-reflective and efficient pricing in transport, translating this agreement into practice is far from being straightforward.

Breaking away from a socially unjust mobility system... in a socially just manner

As a matter of fact, already today transport and logistics account for a significant share of company costs and household expenditures. For the latter, transport is the second largest expenditure item, preceded only by housing costs. On average, every person spends €1,900 on transport per year, which represents 13% of their spending. The enactment of the ‘user pays’ and ‘polluter pays’ principles can therefore result in a disproportionate burden for the lower income segments of the population. This calls for careful planning and design of fiscal policies to ensure social justice and public acceptance of implementation measures.

Having said that, the current mobility system, largely dominated by private transport, is already inherently unjust, given that it does not allow those without access to cars to enjoy the same economic and social opportunities. In this respect, the challenge is to evolve in a socially just manner from unjust mobility practices to a low-carbon, multi-modal mobility system, that will be

dominated by shared- and public-transport. In other words, the internalisation of the external costs of transport must be framed as a contribution of transport to social welfare.

We agree on the principles, but how do we get there?

We have a number of options at our disposal to help us get there, namely market-based instruments (or 'pricing' measures, such as charges, taxes and tradable permits), regulatory measures (e.g., land use planning regulations, parking fees, and vehicle access restrictions), as well as voluntary instruments. The transport sector is, however, not uniform in its contribution to societal and environmental costs, which means that there is no 'one-solution-fits-all' approach and the answer instead lies in a combination of all of the above measures.

Pricing mechanisms have a key role to play in rendering the environmentally and socially beneficial transport options more economically attractive for the users. In addition to rewarding clean and more efficient fuels and transport modes, pricing schemes can be used to influence transport users' behaviour, by, for example, determining the time of the day that people travel, thereby alleviating congestion, reducing air- and noise-pollution, as well as traffic-related accidents.

What is more, distance-based charging for infrastructure use across all transport modes was one of the study's recommendations that received broad support. In fact, the currently reviewed [Eurovignette Directive](#) on road charging of heavy duty vehicles already seeks to implement this. This type of taxation can help to generate an important source of revenue for the public budget to be reinvested into clean mobility projects and infrastructure. In the case of this piece of legislation, adequately designed and implemented tolls will be key when it comes to stimulating improvements in logistic efficiency of freight transport, while encouraging the uptake of cleaner trucks and supporting the EU's modal-shift objectives.

Regulation, on the other hand, will have an important complementary function in enabling the shift to cleaner mobility. This, in turn, will come in the form of both stick and carrot elements enacted by different levels of government, from European-, to national- and local-levels. Examples include regulations about green public procurement of public service and municipal vehicles, the tightening of fuel-economy standards, as well as the introduction of low emission zones in urban centres.

Shifting away from the current mind-set that curbing mobility is not an option

While the uptake of more efficient and alternative powertrains will be central to greening the transport system, this alone will not suffice to address congestion. In parallel, therefore, demand-reducing measures will be needed in order to foster a modal- as well as behavioural shift towards shared-, public-, and soft-mobility. A more efficient organisation of the entire mobility system will in turn rely on digitalisation, data sharing and interoperable standards. These will be instrumental for enabling smart traffic management and increasingly automated mobility in all modes, reducing congestion and increasing occupancy rates.

A critical element, which was also partially touched upon during the Forum, was the need to break away from the current paradigm (as explicitly stated in [2011 White Paper](#)) which claims that a reduction in mobility volumes is *not* an option. As a matter of fact, curbing mobility should not only be an option, but rather must become a necessity. Last but not least, the Commission's ongoing work on the development of a [taxonomy](#), or in other words, a unified classification system for the identification of ecologically more sustainable economic activities, will have a decisive role to play when it comes to ensuring that scarce public funds are channelled towards clean and future-proof transport solutions.

Obstacles on the Road to the European Single Market for Road Transport

Matthias Finger

This 1st Florence Road Forum was an extremely timely event, as it fits into the process of definition of the “[Road Transport Strategy for Europe](#)” of the EU. To recall, the EU’s road strategy has four equally important pillars, namely 1) well-functioning internal market, 2) fair competition and workers’ rights, 3) decarbonisation, and 4) making use of digital technologies.

To improve the overall functioning of the road transport sector, and ultimately to reach an “efficient, fair, and clean road transport sector”, a core part of the initiatives of the Commission addresses the interdependency between the functioning of the internal market on the one hand and the protection of the workers’ rights, on the other. Both come together under the umbrella of what we can call “fair competition”.

Yet, one has to acknowledge that things do not work well in European road haulage: working conditions in the road transport sector are not improving but rather deteriorating. At the same time, the current regime of cabotage rules is preventing the development of a functioning European market for road transport. As a matter of fact, cabotage rules now serve as a protectionist measure.

Is this because of increasingly unfair competition due to “illegal cabotage” or other kinds of abuses perpetrated by haulers exploiting “posted workers”? Or is this rather because the overall political climate has changed as a result of growing nationalism and protectionism? Probably a combination of both. So, how can we address these causes?

It clearly emerged at the [1st Florence Road Forum](#) that a clear distinction has to be made between legitimate international transport on the one hand and exploitative “nomadic transport” on the other. Of course there is the need for better data on the latter phenomenon; yet “nomadic transport”, i.e., the fact that workers never return to their home country and live in their trucks for extended periods of time, seems to be a reality. Clearly, this is an abuse of the rules of the game. More research and data are also needed in order to know who – and in particular which countries – are behind such abuses.

But even before all the figures are in, one can already say that is necessary to clarify the rules in the following three areas, both for the small truck companies carrying out cross border operations as well as for bigger transport companies active in several Member States:

- **“Establishment” and “letterbox companies”**: we need to clarify and develop criteria for the so-called establishment, so that transport companies do not set up so-called letterbox companies in low-wage countries without operating there.
- **Cabotage**: the ultimate goal of cabotage should be to improve economic and environmental efficiency of road transport. Consequently, we must not try to enforce the current rules of cabotage that, admittedly, are unclear and have caused problems. Rather, we have to develop new and fairer rules that consider the needs of the transport sector as a whole.
- **“Posting of workers”** and their rights, such as weekly rest, rest in the cabin, or return “back home”: one must admit that

such posting of workers is handled differently in the different Member States, some applying the Posted Workers Directive while others do not. Clearly, the road transport sector is to a large extent international in nature, so that the same rules that apply for example to construction workers cannot be replicated here. Sector-specific rules and a common understanding of workers' rights based on precise criteria (such as weekly rest times, for example) need to be established. The current administrative burden and confusion around, for example, minimum wage rules as applied to transport operation crossing several countries, is indeed counterproductive.

Everybody agrees that we need a common set of rules that are fair, clear and enforceable. But at the same time we have to be pragmatic, especially in light of the following two elements:

- Indeed, **digitalisation** is rapidly entering the road sector. Such digitalisation will not only improve the efficiency of road transport, but it will also help address the enforcement challenge. For example, an electronic vehicle registration system could serve as a highly cost effective means to ensure compliance of truck companies with the applicable rules. in their constituency.
- **Timing** is important, as the legislative proposals pertaining to the "Road Transport Strategy for Europe" will be published by the Commission before the summer. This will be followed by discussion in Parliament and in the Council. However, if such discussion drag on, they will collide with European Parliamentary elections to be held in April 2019, voiding the entire Road Package.

In short, the road sector desperately needs clarity, and this urgently and especially before profound disruptions will outdate the current efforts. Of course, digitalisation can be useful for fair competition and for more efficient road transport. But it can also lead to profound disruptions, such as automated driving or platooning.

Published in March 2016

In the Era of Digitalisation and in Order to Achieve an Intermodal Level Playing Field, do we Need to Regulate?

Matthias Finger

There is currently clearly no level playing field in the competition between the different transport modes: railways complain that the road sector – the private cars and the trucks – does not pay for all their costs, whereas the road sector complains that rail is subsidised. Both complain that air transport is too cheap, and air transport, in turn, complains that it has to comply with costly security regulations which do not apply to rail and road

But even between operators in the same transport mode there is no level playing field:

truck owners and drivers in Western Europe are complaining about dumping prices from Eastern and from outside Europe. Rail operators are complaining about distorting subsidies in the different countries. Not to mention research and development subsidies which are distributed selectively.

Therefore, even without and before considering the digital dimension, there is a clear need for an intermodal level playing

field. And this in particular in two areas: on the one hand, in terms of interoperability and interoperability regulation inside the different transport modes, something which is significantly impeding the creation of European modal transport markets; on the other hand, in terms of consistency of financing of the different transport modes.

The above two issues a level playing field among the different transport modes would probably have continued for many more years. However, the disruptive effects of the Information and Communication Technologies (ICTs) now give rise to a new intermodal reality. Indeed, thanks to the ICTs, mobility now transforms into a service. In other words, the mobility needs of the users can ever more easily be satisfied by the combination of cross-modal services offered by different providers and even by new market entrants. Also, and because of the ICTs, customers are now changing the way they deal with their own mobility needs, from travel planning to payments. This so-called “digitalization of transport” gives rise to “mobility platforms”, i.e., companies that collect the various data of the different transport operators across the different modes, analyze and package them and sell as more or less integrated and comprehensive mobility services at local, regional, national or even European levels

But, rather than creating a level playing field, these integrated mobility platforms – such as MaaS.fi or smile-einfachmobil.at, just to mention a few – are exacerbating the distortions among the different transport modes, or, at the least, they are bringing the existing distortions into the open. Thus the question: is there a need for regulation? And if there is a need, what exactly needs to be regulated? The traditional transport modes? Intermodality itself? Or digitalization as related to mobility? The 4th Florence Intermodal Forum tried to bring some clarity to these questions.

From our discussions, it emerged clearly that the main contribution to creating an intermodal level playing field will indeed result from the intelligent regulation of the digital dimension. The

following aspects need to be seriously considered, since, without them, the benefits of digitalization for a more efficient and more customer-friendly European wide (intermodal) mobility may well never see the light of the day. However, it is not clear yet, whether the regulatory initiative should always come from the EU

4. First and foremost, **data need to be harmonised**: the different owners and infrastructure operators (railways, roads, ports, airports, waterways) all have data, yet in different formats which make them useless for mobility platform operators and consumers. Many of these data need to be made available in formats that allows others to analyse and use them.
5. This type of (data harmonisation-) regulation comes indeed before the whole issue of data **accessibility** and **openness of data** (but of course data harmonization and data accessibility are not unrelated). Such is the second big regulatory issue, which however is of different nature, as this pertains to data ownership and firm strategy. This will be a big challenge for the European Commission as the different (even public) owners and operators will strongly object to giving access to real-time data. Such regulation will therefore have to be proportionate to the benefits and it will only make sense if it can actually be enforced. If not, it will distort the mobility market even further.
6. The regulation of **privacy** and **data security** remains an ongoing issue and is not specific to the transport and to the different transport modes, as it concerns the entire digital economy, including banking, health care, electricity, etc. Once general principles of data protection and privacy are agreed upon at the EU level, their application to the transport sector should not cause controversy.
7. There remains the question as to whether emerging integrated **mobility platforms** need to be regulated, and if yes

how? Two regulatory issues will become particularly acute, namely first the issue of **competition** among these mobility platform operators, along with corresponding market distortion resulting from privileged access to or exclusive contracts with transport operators. The second issue will be **consumer protection and liability**, as the European Commission will have to clarify who exactly is responsible for the service and for the transaction: is the liability with the platform operator or the transport service provider?

Published in March 2015

Mobility-As-A-Service: From the Regulation of Transport as a Sector to the Regulation of Transport as a Service?

Matthias Finger

Amongst the major changes that have influenced the transport sector in recent years in Europe, the **introduction of the ICTs** is among the most prominent ones. Indeed, the rapid evolution and ever more significant application of the ICTs in the transport sector is a heavy trend which leads to breaking **down the boundaries between the different transport modes**: as a matter of fact, the ICTs create an intermediate level between the different means of transport and their users, notably thanks to a new data layer. For the users the focus is therefore no longer on the transport mode, but rather on mobility. As a consequence, mobility will increasingly be seen as an information service with physical transportation products, rather than a transportation product with additional services.

The city of **Helsinki** acknowledged this growing role of the ICTs early on and has subsequently developed its own, original approach to '**Mobility-as-a-Service**'. Mobility-as-a-Service is a mobility distribution model in which a customer's major transpor-

tation needs are met thanks to one single interface with services offered by one single integrated service provider combining transportation infrastructures, transportation services, information and payment services, and others more: *“The Helsinki Model aspires to upgrade the service level of transportation by harnessing the passion and capacities of public and private entities. Collaboration and integration of services aims to create a seamless, demand-based and compelling travel experience for the public.”* (maas.fi)

But what are the **regulatory implications** of this rapidly evolving transportation system? At the 3rd Florence Intermodal Forum, the Finnish model was extensively presented and different stakeholders – in particular the operators, the passengers and the manufacturers laid out their perspectives and opinions in an open discussion. The overall discussion was framed by our comprehensive mobility concept, which had already been tested during previous Intermodal Forums, for example in the case of combining high-speed rail with low cost air.

It is obvious that, in addition to allowing competition and ensuring the provision of public services, the **EU** has to face up to the new challenges emerging from the penetration of the various transport sectors by the ICTs. In addition to regulating the traditional issues of the different transport sectors (namely interconnection, interoperability, capacity management, standards, and security), EU regulators should also focus on the establishment of a new comprehensive regulatory framework that enables the usage of the ICTs in and especially across the different transport modes. In particular, this will imply to design a regulatory framework that 1) takes intermodality as a starting point, 2) puts the user (citizens and companies alike) at the centre of the new mobility system, and 3) sees the role of the public sector mainly as an enabler of mobility, rather than as a direct provider of transportation services.

This change of perspective will in particular draw attention to the **regulation of the new data layer** as well as to the regulation of the interface between this data layer and the physical transportation services. As the Helsinki case clearly demonstrates, such an integrated mobility system combining different transport modes along with the related access points (parking spaces, car- and bike-sharing points, but also tickets and booking), tailor-made mobility services can indeed be provided to the benefit of the user and society as a whole. However, as it was also pointed out at the conclusion of the Forum, the daily increase of the use of ICT-based transport services does carry risks: those who have access to the data (and especially to the way these data are conveyed to the end-users) and thus do control the information, do immense power. The abuse of such data and information can thus result in market distortions, security risks, diminished privacy protection, and others more. Furthermore, the spread of the ICTs and the trend towards a “sharing economy” now also entering the transportation sector are creating a paradigm shift leading the user to become more active: instead of only choosing the service that satisfies his or her own mobility needs he or she may now also actively offer services.

In conclusion, it emerges clearly that the transportation sector is changing very rapidly thanks to the ICTs. Both policy makers (especially at the European level) and stakeholders are called upon to address the new mobility needs of the users. Moreover, the EU has to create the regulatory conditions for enabling mobility as a service to unfold to the benefit of all the stakeholders involved, and especially to the benefit of Europe’s global competitiveness.

Low-Cost Air and High-Speed Rail: An Untapped Potential for Complementarity?

Matthias Finger

Comparing air and rail passenger transport is a difficult task. Apart from serving the same demand that is mobility, they differ in several essential aspects: technology, business models, customer needs, ownership structure and type of infrastructure. Moreover, the regulatory and policy environment is completely different. Still, from a mobility perspective, it is useful to look at both sectors simultaneously so as to better understand where and how they could be complementary and become more integrated.

The European Commission has promoted this view, and VP Siim Kallas made the integration of different modes of transport a high priority when he took office in 2009. However, when looking at European transport policy and regulation, the situation rather resembles a patchwork. As a matter of fact, a twofold inconsistency can be detected, namely a lack of coherence between European policies as well as a lack of coherence between different national approaches.

As far as the national level is concerned, cross-border passenger rail in Europe is still hampered by a patchwork of national regulations and a fragmented system of network managers. Even though harmonisation and the establishment of a single market in the air sector has been moving forward at much faster pace it is still facing enormous difficulties that result from conflicting national interests. Central elements of the Single European Sky initiative to harmonise Air Traffic Management systems and increase capacity are still in gridlock.

As far as the European policy level is concerned, there is a problem with competition policy: efforts fostering intermodality by means of cooperation of different transport operators can potentially clash with European competition policy, which ultimately leads to the question how to harmonise cooperation and competition.

On the whole, and despite the attempts to establish a Single European Transport Area with a top-down approach, the policies to implement this goal did not prove to be effective so far. Yet, inevitably air and rail are becoming part of an integrated mobility approach.

Competing or cooperating?

While there are prominent cases of strong competition between high-speed rail and low cost air, especially on city pairs such as Rome-Milan, Madrid-Barcelona, Paris-Marseille, the list of win-win constellations between the two modes is long and could well be longer. Examples such as “Zug und Flug” in Germany have shown that “whole journey” bookings and integrated ticketing are not only possible but moreover meet customer demand.

New entrants in the rail market appear to be particularly innovative when it comes to intermodality: Italian High speed rail newcomer NTV made agreements with Cathay Pacific as well as with Italian municipalities; Passengers from Hong Kong can now book

a single ticket including flight, train and local public transport in several Italian municipalities. This in turn has led the incumbent Trenitalia to engage in similar intermodal projects, such as cooperation with car sharing companies. Another example of such initiative can be found in France where Air France and Thalys have teamed up when connecting Paris Charles De Gaulle.

As for airports, better connections of different transport modes to the airports have proven very successful: for example, in the case of highly congested airports, replacing short-haul flights with high-speed trains has freed up precious airport slots for long-haul airlines. In the case of non-congested or regional airports, rail access can actually enlarge the catchment area and create new demand for air travel.

It seems quite clear that there is an unexploited potential for cooperation between air and rail. Especially railway operators have shown some activism in this respect. To what extent also low cost air lines can be involved in intermodal projects mainly depends on what type of business model they follow; established low cost airlines like Easyjet and Ryanair are not part of global distribution systems (GDS) which makes it hard to include them in integrated ticketing. Some of them however, like Vueling or Air Berlin, follow a different approach that appears to be closer to the traditional air carriers.

Still much is left to be desired in terms of better integration between rail and air in Europe. Yet, Japan can show the way for what is achievable by means of cooperation: Japan's airlines do not perceive High Speed Rail as competition to their business as they benefit just as well from increasing air traffic through the feeder services they provide.

In conclusion, there is the wish, from both policy makers at the European level and stakeholders, to look at passengers' needs for mobility and to innovate in order to satisfy it. What is needed for a more efficient transport system, more coherence between

European policies as well as bottom-up initiatives: policies that allow for collaboration or even incentivise them (in terms of interoperability, financing, investments, etc.) are crucial. At the same time all this must happen against the background of competition control, i.e., by making sure that cooperation does not result in monopolies or collusion and that competition is maintained as a principle to incentivise actors to stay dynamic and innovative.



Publications Office
of the European Union



With the support of the
Erasmus+ Programme
of the European Union

The European Commission supports the EUI through the European Union budget.
This publication reflects the views only of the author(s), and the Commission cannot
be held responsible for any use which may be made of the information contained therein.