HIGH-SPEED RAIL

ROADMAP

TRANSFORUM
TRANSPORT 2050

This project is co-funded by the European Union

SEVENTH FRAMEWORK PROGRAMME

ROADMAP towards goal 4 of the White Paper on Transport:
By 2050, complete a European high-speed rail network. Triple the length of the existing high-speed rail network by 2030 and maintain a dense railway network in all Member States. By 2050 the majority of medium-distance passenger transport should go by rail.

The research leading to these results has received funding from the European Union's Seventh Framework Programme [FP7/2007-2013] under grant agreement n° MOVE/FP7/321565/TRANSFORUM.

The TRANSFORuM consortium:

The TRANSFORuM Project was coordinated by

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Suggested citation: Crozet, Y.; Chèze, C.; Guihéry, L.; Reichenbach, M.; Desmaris, C.; Anderton, K.; Krejčí, L.; Hřebíček, Z. (2014) TRANSFORuM Roadmap High-speed Rail. Cologne / Köln: Rupprecht Consult.

Layout by alma grafica. Nicole Sillner. Ansbach, Germany. www.almagrafica.de

THE CONVERSATION DOES **NOT** STOP ON 8 DECEMBER 2014!

The comments we receive at the conference on 8 December 2014 will still be considered in the condensed version of the TRANSFORuM Roadmaps and for the Strategic Outlook document. We will also compile the essence of the Brussels discussions on our project website.

The conversation about the revision of the White Paper and the best ways to implement its goals will also continue on the TRANSFORuM website, where we provide an online forum for all your thoughts, comments, criticisms and suggestions. Keep the discussion alive.

www.transforum-project.eu

THE WHITE PAPER GOAL

"By 2050, complete a European high-speed rail network. Triple the length of the existing high-speed rail network by 2030 and maintain a dense railway network in all Member States. By 2050 the majority of medium-distance passenger transport should go by rail."

GENERAL INFORMATION

The present document is the Roadmap 2.0 on High-speed Rail of the FP7 project TRANSFORuM. This roadmap is one element of the formal Deliverable 6.2 "Consolidated roadmaps and recommendations to reach selected EC 2011 WP goals".

More information about the project can be found a www.transforum-project.eu

Project details	
Project title	TRANSFORuM - Transforming European Transport through an Active Actors Forum
Grant Agreement No.	MOVE/FP7/321565/TRANSFORUM
Project Start Date	01 February 2013
Duration	24 months

Document details	
Deliverable no.	D6.2 "Consolidated roadmaps and recommendations to reach selected EC 2011 WP goals" (this document together with three other thematic roadmaps and recommendations on joint actions)
Dissemination level	Public
Work Package	WP6 "Implementation roadmaps, concrete recommendations and a detailed strategic outlook"
Author(s)	Yves Crozet (Institut d'Etudes Politiques, Laboratory of Transport Economics, Lyon) Cécile Chèze (Laboratory of Transport Economics, University of Lyon) Laurent Guihéry (Laboratory of Transport Economics, University of Lyon) Max Reichenbach (Karlsruhe Institute of Technology) Christian Desmaris (Institut d'Etudes Politiques, Laboratory of Transport Economics, Lyon) Karen Anderton (University of Oxford) Libor Krejčí (Czech Transport Research Centre, CDV, Brno) Zdeněk Hřebíček (Czech Transport Research Centre, CDV, Brno)
Status	Final
Publication date	January 2015

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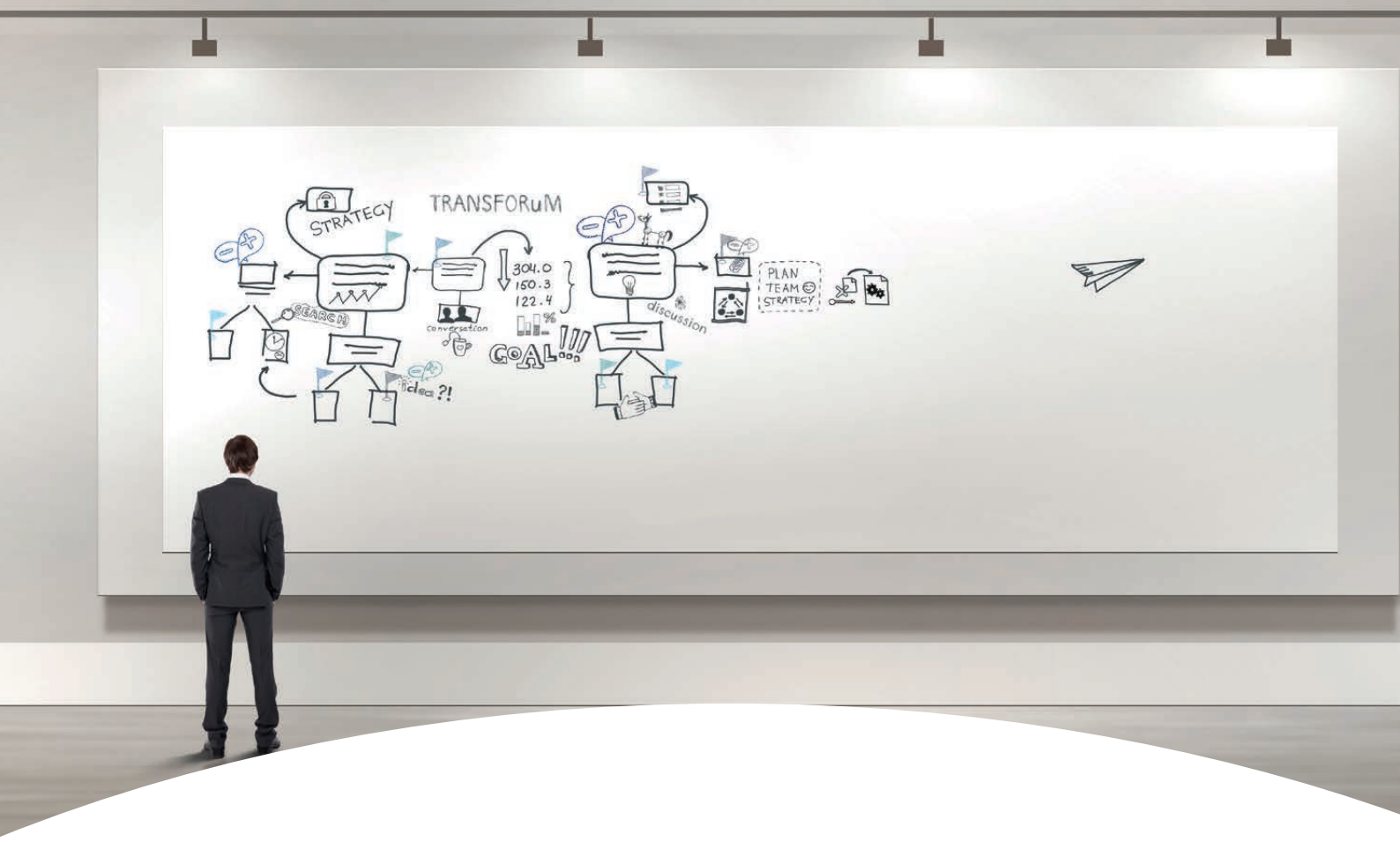
TABLE OF CONTENT

TABLES

FIGURES

LIST OF ACRONYMS

CBR	Cost-Benefit Ratio
CZK	Czech Crown
DfT	Department for Transport
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
EU	European Union
GHG	Greenhouse gas
GSM-R	Global System for Mobile communications - Railways
HS1	High-Speed 1, Exploitation of the Channel Tunnel Rail Link (CTRL)
HS2	High-Speed 2, Projet of High-Speed line between London and Manchester and Leeds
HSR	High-Speed Rail
IPO	Integrated Programme organisation
IT	Information Technology
Ltd	Limited
MIMP	Multimodal information, management and payment
MLG	Multi-level governance
NGO	Non-governmental organisation
NTV	Nuovo Trasporto Viaggiatori, Italian train operator (on HSR)
OECD	Organisation for Economic Co-operation and Development
PKP	Polskie Koleje Państwowe, Polish public railway company
PPP	Public-Private Partnership
PSG	Programme Steering Group
PSO	Public Service Obligation
SNCF	Société Nationale des Chemins de Fer, French train operator
SNIT	Schéma National des Infrastructures de Transport, French governmental report on territorial organisations and infrastructure needs
TEN-T	Trans-European Transport Network
TGV	Trains à Grande Vitesse, French high-speed trains
TSI	Technical specifications for interoperability
UIC	Union Internationale des Chemins de Fer



1 Information about the TRANSFORuM project

Generally speaking, the FP7 project TRANSFORuM contributes to the transformation of the European transport system towards more competitiveness and resource efficiency. It has done so by engaging key stakeholders in carefully moderated forum activities and through other consultation measures in order to identify their views about the related challenges, barriers, trends, opportunities and win-win potentials. TRANSFORuM thus facilitated a discussion forum of relevant actors and stakeholders about the best ways to reach four key goals of the 2011 European White Paper on Transport:

- Clean Urban Transport and CO_2-free city logistics (goal 1)
- Shift of road freight to rail and waterborne transport (goal 3)
- **Complete and maintain the European high-speed rail network (HSR) (goal 4)**
- European multimodal transport information, management and payment (MIMP) system (goal 8)

TRANSFORuM's underlying assumption was that policy making should be based on an in-depth understanding of all stakeholders' positions and that coordinated action among them is more effective than any solo attempts. The TRANSFORuM consultation process was therefore designed to elicit these views and to facilitate the emergence of synergy ideas.

The concrete conversations with and among stakeholders were conducted through many direct interviews, 130 responses to our online survey, via various social media channels and the feedback function of our project website. Most importantly, though, TRANSFORuM organised 10 face-to-face workshops in 10 different European countries – at four of which HSR was addressed (see overleaf).

We paid careful attention to ensure a balanced representation of all types of stakeholders: Men and women, established large companies and innovative start-ups, representatives from all corners of Europe, suppliers and users, hardware and software companies etc. This selection process was based on TRANSFORuM's first official deliverable ("Shaping the

TRANSFORuM Network"[1]), which spells out the criteria that guides our stakeholder selection. To ensure the complete transparency of this process we made the list of attendees of our events always publicly available on our website. Our participants included representatives of national and EU administrations, transport operators and HSR operators in particular, mobility service providers, representatives of passenger organisations, railway industries and other non-governmental organisation (NGOs) and members of national and European programmes and platforms.

The essence of these conversations has been distilled into a series of roadmaps and recommendations for achieving the four mentioned White Paper goals. This document is the roadmap for the urban transport goal. It is mainly based on the stakeholder debates at the following TRANSFORuM workshops:

- A two-day workshop in Gdansk, Poland, in June 2013, which provided basic identification of key policies, actors, funding mechanisms and trends with regard to HSR, as well as an identification of barriers, challenges, and ways to overcome them;
- A two-day workshop on good practice lessons and learning processes in Lyon, France, in November 2013, including a visit to SNCF's TGV maintenance centre in Lyon;
- A two-day workshop in Vienna, Austria, in January 2014 with a particular focus on cross-cutting issues between TRANSFORuM's four White Paper goals and a discussion of the preliminary roadmaps;
- A two-day workshop to discuss the draft roadmap 2.0 on HSR in Rome, Italy, in June 2014, including visits to the country's two competing HSR operators, Trenitalia and NTV.

The roadmap was carefully reviewed by two external experts ensuring a consistency and quality check and allowing for some further improvements.

1 Deliverable 2.1 is available at www.transforum-project.eu/resources/library.html

2 The White Paper goal on HSR

TRANSFORuM's HSR Thematic Group **deals with goal no. 4 from the European Commission's 2011 Transport White Paper**:

> **By 2050, complete a European high-speed rail network. Triple the length of the existing high-speed rail network by 2030 and maintain a dense railway network in all Member States. By 2050 the majority of medium-distance passenger transport should go by rail.**

It is important to underline that the EU support to HSR is one component of a global view in favour of a more sustainable mobility. For these reasons, the White Paper recommends for freight and for passengers, a modal shift in favour of rail. Therefore it is necessary not only to increase the rail network capacity, but also to improve the quality and the diversity of services. The demand shift towards rail depends on these improvements. Developing the HSR network is part of a global development of the rail sector.

It is necessary at this stage to identify the different rail system models present in Europe (Pagliara, 2014). They can be classified into:

- the French system with very high speeds, conceived only for passengers, set on new lines with peak speeds equal to 300 km/h and non-stop connections between metropolitan areas (focus: high speed);
- the German HSR system, mixed traffic (passengers and freight), serving also intermediate cities with a system of trains with different speed not exceeding 250 km/h, developed on the basis of existing renewed lines (focus: high capacity);
- the Swiss/English HSR system, mixed traffic, consisting in speeding up the Intercity service to 200–225 km/h, combined with a train every hour for any other destination on the network and connections in all stations, at the same time, with all other passenger trains.

The European HSR network should be integrated in the wider transport system to promote lower door-to-door travel times and costs, and enable more efficiency in the promotion of HSR (and regional transport) as a powerful alternative for medium- (within a 3 hour travel time band) and long-distance travel. The concept of 'seamless transport' needs to be discussed.

For this, a strong integration of HSR into the urban transport network of major cities and connection with major airports would ensure a cooperation between local and urban transport authorities as well as a better cohesion between the main HSR lines and the priority Trans-European Transport Networks (TEN-T) axes.

By facilitating access to both international passenger hubs (by linking airports to HSR stations) and commuters of major European economic and urban areas, HSR could act as a sustainable and effective alternative to both road and medium-distance air transport.

2.1 TRANSFORuM's understanding of the goal

An increase in mobility raises two issues for the existing transport system: how to cope with a growing pressure on the capacity of main lines and how to ensure a strong connectivity between HSR and the rest of the transport system. The financial sustainability of HSR relies on it offering an attractive alternative to other modes and its inclusion in a global seamless transport system.

The underlying rationale for HSR has conventionally been about speed of service, but it has been acknowledged that that travel time is not a waste, but can actually be used for productive activities (Givoni and Banister, 2012). As such, the fundamental need for more efficient transport services which prioritise the need to travel point-to-point as quickly as possible, should no longer be the primary driver for the HSR sector. This consideration of commercial speed needs to be matched with consideration for on-board and off-board services which enhance users' experiences and for connectivity to services and to other modes of transport. Indeed, this need for speed is more relevant when considering door-to-door journeys, not to single routes. Taking this all into consideration, there is therefore a need for improved on-board service, work and leisure facilities on trains, and a better connectivity with the urban and international transport networks (airports, intermodal services etc.).

In medium-distance interurban transport, the need for better cooperation between the operators and the local authorities could lead to an improved integration of HSR services into to the existing local transport network, which would in turn improve intercity connectivity and inner-city movements; both factors of improvement for a door-to-door travel pattern.

Therefore, HSR needs to be seen as a combination of attractive features, the initial factor of speed, alongside the improvement of other features (integration, frequency, on-board and off-board services...). Such considerations can make HSR a competitive transport mode for medium-distance travel compared to air and with road.

The territorial organisational objectives, nationally defined, are then the main source of difference between European HSR models. In that sense, urban-centralised territories such as France developed services with very high speed and only few intermediate stops whereas countries with strong regional decentralisation such as Germany apply an interurban model with intermediate stops in medium-sized cities and thus, speeds lower than the very high-speed threshold of 300 km/h (UIC, 2014[2]).

2.2 Stakeholder perceptions of the goal

Results of a survey conducted alongside TRANSFORuM's first Thematic Workshop on HSR in Lyon in November 2013 show that not all experts and stakeholders in the field of HSR are aware of the White Paper goal. It is also perceived to be partially relevant to the daily work of these stakeholders. Still, all participants of the survey were convinced that the goal is at least partly achievable.

If the goal in itself seems to be accepted, most of the stakeholders highlighted technical issues as the major factors to consider in the development of a European HSR network. These were mainly the need for interoperability and compatibility of rolling stock and infrastructures in order to overcome national barriers and specificities and widen the access of networks to operators from neighbouring countries. The results of the survey also showed that national

2 The UIC definition can be found at: www.uic.org/spip.php?article971. It divides HSR mainly by the commercial speed possible on an infrastructure: above 250 km/h, around 200 km/h and mixed-speed capacities. The highest speed category is further divided between above 250km/h and above 300km/h for very high-speed

governments should be less financially supportive and should concentrate on regulatory functions that would enable competition or at least cooperation to reach the goals of effectiveness and harmonisation of the European rail network. Whilst this was clear, monopoly situations in many European countries were not considered as a significant barrier for such interactivity in the European HSR network.

This perception of the White Paper goal relates to the attitude of many stakeholders that the focus of future HSR developments and the respective policy measures should be on capacity extensions of the railway system and a user-oriented perspective on excellent service, rather than mere infrastructure extension. Thus, investment needs should be adapted to the current state of national HSR networks. In well-equipped countries, these investments should be directed towards alleviating congested railway nodes, freeing capacity and in this sense extended the HSR network. While in poorly-equipped countries, these investments will be dedicated to the creation of a network. Therefore, tripling the length of the European HSR network can be interpreted as both freeing capacity on some nodes, or linking some high-demand cross-border sections (as it has been the case for the Eurostar or Thalys), as well as the literal building of HSR lines where there are none.

This is to say that improved HSR services are seen as desirable but increasing the patronage of existing routes is just as, if not more desirable. The goal should not just concern the construction of thousands of kilometres of new HSR lines. Infrastructure should be seen as just one service among a host of others and alongside the need to improve this service, investments are also required to maintain current financing schemes as well as for upgrading existing lines, enabling higher speeds, and thus extending parts of the HSR network, while not literally creating new lines.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THALYS

3 Pathways towards the goal: general ideas

The White Paper goal points to a final target that cannot be achieved without intermediate supportive measures, all part of one single strategy that will lead to an increase in the modal share of HSR and rail more generally. In order to identify the most appropriate intermediate steps to take in order to achieve the White Paper goal, TRANSFORuM identified four action levers – with the help of all stakeholders involved during the project. These levers are far from being exclusive and there is a need for very strong cooperation between the levers and between relevant actors in order to combine measures, to prioritise them and determine a clear resource allocation.

The first two action levers (increasing **rail capacity**, increasing **rail demand**) respond to a need for an increase in rail traffic, an improvement in its perceived attractiveness by developing capacity and increasing the flexibility of traveller options through incremental or radical measures (e.g. the European Railway Traffic Management System (ERTMS) or new HSR lines). The third lever (**good planning** of railway services) seems more theoretical but is fundamental for designing an appropriate model of HSR in Europe. A fourth lever (improving the **relative competitiveness of rail**) highlights that HSR policies must take into account the creation of a level playing field between different transport modes, balancing rail, air and road transport. All levers are intertwined with each other each contributing to the achievement of the goal, but serving also to highlight the complexity of the HSR system, but also of HSR's relationships with the wider transport network.

The pathway (Figure 1) gives an overview of what the White Paper's goal relies on, and defines which actors need to be involved at which step of the process, according to the HSR strategy pursued in Europe. This is intended to answer TRANSFORuM's guiding question of "Who needs to do what, and by when?"

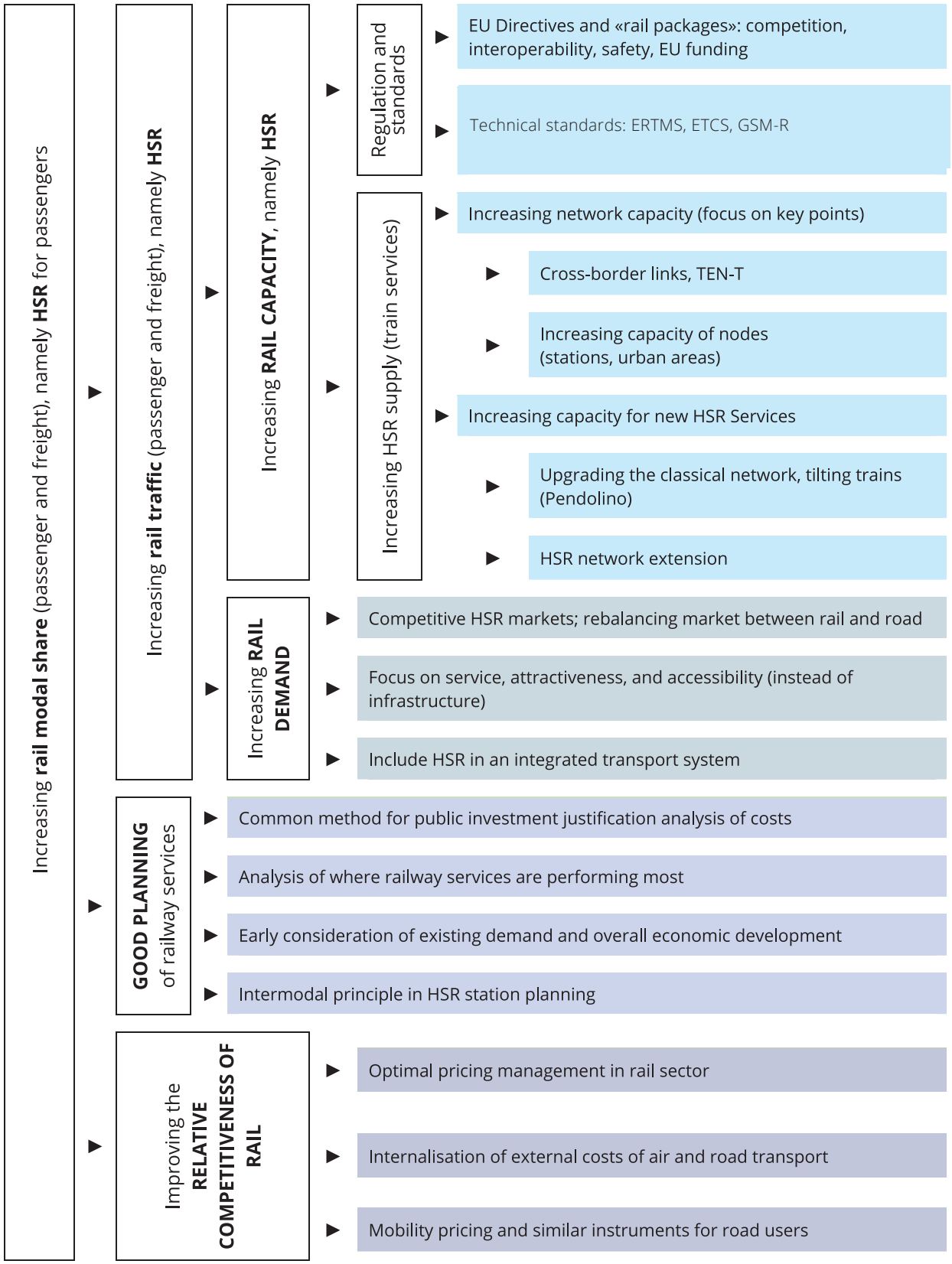
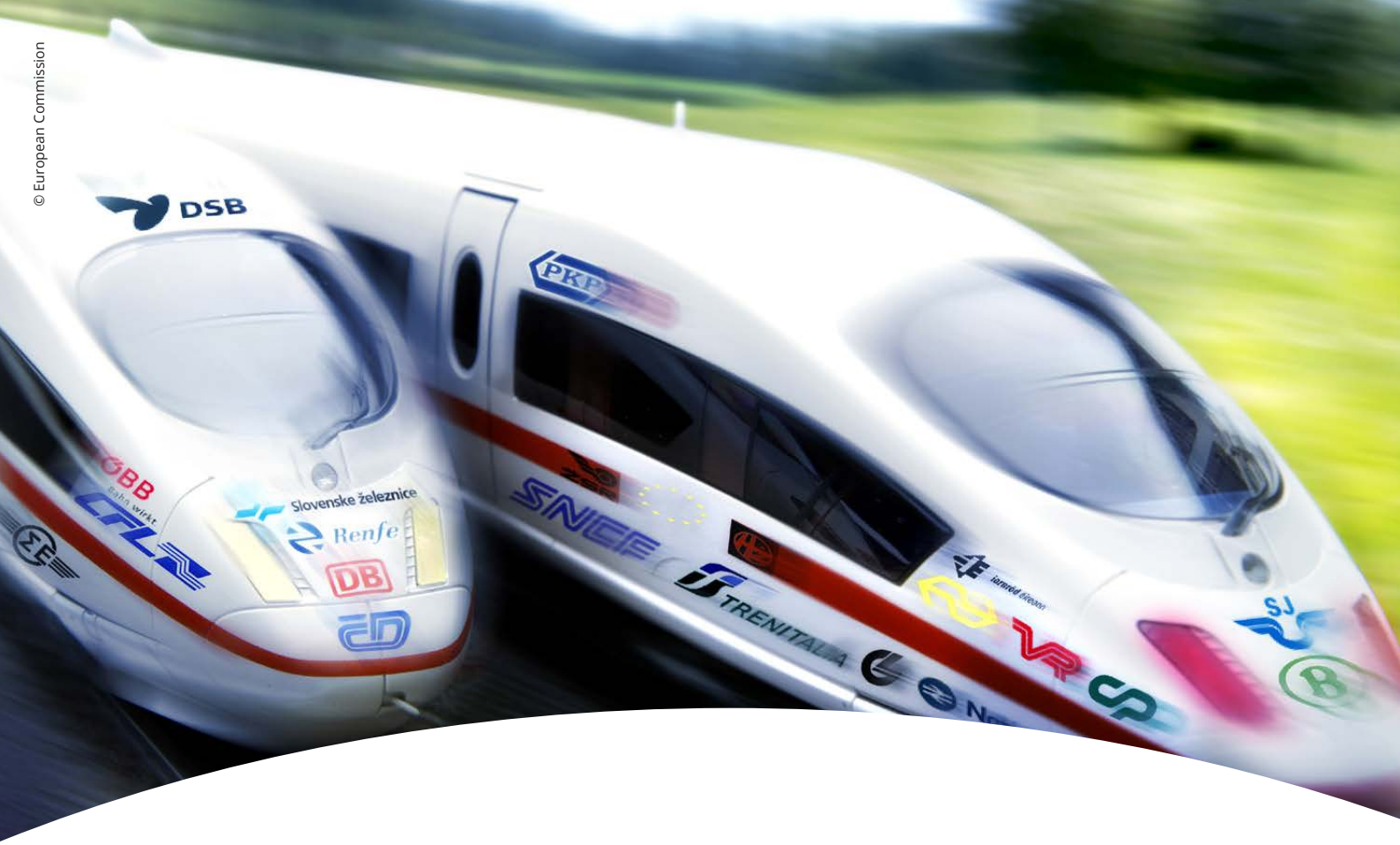


Figure 1: Structure of measures towards the HSR White Paper goal
(Measures increasing rail capacity represented in blue, measures increasing rail demand represented in turquoise, good planning measures represented in purple, measures referring to the relative competitiveness in grey).



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4 Background, trends and barriers

Most high-speed trains have been developed during a period of increasing pressure to deliver transport sustainably, whilst managing an increasing demand for mobility, often over a greater distance. This pressure on capacity results from the enhanced economic attractiveness of major European hubs. Some capital-capital lines such as the Eurostar between Paris and London, the Thalys between Paris and Brussels and the planned Rail Baltica line linking Baltic capitals with each other and with the Western European HSR network demonstrate this. But demand is also influenced by generalised costs on which the distribution of modal shares depends, assuming a constant travel pattern. Another major trend is the modal share objectives determined by national and European institutions, declaring rail and HSR a sustainable transport mode whose modal share needs to be enhanced through monetary and quality incentives.

During TRANSFORuM's first joint forum meeting in Gdansk in June 2013, major trends that influence most HSR planning schemes – whether constraining or supporting them – were identified. TRANSFORuM's deliverable 3.1[3] highlighted the most important cross-cutting and HSR-specific trends such as the quite recent widening of the HSR rationale from its previous exclusive focus on speed towards a perspective that more consciously takes service quality and improved connectivity into consideration (through seamless transport measures, corridors and station design etc.). The scarcity of public funds which require an improved allocation of resources across the HSR network and the need to improve the efficiency of the HSR network by developing an integrated multimodal transport system were also identified as major areas that need to be addressed in order to reach a long-term goal of modal shift from road and air to rail and HSR on medium and inter-urban distances.

What also needs to be considered in order to deliver an efficient HSR network in Europe is the organisation of institutions, public bodies and decision-making processes. Indeed, some European Directives still need to be implemented as ground conditions towards the European Commission's goal of a Single European Transport Area, in order to establish common rules of organisation and management on national networks and enhance international cooperation on cross-border links. In that sense, it is important to identify and highlight the legislative background on which TRANSFORuM's roadmap towards a Single European HSR area will have to rely on across definite timescales: 2020, 2030 and 2050. The recently adopted Committee of Regions of the European Commission charter on multi-level governance (MLG) and cooperation for European projects (cf. Committee of the

3 Deliverable 3.1 is available at www.transforum-project.eu/resources/library.html

Regions, 2014) is useful in this context. Through the objective of more effectiveness and appropriateness in the decision-making process for European or trans-national projects; the Charter suggests to transfer the subsidiarity principle to a multi-level public body partnership, involving local, regional, national and supranational collectives. In the particular case of HSR, such a Charter could consider multi-level issues and anticipate a host of impacts of transport infra-structure development and management on macro-, meso- and micro- socio-economic scales to ensure a cohesive political process in the shaping of the Euro-pean railway network.

4.1 Brief mapping of the field

The development of a European HSR network is a key component to achieving a more sustainable European transport system. HSR is highly flexible in terms of energy supply and unlike the plane, can use renewable, non-fossil fuels and can easily adapt to new electricity sources, improving its environmental sustainability at the same pace that renewable energy develops with. The development of a European HSR network is thus a powerful lever to reduce green-house gas (GHG) emissions and the dependency of our mobility on non-renewable energies (UIC, 2010). HSR services have shown a rapid development in recent years, making up a quarter of rail passenger trips in 2010 (European Commission, 2012, 52) and contributing to significant increases in overall rail travel. Still, understanding of HSR and the respective approaches to implement HSR services are quite het-erogeneous across Europe and need close inspection.

Billion pass. km	1995	2000	2005	2010
France	21.43	34.75	43.13	51.89
Germany	8.70	13.93	20.85	23.90
Spain	1.29	1.94	2.32	11.72
Italy	1.10	5.09	8.55	11.61
Sweden	0.42	2.05	2.33	3.10
Belgium	-	0.87	0.98	1.06
United Kingdom	-	-	0.45	1.01
Others	-	0.17	1.50	1.75
Total% of all rail	**32.94** 9.4%	**58.80** 15.9%	**80.11** 21.2%	**106.04** 26.3%

Table 1: State of the art of HSR in Europe 27 (Source: Banister & Givoni, 2013, 326)

Since the inauguration of the first French HSR line in 1981, lots of European countries have made huge investments in order to manage the increasing demand for more speed on longer distances. HSR, coupled with the general request for more sustaina-ble mobility, appeared to be an appealing solution to the Member States, and with regards to their own economic, financial, political and demographic situa-tions, national networks have started to develop and now reach a total of 7,378 km of HSR lines (250 km/h or above). In a strategy of cooperation and in the search for a network effect enhancing medium and long-distance cross-border HSR links, 12 Member States defined top priority links at the beginning of the 1990s, among these some HSR lines, led by com-mon standards of interoperability and requirements defined in European Commission Directives that are listed below. This policy of developing a framework for a common vision of an international transport led to the TEN-T networking and planning, as presented in Table 2 and Figure 2 respectively.

Axis/ Project No.	Title
1	Railway axis Berlin–Verona/Milan–Bologna–Naples–Messina–Palermo
2	HSR axis Paris–Brussels–Cologne–Amsterdam–London
3	HSR axis of South-West Europe
4	HSR axis East
6	Railway axis Lyon–Trieste–Divača–Ljubljana–Budapest–Ukrainian border
12	Nordic Triangle railway/road axis
13	West coast mainline
16	Freight railway axis Sines/Algeciras–Madrid–Paris
17	Railway axis Paris–Strasbourg–Stuttgart–Vienna–Bratislava
19	HSR interoperability in the Iberian peninsula
20	Railway axis Fehmarn belt
22	Railway axis Athens–Sofia–Budapest–Vienna–Prague–Nuremberg/Dresden
24	Railway axis Lyon/Genoa–Basel–Duisburg–Rotterdam/Antwerp
28	Eurocaprail on the Brussels–Luxembourg–Strasbourg railway axis

Table 2: TEN-T axes and priority projects relating wholly or partly to HSR (Source: European Commission, 2010, 7)

The European Commission's goal of tripling the length of the HSR network is already on track. More than 1,900 km of HSR lines are currently under construction or planned (UIC, 2013). This is in order to support the increasing demand for HSR services that doubled between 1998 and 2008, as shown in the latest numbers (from 52.86 to 104.10 thousands million passengers per km (European Commission, 2012)). The TEN-T programme enables project finance and provides an overview of what the European strategy on the priority projects is. But the European Commission has also settled a legal framework for common rules of functioning, intervening in lots of elements of the railway market organisation. Table 3 provides an overview of the Directives that provide the most substance and structure, which must be regarded in the development of recommendations for policies and measures since they are already institutionalised and provide a strong signal on the direction intended to be taken by the European Commision.

Directive	Principles
EC/1991/440	Independence of the railway infrastructure management Separation of infrastructure manager and railway operator Open access on international railway operations
EC/1996/48	TSI of HSR infrastructure (TEN-T objective)
First railway package (2001)	Railway regulator for access charges and railway allocation Licensing framework
Technical specifications for interoperability (TSI) 2002)	Framing the interoperability on both HSR and conventional rail
Second railway package (2004)	Harmonisation of safety and technical norms
Third railway package (2007)	Settlement of open access rules of international passenger services
Fourth railway package (upcoming)	Settlement of common regulatory rules Reinforcement of measures on safety, liberalisation and vertical separation

Table 3: EU Directives and their principles

Country	EU contribution in million €
Czech Republic	2217,0
Estonia	195,0
Cyprus	16,3
Latvia	476,6
Lithuania	117,2
Hungary	1480,5
Malta	93,7
Poland	13193,5
Slovenia	593,5
Slovakia	1095,7
Bulgaria	1251,7
Romania	3054,7
TOTAL	**23788,6**

Table 4: EU contribution to TEN-T programmes (Source: European Commission, 2014a)

Another signal from the European Commission was given in October 2013 with the inclusion of the Eastern European HSR network in the priority projects, according to HSR schemes in the Central and Eastern European Member States (see Table 4 and section 5.1). Their obvious importance in the context of implementing the White Paper goals leads TRANSFORuM's work to also take their implementation stage into account and this is why a third time horizon, 2020, has been utilised in order to leave time for them to complete background measures on which our recommendations are built.

It is noteworthy that current measures only partly point towards the need for a user- and service-orientated perspective; opposing the above-mentioned perception of stakeholders in the field. But before even extending the HSR network length; there are incremental, although significant, goals to reach in order to increase traffic such as ERTMS-based signalling, high on-board capacity and other technologies such as ETCS, GSM-R. The unification of such measures is also important in order to settle interoperability and ease the path towards international operation. This would also complete a user-orientated perspective by enabling services that are higher frequency and composed of better connections across European network.

Figure 2: Map of European HSR projects (UIC, 2010)[4]

4 These maps were released in 2013; therefore projects that have subsequently been decided upon may not appear in the 2025 vision (e.g. Fehmarn Belt between Scandinavia and Germany).

4.2 Trends

Though demand for mobility and rail traffic has continued to increase over the last decades, at least in most of Western Europe countries, this does not necessarily imply a rise in rail modal share (for example in the UK, modal share has fallen from 18% to 6% over the past 50 years (DfT, 2012)). The first trend of increasing rail traffic is an argument in favour of HSR as a way to relieve some major hubs from bottleneck effects, where the mix of both commuters and long-distance travellers at peak hours creates congestion and leads to longer travel times, affecting its attractiveness and thus, its modal share. Addressing accessibility and attractiveness considerations, without providing additional capacity, might in some cases lead to congestion which has the adverse effect of shifting modal share towards road. HSR is justified to create supplementary capacity on longer distances and offer a high level of service, thereby rebalancing travellers' shift towards rail. This is the case of the Napoli-Roma link where, after the introduction of the HSR line at the end of 2005, the mode share between car and rail switched in favour of rail (55%) (Cascetta et al., 2011).

Another structuring trend in the rationale for HSR is the importance given to valuation of time in project assessment – which does not often consider the potential value of other service characteristics. Access to the internet and electrical power sockets are exemplary features that can illustrate a focus on services and quality of travel experience. HSR valuation needs to consider not only the cost of speed in terms of rolling stock, construction and electrification and even perhaps environmental impacts, but also be orientated towards a reduction of wasted time, by facilitating the productivity of travel time. To go further, increasing travel time productivity could change the rationale of travel itself from a completely derived demand serving another primary purpose. This trend is influencing opposition to increasing speed on some dedicated line, leading to lack of public support as the UK Department for Transport has faced for the past months regarding its HS2 project. This can be clearly explained by the high need for public money in HSR schemes but also the lack of precision and certainty in HSR impacts studies. Appraisal methodology on spatial and socio-economic impacts of HSR is a current research axis that deserves attention and resources in order to anticipate more precisely the direct and indirect effects of HSR. Literature focused on this area is prolific and must be taken into account, although the field is continually progressing and changing (OECD, 2007).

Another key feature of planning HSR is the degree to which it is integrated into the existing public transport network as a mean to increase efficiency. Transport policies are based on generalised costs, including price and travel time, not as a segmented line that would represent access alone, but from origin to destination, emphasising the need for more accessibility and thus reduced waiting times by more frequency, for instance. This rationale, namely the door-to-door approach, would mean a global thinking of HSR as part of an integrated transport system and a travel time value including connectivity, efficiency and access facilities. It also highlights the need for multi-level cooperation in order to settle a coherent transport organisation on the basis of HSR as part of multimodal travel, which is one of the current goals pursued by most regional, local, national organisations as well as by the European Commission in the 2011 White Paper.

On the technological side, trends are dominated by the need for better services which would bring together the multiplicity of actors sometimes involved in one journey. For this, integrated initiatives such as Rail Europe Ltd. need strong cooperation of actors in order to gather data and provide reliable information to customers in reaching the ultimate goal of facilitating multi- and intramodal ticketing and thus multimodal trips and integrating HSR in the process as part of an attractive transport offer with efficient and reliable connections. This relates also to the role of frequency as a valuable service for interconnections and multimodal travel patterns.

Finally, HSR cost schemes are still under very much pressure as lifecycle costs of HSR are very much a focus for the industry. The scarcity of public funds and the increasing pressure put on financial health of private actors were and still are both incentives for a higher efficiency and a better allocation of resources. As stated above, the development of technologies is key for user services but also in investment productivity as it would enable an optimisation of expenses. This is the case with the capacity of HSR to adapt to any source of electric energy, leading to a high flexibility towards energy technology progresses. This continuous search for higher financial efficiency is also an explanation for the European request to introduce competition in the railway sector.

4.3 Key barriers and fields of conflicts

HSR services and investments are technologically, organisationally, financially and politically challenging. In the political and institutional perspective, governments may be reluctant to develop and implement strategies to improve HSR services; on the other hand appraisals for new HSR lines are often not used in the best possible way (i.e. by not thoroughly analysing the full benefits and drawbacks of HSR investments), which may lead to inefficient use of public money and an ineffective HSR system (Nash, 2010). The asymmetry of interests between political interests and socio-economic appraisal has been highlighted by a recent report of the French Court of Accounting (2014), Indeed there is a need for both sides to collaborate more closely and public accounting needs to be aligned to avoid seemingly irrational project construction that can lead to controversy surrounding economic viability.

In addition, local resistance against big infrastructure projects is of growing importance and requires careful analysis and consideration of arguments in order to be implemented in a fair and transparent way. Public acceptance is one of the key levers in the construction of an HSR line, as it often opposes political will and relies on the quality of communication of both parties. Indeed, some projects currently under consideration such as the Lyon-Turin tunnel, or HS2 in the UK, raise strong local and sometimes national opposition for environmental reasons but also for social and economic reasons (notably issues on taxation effects and infrastructure financing schemes). Such resistance to extensive HSR works highlights the staggering objectives of politics and citizens, particularly strong in times of economic pressure as Europe is facing now.

Political will, political vision and long-term infrastructure needs can also conflict when it comes to the allocation of budgets. This is because timescales, interests and motivations differ between policy actors and their short term policy cycles and between medium and long term lifespans of particular infrastructures. Some needs may be fulfilled by different solutions and it may not be possible to satisfy every democratic decision-maker (whether politician or citizen). Such delicate issues must be handled carefully as asymmetric information often leads to misunderstanding and sometimes even to lack of support. Institutional communication might be one of the levers that could enhance bilateral understanding and identification of objectives leading to a maximisation of public interest in cases of very expensive schemes. Switzerland is a good example of democratic allocation of public budgets. Earlier this year, Swiss people voted positively for a new financing scheme of rail development plans which brings more money to the sector (Bundesamt für Verkehr, 2014).

Technical challenges remain where international standardisation is incomplete and where train manufacturers and operators therefore come across multiple sets of requirements and complicated and multiple approval procedures.

For HSR operational models, the distribution of HSR stations and timetable planning is a challenge because a dense network of stations conflicts with minimised journey times. Closely linked to the distribution of HSR stations, is that the impact of HSR investments is still difficult to assess. In a competitive market, HSR services have to compete with road transport on shorter distances (which can offer convenient door-to-door travel) and air travel on longer distances (which can offer faster point-to-point speeds); this is a major reason why the strategic planning of HSR services has to consider an integrated transport system perspective and should focus on good service –not only speed. This goes along with the need for HSR planners to include considerations about the existing territorial pattern. Considering HSR as a support for demand, it is likely that most lines are adapted to the existing socio-economic situation and enhance the existing trend, as commonly agreed in research. This is also the reason why talking about HSR without differentiating different models such as Germany and France should be avoided. Terminology has to be specified, in order to identify what adaptation of HSR features is required in any given context.

A main barrier for the extension of the European HSR network is cost. Building up a HSR network entails significant capital costs for the construction of the infrastructure, and the operation of trains on HSR infrastructure, and the maintenance of the network are construction costs. It is therefore not likely that HSR investments will be possible without public subsidies and a rigorous inclusion of external benefits. Overall sources of conflicts can be found in the very first step of HSR planning: in defining its strategy and justifying the need for an HSR line and services. Such a strong political vision needs some visibility in order to be accepted but also in order to implement the right measures. Thus, there is a need for setting timescales in order to give a clear vision to future decision-makers and a pathway to follow, which the following pages and TRANSFORuM project in general aim to provide for all kinds of HSR actors.

5 Processes and policy packages towards achieving the goal

The processes towards achieving the goal require a strong coherence between the vision of the European Commission as the common decision-maker and the Member States with their own national strategies on mobility and their own plans for the degree of integration and multimodality in their national networks. This vision, as explained before, needs to clarify whether the European Commission is in charge of cross-border links and then of a connection-focused HSR network or if all Member States act together towards a common HSR area, where national lines and cross-border connections are both part of a whole network that has to be supported by the European Commission. Once a common vision is provided to all European HSR actors, there are still decisions to be made on. Therefore different options or policy packages which could lead towards the achievement of the goal. These are different sets of measures and policies aiming at achieving the primary goal of both the European Commission and Member States: increasing rail modal share.

The policy packages are combinations of relevant measures required to reach the goal that seems to most feasible in order to increase HSR attractiveness and thus rail modal share. The table below aims to present a non-exhaustive list of HSR features that need to be included in the rationale of a European HSR network. It is divided into three main organisational branches structuring HSR: infostructure[5] – and infrastructure, end-user services, and institutions and policies. These three branches imply multi-actor decision-making processes and some issues and actors may be relevant across one or more areas. The aim is to provide a relevant overview of HSR as a system, especially where cooperation between actors is particularly needed.

As a basic orientation, every policy package in the table below (one policy package = one column) follows a specific orientation. Policy package I is about extending the HSR network (infrastructure focus, section 5.1), package II deals with providing good access at stations, but also good stations (accessibility focus, section 5.2), package III deals with integrating HSR into local, regional and national networks (integration focus, section 5.3), and package IV considers HSR services and their attractiveness for users (service focus, section 5.4).

5 Infostructure was defined by Curien (2005) as the non-physical systems, organisational and managerial, that are essential to the exploitation of the infrastructure and service provision.

Policy package	Policy package I Extending the HSR network	Policy package II Providing good access at stations	Policy package III Integrating with local/regional/ national networks	Policy package IV Focus on HSR services and attractiveness for users
Info- and infrastructure features				
Financing focus: projects with high cost benefit ratio (CBR)	Public subsidies as a possibility if line declared as a public service obligation (PSO) – PPP without traffic risk guarantee	PPP without risk guarantee for station management through a public and MLG public support (multimodal involvement)	PPP without risk guarantee for station management through a public and MLG public support (multimodal involvement)	Monopolies: equalisation logic Competition: regulator to define PSO
Financing with low CBR	Mainly open access and/or PPP with traffic risk guarantee (on a build and operate model)			
Main source of funding	Equalisation payments (spillovers) and funding through other modes Customer fares on most profitable lines Regulation of access charges	Public Subsidies justified by PSO Commercial revenues (stations development) through "access charges" in stations	Multimodal financing through partnerships	High CBR: other modes spillovers/ competition efficiency and productivity gains Low CBR: public policies for environmental HSR promotion /other modes spillovers
Offer focus	Capacity issues Corridors with high demand and air/HSR competition Bottlenecks in urban railway hubs (especially mixed-traffic networks)	Door-to-door travel patterns focus Intermodal strategy (airports /urban) and traffic origins (regional/national/ international hub) IT development (online ticketing, integrated multimodal ticketing)	Door-to-door travel patterns focus More service off-board (in stations) through ticketing (multimodal and online solutions) Reliability and frequency	More services on-board; WiFi etc. in metropolitan regions with many business commuters; convenient night trains where applicable
Network focus	Capacity solutions on congested networks (specific lines, research focus to be put on congestion assessments) Focus on high to very high demand axis for high and very high speed rail ERTMS and traffic optimisation tools Frequency and reliability Network focus is seen by travellers through reliability and frequency of HSR services	Central hubs in less populated areas, dense network in highly populated areas	Territorial equity and transport land use strategies Identification of possibilities of separation of traffic flows in metropolitan areas, direct integration in medium-sized cities	Capacity solutions on congested networks (specific lines, research focus to be put on congestion assessments) ERTMS and traffic optimisation tools Frequency and reliability

Policy package	Policy package I Extending the HSR network	Policy package II Providing good access at stations	Policy package III Integrating with local/regional/ national networks	Policy package IV Focus on HSR services and attractiveness for users
Capacity extensions	Focus on bottlenecks and corridors Upgrade existing lines in densely populated areas, careful consideration of demand in less populated areas	Focus on long-distance links (300+ km/h) and securing connected regional services	Upgrading existing lines (200 km/h) and balancing with regional and freight traffic – use expensive infrastructure efficiently	Upgrading existing lines, bringing equipment to modern standards, keep compatibility with European network
Business models	Private operators, licenses, franchising	Separate service operators through strong MLG model	Cooperation between public authorities and private companies for mutual benefit	Competition between operators on most profitable lines PSO: PPP with traffic risk guarantee
End-user services				
Access at stations	Integration in urban and central business districts	Isolated station accessible by high level coach services and car	Urban multimodal hub	Focus on accessibility indicators instead of access facilities (see generalised cost methods): accessibility and generalised speed as part of attractiveness of HSR on a door-to-door logic
Integration	Integrated network with balanced hierarchy of hubs	Separation of traffic flows in metropolitan areas, efficient and accessible integration at regional hubs	Integration with local and regional transport, links to airport	Integration in existing dense networks, taking care of balance between modes
Institutions and policies				
Legal framework	Fair competition Need for an independent EU regulator for European structuring network schemes	Access rights Regional level PSO rules	Obligations to integrate with connecting services	Passengers' rights Independent and strong regulator (competition and monopoly)
Decision-making leadership (in cooperation with others)	Mostly MLG with local/regional/national/European partnerships considering scale of structural effect of the project EU (and national level) as final decision maker for global strategy of HSR and main cross-border corridors National subsidiarity in priority schemes			
Good planning factors	Early public involvement, transparent strategies	Early consideration of which actors are affected and should be involved	Eye-level involvement of affected actors, i.e. rail service operators, rail infrastructure operators, local public transport operators, car and bike sharing operators, city authorities, users	Balancing economic interests of private actors with societal economic interests and user's interests (convenient usage of rail services to foster modal shift)

Table 5: Proposed policy packages

In addition, section 5.5 adds another range of measures that should accompany the policy packages mentioned above: measures to improve the relative competitiveness of the rail sector, e.g. by internalising external costs of other transport modes, introducing mobility pricing etc.

Section 5.6 concludes with discussing the role of public private partnerships (PPP) as a financing instrument that is particularly relevant for HSR because of the big investments that are needed, depending on the chosen policy package(s).

Considering the features presented above, some major issues have been identified. They need to be addressed and developed in order to enhance the construction of a solid and common rationale on the future direction of HSR development in Europe. These questions also address some of the issues already identified in TRANSFORuM's Deliverables 5.1 and 5.2.6 While developing the points that seem relevant to emphasise, a parallel will be drawn with the most illustrative case studies that can serve as benchmarking for future projects in Europe, whether nationally or commonly planned by the European Commission and the Member States.

Good practice examples

Throughout this section, examples from TRANSFORuM's previous work on good practice in the context of the White Paper (Deliverables 5.1 and 5.2) will demonstrate identified factors of success. These examples will be presented in small blue boxes.

5.1 Extending the HSR network

Though extending HSR network in Europe is very much about the financing scheme, considering the scarcity of public funds and the search for private funding it also implies a need for a European vision in shaping the European network. The TEN-T focuses a lot on cross-border links, putting the European Commission in charge of international HSR lines and focusing on a network effect that is only feasible if national operators enable interoperability between each other, enlarging the sense of a common HSR area. But when considering some projects such as the Lyon–Turin link, the issue of frontier effect tends to highlight the lack of relevance of some international lines, making traffic much lower than predicted. The main issue to be addressed in the extension of the HSR network in Europe is if there actually can be a European HSR network. It also means developing quantitative ex-post studies and ex-ante methodologies in order to specify the magnitude and amplitude of the frontier effects in international flows. These kinds of studies include figures and quantitative results are nowadays a real scientific need and an opportunity in developing HSR-related research.

This issue raises the question of funding HSR schemes according to the vision given and supported by the European Commission. In a vision of focusing on cross-border links, a bi-national funding scheme seems relevant as it mostly depends on the situation of national railway networks. However, if the European Commission advocates for a global thinking of HSR, there could be an encouragement for equalisation payments between Member States on the basis of the network effect on national markets due to the facilitation and common effort put on European traffic and not only national and bi-national traffic. Such European strategy could be divided into three different markets on which to act: the endpoint markets (and links competitive with air transport), intercity markets and higher accessibility on door-to-door travel times compared to road on congested urban areas and potential on some corridors for freight, where demand in volume is sufficiently high.

Another equalisation payment scheme can be applied to a funding solution through intermodal spillovers. Indeed, in order to increase HSR attractiveness, the improvement of its service might not be sufficient as perceptions of transport modes differ among populations. In a policy that promotes environment-friendly mobility and HSR as a sustainable transport mode, monetary incentives for applying the complete social costs to the most polluting transports modes (by internalising externalities) can support the modal shift goal of the White Paper and finance some extensive projects of the HSR network reinforcing its substitutive power. The opposition between different transport modes is somewhat arbitrary and an integrative

6 Deliverables 5.1 and 5.2 are available at www.transforum-project.eu/resources/library.html

transport policy should instead focus on the overall efficiency of the transport system as a whole (see also section 5.6).

The final goal of tripling the length of the European HSR network[7] might be more a tool than a target in another more feasible objective: building a continuous HSR network across Europe. Some action points can be identified as main levers of reaching such goal: focusing on missing links and, in cases of specific high demand traffic, cross-border corridors. Other conditions such as a more efficient linkage between HSR and conventional rail, increasing the density of network, are noteworthy. There are organisational prerequisites here since distributive and efficiency conditions need to be considered (Mackie, 2010). Mackie suggests a more inclusive cooperation between decision-makers and any other public body that might be affected by the transport scheme. Although such cooperation is required in order to adapt transport schemes to specific territorial or economic conditions, processes must be guided by operational rules, to ensure that all decision-making is transparent. Finally, a methodological point is to be underlined. Most methodologies use a baseline and a 'do-something' comparison analysis, but deeper thought can be given to enlarging the scope of the 'do-something' case by widening its prevision. In fact, providing a range of evolution-sensitive indicators might help better acknowledge the risks and challenges of high capital transport schemes, therefore focus has to be on uncertainty in ex-ante assessments, weighting indicators according to diverse predictive situations.

Yet, in many cases, decisions are seen as having greater credibility or influence where numbers are outlined in central plans and because a lot of new infrastructure funding comes from the state. Similarly, the decision between investing in HSR lines with many stops to serve regions along the route, and fast point-to-point HSR lines may be a decision that is influenced by territorial planning perspectives. In a general sense, this is not a problem, but it still needs to be justified through transparent planning and policymaking processes. If then public institutions decide to finance infrastructures where it can be expected that they will never or not very soon amortise in financial terms, there need to be very good explanations and justifications why such money is spent and why the investment is still in the wider socio-economic interest, not least in the interest of future generations – instead of just accepting that it happens.[8] This is linked to the contrary challenge of successful projects where private firms take all the profits and citizens' see this as not reinvesting back into the community.

Still, cases remain where pure HSR investments may not be the optimal solution from either perspective. A particular issue to be taken into account is that, while modal shift towards rail is generally seen as positive, the introduction of HSR services in particular may sometimes have adverse (whether direct or indirect) effects. TRANSFORuM seeks to avoid some of these risks like a decline of conventional rail, by strategically focussing on an excellent integration of new HSR services with the existing rail and public transport system. However, some risks remain. For example, HSR services themselves have significant environmental impacts that should not be forgotten. Other problems are more complex: Givoni and Dobruszkes (2013) highlight the relevance of induced demand for other transport modes (particularly air and road) when HSR helps to free capacities in congested places – which increases accessibility of these places and will soon be taken up by new road commuters or long-distance flights to new connections, reducing environmental performance overall. This is a current struggle in the UK appraisal development and the controversial assessments and classification of the wider economics impacts of HS2. This precise case highlights the need to apply new methodologies or updates of existing cost-benefit analysis, to ex-post studies in order to back theories up with practical cases.

It is therefore noteworthy that stakeholders reported that from the railway perspective and the operators' experience, it seems to be easier to compete with air travel than with road transport. In fact, airlines already shut down their services in certain corridors because HSR services are more competitive.

7 In fact, stakeholders at the TRANSFORuM workshops clearly and repeatedly stated that physically tripling the HSR network in terms of HSR infrastructure kilometres is just not feasible

8 The Eurostar services (see good practice box) provide an example where the initial investment was not profitable and where the first years of services did not pay for the operators. Yet, there was a political vision behind this link across the channel, which cannot be calculated in Euros or Pounds. Nowadays, the service is profitable, but this could only happen after significant parts of the investment costs for the tunnel across the channel had been written off.

Measure	Description	Actors and responsibility
Integrating modes	Bring the arbitrary opposition between transport modes to an end	**Policy actors** on all levels to be conscious and change regulations **Operators, infrastructure managers** (through access charges) and **regulators** to consider new cooperation with other modes
Missing links and corridors	Focus on missing links in the HSR network between conventional networks and on important cross-border corridors	**Policy actors** to prioritise projects and funding **Operators, infrastructure managers** and **regulators** to take an integrated European planning perspective
HSR and conventional rail	Provide links between HSR and conventional rail, particularly allowing HSR extension to conventional routes	**Policy actors** to provide funding **Operators, infrastructure managers** and **regulators** to adapt network layouts and implement links
Network density	Increase the density of the network in the regions with highest demand	**Operators, infrastructure managers** and **regulators** to provide information on existing bottlenecks and missing network elements and implement projects
Planning procedures	More comprehensive consideration of risks and challenges in planning processes, (not only comparing a baseline and 'do-something')	**Policy actors** shifting away from ownership of "the one project" to openness for alternatives Implementing **operators, infrastructure managers** and **regulators** to remove blinders in planning procedures
Transparent planning	Transparent planning procedures and transparent reasoning and prioritisation of projects (particularly in case of doubted economic feasibility)	**Policy actors** and **operators, infrastructure managers** and **regulators** to disclose reasoning and background information (expected demand numbers etc.)
Administrative burdens	Reduce administrative burdens for state-owned operators	**Policy actors** to adapt regulations
Avoiding adverse effects	Avoid adverse effects of HSR development like decline of conventional rail (combine with TRANSFORuM's other policy packages across modes)	**Policy actors** to balance projects and policies, eventually making integration with conventional rail a criterion of funding decisions **Operators, infrastructure managers** and **regulators** to move away from expensive prestige projects that take budgets from maintaining conventional rail services

Table 6: Extending the HSR network: Key actors, measures and responsibilities

Good practice: HS1 and the Eurostar

HS1 and the Eurostar are examples of how international coordination is possible and can drive innovation for domestic services at the same time. The international link connects London to Paris and Brussels (Amsterdam is in planning). The strategy to plan and develop the route required strong cohesion. Despite traffic figures being lower than government estimates, this speaks more to the shortcoming in assessment methodology used, rather than the success of the service. HS1 and the Eurostar can be considered a real success in cross-border HSR services.

5.2 Providing good access at stations

Providing good access at stations raises the issue of the market area and relevancy zone of HSR around its stations. HSR trains have a larger impact than only on the primary market, being the HSR station, implying a strategy of linkage facilities. The economic and geographical strategy implied by the implementation of HSR is the key for deciding how to provide linkages to the railway station.

Station planning has to be coherent in its location and integration in the existing transport system. In order to think in terms of intermodality, policymakers and other decision-makers must move away from talking about 'transportation' and instead talk about 'mobility' and 'mobility needs'. This includes a perspective that is oriented towards door-to-door and seamless travel that includes different modes. For an international linkage, connected to an airport, there is a need for dedicated and fast links with economic centres and a strong integration in the airport connectivity. But for a larger regional impact, focus will have to be put on connecting the station with the urban public transport system and regional railway network, meaning to integrate the station into a hub or making the station itself a hub. Indeed stations are no more considered in a static way, i.e. as nodes in a network, but as heavily dynamic places in an area (Bertolini & Spit, 1998). Locating a HSR station outside a city centre or at least in a location with a poor public transport support has to be planned carefully to avoid the adverse effect of segmenting HSR and isolating it too much, leading to both a disappointing ridership compared to predicted figures and the over use of the private car to reach the station, which questions the overall sustainability of HSR. The key variable in this goal is to quantify and use ex-post findings regarding the perception of journey times as the elasticity of users can greatly influence schemes through the efficiency of connections between modes in multimodal travel patterns. A closer look to urban studies is important, as most multimodal platforms are located in city centres, but studies on remote stations or "gares des betteraves" can lead research in the case of "rural" HSR stations.

Measure	Description	Actors and responsibility
Integrating with the existing network	**Integrate HSR lines and particularly stations with the existing transport system instead of building a new system; particularly provide good connections to local public transport at destinations**	**Operators, regulators** and **infrastructure managers** to adapt HSR-suitable planning philosophies **Policy actors** to make this adaptation a prerequisite for funding **Interest groups** to share their views during early stages of the planning process

Table 7: Providing good access at stations: Key actors, measures and responsibilities

Good practice: Javelin line

The **Javelin line** is a good example of linking a specific destination to a network and upgrading stations to accommodate the train. As a route planned to cope with strong demand during the London Olympic Games of 2012 from St Pancras international station to Stratford, its efficiency in linking major transport hubs according to a specific demand (both in volume and in timescale). Javelin accommodated the needs of users as an example of flexible ground transportation.

5.3 Integration with local/regional/national services

There is a parallel to be drawn between section 5.2 and the issue of HSR integration. Indeed when a HSR strategy has been defined and its market area determined, there is a need to also adapt the existing public network to reflect the need for all services to be integrated. A segmented HSR line needs a fast and dedicated line connecting the station and the closest city centre like a dedicated bus, much like airports. Such schemes might find some relevance in the need for more inter-regional relations, making the HSR station a hub for inter-regional traffic, but often also implying to link two strong economic centres to reach satisfying level of traffic to keep economic relevance. This may be necessary where one destination alone cannot be expected to have enough demand to warrant a dedicated station close to the centre as well as a final destination. In addition, the density of stops on the HSR line provides another argument that suggests hub stations with good local and regional connections instead of a multitude of stops on the HSR line that complicate operators' supply management, timetable organization etc.

Planning a HSR station requires sharing information on land use, environmental, economic, and social policies and strategies between different jurisdictions. Such collaborative and transparent multi-actor decision-making process can avoid unsustainable planning in a HSR strategy and thus a station allocation that could lead to inefficiency of HSR and a too low level of traffic. Cooperation is also a key success factor for integrating HSR into the existing transport network which needs some logic in terms of accessibility and reliability of services linking HSR stations and the rest of the network, for example by the creation of a hub. Priority access should be given to the mode that needs to be most promoted to achieve the modal shift (e.g. parking will promote access by private car and might lead to environmental adverse effect).

Stakeholders clearly stated that in its current state the HSR connectivity between European regions is very weak. It is important to address this connectivity, not only with HSR lines, but also with an integrated conventional rail network. Currently this is very difficult because every single actor looks at his own conditions and remains in its respective limited perspective. An integrated view on track access charges would be an important step in this direction. Taking an integrated perspective on a rail network which consists of HSR and conventional lines, high access charges for HSR lines can be a problem, particularly if the infrastructure manager has to maintain and finance an extensive network with many regional lines and will try to get funding for this from its profitable HSR lines. However, the subsidisation of regional lines can be justified under certain circumstances. In some regions where commuting by rail is a priority in land use and urban policies, an assessment focused on external costs, such as environmental costs, can lead to a strengthening of commuter services as a more environmentally-friendly mode than road, and of regional commuting by rail as a factor for preventing urban sprawl. Balancing the framework conditions for an integrated railway network where HSR lines and conventional lines are combined in the most efficient way needs careful coordination and an adequate level of public funding. Furthermore, with the changing perspective on the relevance of services and mobility needs etc. instead of the mere speed of single trains, the optimal size of the railway network might be changing. This again includes giving more importance to the overall efficiency of the intermodal transport system.

Good practice: TGV Sud-Est, Frecciarossa, City-Ticket

The first European HSR line, the SNCF **TGV Sud-Est**, is a good example of managing a complex transport system to provide capacity on both HSR and conventional rails. This is also the case for Trenitalia's **Frecciarossa** train, which is adapted to multiple speeds, enabling operation on different tracks all over Europe, opening up the possibility of new international routes.

The German **City-Ticket** provided by Deutsche Bahn is an example of how technologies can facilitate door-to-door travel. The City-Ticket allows access to both regional and national networks through one single pass. This integration of HSR into the existing transport system is important for promoting multimodal travel.

Measure	Description	Actors and responsibility
Hubs	Create hubs where HSR meets the local/ regional/national conventional rail network and provides easy and smooth connections so that regions that cannot directly be linked to the HSR network also profit from HSR lines in the most efficient way (Hubs should at the same time be balanced with the requirements to provide good direct access at stations, see section 5.2)	**Policy actors** to make hubs a criterion for project funding Operators, infrastructure managers and regulators to provide information on the consideration of network integration during planning process Interest groups (particularly transport users) to be consulted and to share their needs and expectation
Collaborative planning	Sharing information on land use, environmental, economic, and social policies and strategies between different jurisdictions, taking into account stakeholders and interest group needs – to avoid inefficient planning and later opposition	**Policy actors, operators, infrastructure managers** and **regulators** to change planning philosophies **Interest groups** (transport users, NGOs, citizen organisations) to share their views early enough to be collaborative
Connectivity of European regions	Ensure that European regions beyond economic centres are not forgotten and connectivity with them is also improved when HSR lines cannot directly serve them	**Policy actors, operators, infrastructure managers** and **regulators** to develop strategic visions and keep with regional development plans (not focusing on prestige projects)

Table 8: Integration with local/regional/national services: Key actors, measures and responsibilities

5.4 A focus on service and attractiveness of rail services

The rationale for HSR is changing over the years as technological progress made in off- and on-board services. Without considerations of service, frequency, internet access, a reliable mobile network connection, power sockets, journeys were naturally considered as wasted time, spent on unproductive activities. Since technological innovations, frequency and accessibility improvements were introduced by most operators and in most HSR stations, travel time can be spent on productive activities such as answering emails, schedule management etc. This value is not always appreciated in some HSR projects where significant focus is placed on values of time and thus benefits linked to speed and travel time savings are emphasised, with poor consideration of more qualitative elements that are also important to travellers. The current trend is to focus on comfort, reliability and frequency as considerations in door-to-door travel patterns, making HSR a travel 'experience' and due to perceived reliability, rail and HSR are becoming a relevant alternative to other modes like road (whose travel times can still be considered as wasted time) or air (where door-to-door travel time can be, especially on medium-distance, unattractive compared to HSR).

Considering the user perspective is essential. Policy developments relating to the HSR system should ultimately benefit users and make conventional rail and HSR services more attractive. Only by taking this user perspective can it be supposed that the policy activities will actually contribute towards the ultimate White Paper goal of increasing rail modal share. Therefore, the main target is the idea of seamless transport, especially when planning competition, since competition can favour travellers only if it doesn't become a barrier in terms of ticketing, booking and other services.[9] As a good practice, Italy shows that on-track competition between operators (Trenitalia with "Frecciarossa" trains and NTV with "Italo" trains) can trigger service improvements that benefit the customer. In addition to lower ticket prices being offered, also the incumbent Trenitalia reacted with business compartments and similar improvements to its new competitor NTV.

Attractiveness for users also refers to the train stations, being the places where travellers begin and end their journeys. For example, St. Pancras International and Stratford HSR stations in London themselves have become major attractions for their users due to the upgrade of the stations and surrounding facilities as well as track and train improvements (Pagliara, Rietveld, & Preston, 2011).

9 TRANSFORuM's European Multimodal Information, Management and Payment – Roadmap 2.0 provides more detail regarding the issue of how to balance open transport markets and competition with easy access to information and tickets and seamless travel (e.g. considering passenger rights).

Measure	Description	Actors and responsibility
Travel time as valuable time	Change the perspective from travel time as wasted time towards travel time as valuable time, through the provision of facilities that can be used for work or leisure e.g. internet access (this includes a modified economic assessment of travel time gains by new HSR lines)	**Operators, infrastructure managers** and **regulators** to consider value-added elements when conducting project studies **Policy actors** to acknowledge changing perspective and promote it to the public (no fast prestige projects anymore)
Improve services	Improve services for travellers at stations and on-board	**Operators, infrastructure managers** and **regulators** to work on service improvements **Interest groups** (particularly passenger organisations) to share their views **Policy actors** to include more service variables in contracts, tenders etc.
No new barriers	Ensure that no new barriers are created (e.g. no loss of passenger rights when combining different carriers)	**Policy actors** to adapt regulations to changing environment **Operators, infrastructure managers** and **regulators** to develop appropriate, customer-friendly back-office procedures
User perspective	Take a user perspective so that the ultimate goal of a modal shift can be achieved	**Policy actors** and **operators**, **infrastructure managers** and **regulators** to change planning philosophies (away from mere technical perspectives) **Interest groups** (particularly passenger organisations) to raise their voices

Table 9: A focus on service and attractiveness of rail services: Key actors, measures and responsibilities

Good practice: Thalys, Frecciarossa1000, Rail Europe, City-Ticket

The introduction of Wi-Fi services and electrical plug sockets should not be underestimated. **Thalys** trains offer these free to 1st class and selected 2nd class ticket holders. Similarly, the new **Frecciarossa1000** will also offer meeting rooms in addition to these facilities as a means to attract travellers from medium-distance road journeys. **Rail Europe**, a common platform for booking international travels (both international links and national networks), is also facilitating point-to-point integrated rail ticketing across Europe, helping to remove some of the organisational complexity involved in bringing rail operators from across the Member States together. Integrated ticketing and links to other modes, as provided by the **City-Ticket** mentioned above, should be seen as an important consideration for HSR development, linking HSR with the other European transport modes and priority areas identified in the White Paper.

5.5 Improving the relative competitiveness of rail

Having the European Commission's ambitious target for modal shift in the medium-distance passenger rail sector in mind, it becomes apparent that improvements only within the rail sector itself might not be sufficient to reach these targets. If the majority of journeys should be taken by rail by 2050, the goal implies that changes are required to other modes i.e. air and road transport. The wider context of the White Paper – reducing the environmental impact of the transport sector – might even ask for absolute transport volume reductions for these modes. However, this issue was not discussed in detail by the stakeholders during the TRANSFORuM process, as the challenges within the rail sector itself proved already complicated enough to fill the discussions about potential ways to go and recommendations to be given to policymakers. It is however important to consider the role that addressing use of the other modes can have on

promoting modal shift to rail, and therefore this section draws briefly on scientific literature on the issue.

Approaches that could contribute to increasing the relative competitiveness of the rail sector on medium distances include the internalisation of external costs (fair and efficient pricing) for all transport modes, mobility pricing (particularly for road users) and strategies to reduce indirect subsidies for air and road. Such approaches would redress the current cost structure for these modes which does not reflect the true costs of their wider economic, social and environmental impacts (cf. e.g. Nash & Matthews, 2005). Social marginal cost pricing should be applied instead. There are also already reasons within the road sector itself to introduce mobility pricing measures, as inefficient infrastructure use and congestion in particular impose huge costs to society, which could partly be managed by mobility pricing (Müller-Jentsch, 2013). In a model for England, Graham and Glaister showed that road user charging "can make a real difference to traffic growth, congestion and environmental damage" (2006, p.199). This holds true under the assumption of a neutral revenue charging system, where user charges still lead to a more efficient use of infrastructure.

However, road pricing instruments and policies must be handled carefully. There may be regional planning goals that interfere with the mere efficiency of the transport system. Therefore, some approaches suggest focusing on the actual accessibility of locations, instead of traffic performance in terms of kilometres travelled, when designing road-pricing instruments (Levine & Garb, 2002). Acceptability of road pricing measures is another issue and operational revenue use is particularly decisive in this context. Schuitema and Steg (2008) found that revenue use within the transport system is generally more acceptable for the public, and this is in line with the results of the European Commission's stakeholder consultation on charging for road infrastructure use, where respondents generally agreed with user charging, but were very much in favour of earmarking the revenue generated (Skinner, 2012). However, this does not imply the use of revenues within the same transport mode, as shown by the Swiss model of using road transport revenues to improve the entire public transport system (Balmer, 2012). Furthermore, social marginal cost pricing for all transport modes my eventually not contribute to a significant modal shift, but instead reduce overall transport volumes (Proost et al., 2009).

Good practice: Swiss rail policy

Although being taken from the freight transport domain, policies in **Switzerland** offer an example of how to balance different transport modes. Switzerland introduced a package of policies and regulations that intentionally shift money from the road freight sector towards the rail sector, using road transit revenues for infrastructure investments (Balmer, 2012). This philosophy acknowledges the negative effects of road transport and furthers the potential of the rail sector. A recent referendum saw the Swiss people agree to the creation of a new fund for additional agreements (Bundesamt für Verkehr, 2014) emphasising public support for redistribution. . Moreover, some actors explicitly call for further pricing measures, particularly the introduction of mobility pricing for passenger transport (road and rail) (Müller-Jentsch, 2013).

Measure	Description	Actors and responsibility
Internalise external costs	Internalise environmental and social costs of transport (social marginal cost pricing) in order to achieve fair and efficient competition between transport modes	**Policy actors** to adapt regulations in order to enforce internalisation and to establish models to distribute revenues and cover for external burdens **Operators, regulators** and i**nfrastructure managers** to develop pricing models that incentivise more efficient infrastructure use (including external effects)
Balancing with other policies	Balance with other (potentially conflicting) policy goals like regional development policy, e.g. by mobility pricing based on accessibility	**Policy actors** to end inconsistent policies and develop coherent visions across policy fields

Table 10: Improving the relative competitiveness of rail: Key actors, measures and responsibilities

Apart from mobility costs themselves, there is another discussion about indirect subsidisation of specific transport modes (for example, in many countries commuters can use regulations that allow them reducing their tax burdens by claiming their commuting costs). While there may be spatial planning reasons to continue with such kinds of regulation, discussions are ongoing about the sustainability of such solutions and whether some transport modes are discriminated against others by the specific regulations in place (cf. e. g. Brueckner, 2005). In the air sector, the European Commission has taken measures to end the current subsidisation of many regional airports by public authorities (European Commission, 2014b), although this particular decision was more driven by fair competition issues within the aviation sector, than by considering modal shift targets.

5.6 The role of PPPs

PPPs have been identified throughout the TRANSFORuM project's stakeholder consultation as a key means to finance HSR. By building new projects through mixed consortia, both private and public organisations guarantee a share of knowledge, know-how and financial advantages with each other. Indeed, if public bodies can provide lower interest rates than private companies, the latter can bring higher skills and more efficiency due to stricter management rules. In socio-economic evaluation, some key differences need to be considered in order to identify each party's requirements to explain what issues a PPP can face and how to cope with these constraints. If the State is rather focused on distributional effects of an infrastructure providing services in regards of public interest, the pressure put on infrastructure deficits is lower than for private companies whose financial pressure is by far greater, considering the interest rates burdening the financial charges more than for the States. A paradox addressed by PPP that needs to be considered is the balance between level of subsidies and private funding. Indeed, in some cases profitability can be too low for private companies to invest without support through subsidies, leading to some public subsidies representing more than half a project investment. In such cases, one must wonder if a PPP is a really an inevitable solution, as it has been the case during the Railtrack privatisation in the UK, whose subsidy needs were so great that the company has been re-nationalised in order to keep financial charges on a reasonable level.

Thus, there is not just one form of PPP. If PPP seems a relevant solution for an HSR line, its conditions need to be discussed. Indeed, there is a particular attention given to traffic risk (or commercial risk) and the party that will have to take the burden. In some cases, the public organisation can guarantee a certain level of revenue on the basis of traffic risks, if the private company invested in the infrastructure; whereas in other forms, the State is tenant of the infrastructure and the private operator assumes the traffic risk and pays an access charge to the public infrastructure manager which can also be a great risk as some lines, like the Eurostar line between Paris and London, take 20 years to reach a sufficient level of profitability to be considered successful. These are the two main kinds of PPP, mostly used in consideration of the predicted profitability rate and its sensibility to economic context.

Measure	Description	Actors and responsibility
Considering risk	Develop PPP models that allow for different methods of who bears the risk in PPP contracts, using the different models in a way that is appropriate to the economic rationale and the policy goals implicit to any given rail infrastructure project	**Policy actors** and **investors** to refine appraisal methods

Table 11: The role of PPPs: Key actors, measures and responsibilities

Good practice: Eurostar, Thalys, Swedish HSR investment

Multi-actor funding schemes are typical for cross-border links such as **Eurostar** and **Thalys**, since diverse funding arrangements reflect the commitment of resources from all countries involved. But the **Swedish case** of investing in HSR provides a good example for multi-jurisdiction cooperation, as its transparency and consideration of the best approach to investment is outstanding. Here, the process of deciding to introduce HSR included a systematic investigation of the environmental effect, the options for improving conventional rail lines in combination with new HSR lines, and the 'social worthiness' of any planned development was considered thoroughly before route choices were decided upon.

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6 Aligning HSR with long-distance freight transport

Facing the objectives of the European Union to develop an efficient railway network, both for long-distance freight (corridors) and HSR, rail congestion is clearly a large obstacle for achieving these objectives. Long-distance freight is a separate thematic group of the TRANSFORuM project and a specific roadmap document is available also for this group (Long-distance freight Roadmap 2.0[10],). However, the technical nature of rail transport implies a direct interrelation between both thematic groups. Therefore, this chapter briefly highlights some important issues to be considered in order to properly align the policies in order to make them consistent, enabling the achievement of both White Paper goals at the same time.

6.1 A need for improved cross border links and key rail network nodes

Neither developing the HSR network nor developing freight corridors alone is enough to achieve a better integration of European markets and reduce congestion on the rail network, no matter if the development focuses on dedicated HSR lines or mixed usage lines for both HSR and freight trains. In addition, focus needs to be given to cross-border HSR (upgrade) projects that would be very useful for very many cross-border links in the EU that are still missing today. The existing rail infrastructure provides a base, but should not be underused with only a few trains running on existing (national) HSR lines. Moreover, the importance of nodes between existing national networks has been neglected until recently (Guihéry, 2014; Perez, 2014). In the future, improving cross-border HSR and long-distance freight corridors, Europe should shift its effort from only co-financing infrastructure lines (TENT for instance) to a more balanced policy prioritised as follows:

- Priority 1: Identify key European rail network nodes that are relevant both for HSR and freight and prioritise investments in congested railway hubs.
- Priority 2: Consider investments in rail freight corridors for longer freight trains in the whole corridor length; develop ERTMS for increasing capacity and better interoperability of the European rail network and harmonise technical standards.

10 TRANSFORuM's Long-distance freight – Roadmap 2.0 provides more detail about the Freight goal of the White Paper.

- Priority 3: Improve missing cross-border links that are relevant both for HSR and freight rail, taking into account potential long-term demand for mode shift.

- Priority 4: Consider infrastructure investments in corridors with high total demand for passengers and freight to make a complete European railway network, including HSR links between major urban centres as well as upgraded conventional lines for higher speeds and increased freight capacity.

6.2 Further reading

A more detailed consideration of the issue of rail capacities and rail congestion can be found in the "Recommendations on Joint Actions across Actor Groups". This document links TRANSFORuM's four thematic roadmaps and outlines measures and policies in those fields where the four themes intersect or overlap and where policies require a harmonised procedure across actor groups.

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7 The different contexts for HSR

HSR planning is a multi-disciplinary task since it implies considering lots of different topics in order to build a network that fits both national and European needs in terms of land use policies, traffic forecasts, urban topography etc. One of the key issues to determine success in HSR is the ability to consider the large spectrum of factors required to align before or during the implementation of a new HSR line. In such a perspective a cross-cutting analysis should look at what influences the capacity of HSR in order to cope with the ongoing need for mobility. The building of a HSR strategy needs to take into account both internal and external contexts. Internal contexts define its model (which degree of integration, what pricing regulation what commercial speed, how many stops on the route etc.); external contexts include the economic, social and spatial contexts that are obviously conditions for success or failure of an HSR network. Prospective studies need to take into account different scenarios in order to identify as many potential situations as possible, despite uncertainty risks, and the success of implementation of a HSR model lies in the recognition of intertwined relations between both characteristics of the HSR model and its implementation territory.

A short-/medium-/long-term approach needs a stable basis for the HSR network, both institutionally and organisationally. Some Directives still need to be fully implemented such as the EC/91/440 about the opening of the railway operations to railway companies that are not the owner of the infrastructure. The application of those current Directives needs to be complete before going further in the design and decision of new policy measures, as legal situations that are not harmonised across Europe could lead to complex interactions between the countries and the irrelevance of further measures that need some common framework to reach their goals. In that sense, TRANSFORuM identified a short-term need to clarify this situation and to provide the required background of the White Paper goal. The mid-term, until ca. 2030, can be seen as a reasonable scale to implement the intermediate requirements in terms of norms and standardised and stable interoperability factors. By this time cooperation and coordination among actors of the railway market will have had time to become organised, and provide the right conditions to pursue further common measures towards the final goal. The goal can be reached by 2050 if the correct conditions are provided in all Member States and if a strong cooperation between different jurisdiction levels, different production chains and other decision-making stakeholders is ensured, including open fora for discussing a common understanding and knowledge-gathering platforms. But such a process might need a common framework, officially settled

and with some strong decisional power, to enhance cooperation and institutionalise the legitimacy of the collaboration going forward.

Another approach advocating for a better use of geographical information and organisation in Member States all across Europe might find relevancy in the search for a European Single Area, since geographical matters take much place in territorial strategies and influence the definition of the HSR strategy on regional, national and European scales, underlining some convergences that could lead to a better integration of HSR in intermodal travel patterns. This could also lead to a clarification of objectives pursued by HSR in urban relations and regional accessibility policies. Nevertheless, the geographical approach would need a strong political backbone in terms of clarity of the decision-making processes and the political powers along the process of resource allocation, reinforcing the need for multi-disciplinary cooperation and transparency between economic, geographic and political interests.

7.1 Different potential economic development pathways for Europe

The uncertainty caused by different possible scenarios of the economic situation in Europe in the years and decades to come represents a challenge for analysts. But major points can be highlighted in order to advise some project assessors and give tracks to further reflection on how to cope with the uncertainty of economic development and thus prospective demand figures.

There is a need to take account of public scarcity in economic analysis, as subsidies are in most schemes the main financial source – though not as sensitive as private funding might be. The emphasised scarcity in public budgets highlights the constraint put on other projects by allocating resources on one scheme. Such a consideration might also help in the mutual comprehension of citizens and politicians when projects face a strong public opposition. Such opposition has for instance been the case in France and the National Transport Infrastructure Scheme (SNIT, 2013) when most of HSR construction plans have been postponed and some cancelled.

What needs to be considered when planning very costly HSR schemes, despite cheaper alternatives, is the uncertainty of figures they are based on, uncertainty in economic development leading to traffic uncertainty and uncertainty of funding availability. There is also a need for a better comprehension and inclusion of modes external costs and the consideration of pricing it in order to promote more sustainable mobility.

7.2 A perspective on Central and Eastern Europe

The Central and Eastern European countries are following the trend for HSR planning and development, focusing on long corridors between Western and Eastern Europe by addressing to the European Commission the necessity for interoperable standards, as seen with the Rail Baltica project whose aim is the creation of a North–East Europe axis, opening Europe to Northern networks and Russian traffic. A trend that might also be raised by Eastern Europe HSR planning is the characteristic of developing a national network on behalf of the European network. In that sense, Romania is planning to have a high-speed line from Bucharest to Constanta, nationally managed, with some support from Chinese organisations, and contributing to a Paris–Black Sea HSR axis. All these projects must be considered as part of the European Commission's project of a European HSR network and consideration to interoperability with the whole railway system would surely ensure higher demand on medium- and long-distance travels. This means a better integration with border countries that could enhance the modal shift from air to HSR in such case. It justifies the effort for implementing and stabilising technical norms and planning connections towards other mode for higher accessibility levels along these lines' stations.

But here again consideration of the operation speeds, which may be different across the different countries the line goes through is important, since most of the Central and Eastern European countries plan speeds up to 200 km/h (Poland, Romania, Slovakia etc.), and are therefore not considered as HSR according to the UIC definition. Moreover, given that Western European countries already operate at speeds up to 300 km/h, such discrepancy could lead to traffic disruptions and longer travel times.

What needs to be most highlighted is the strong will from Central and Eastern European countries to commit to the European project and not to be left aside, as it has been the feeling for some years with focus on Western countries when planning HSR lines. Countries now take the initiative of bringing up issues of HSR in order to get included not only as Members of an East–West corridor but also on a Eastern North–South axis, that might bring lots of opportunities in terms of overcoming technological barriers, since the HSR network in Eastern Europe is not yet developed and would be a valuable ground for implementing new technologies and innovations, at least more than in Western European countries whose network are locked in some technological path dependency. But Central and Eastern European countries need to have strong directives from the European Commission on which axes they could be included, based on which funding to build such extensions and should be considering the shift from road to rail, where planning should contribute to encouraging road freight and passenger traffic to shift towards rail.

Good practice: Rail Baltica

The Rail Baltica project is a prominent example of delivering a North-South cross-border link between the Baltic States. It is an example of adopting standardised operability and employing safety norms across borders and in doing so, demonstrates that new significant infrastructure development and improvement is possible in line with the White Paper goal across the regions of Europe. Whilst this development has encountered problems in delivery, it is nonetheless a good example of ambitious plans for collaborative working between Member States.

7.3 Current HSR status in selected Central and Eastern European countries

The present section provides a brief overview of the current state of HSR developments in selected newer Member States. This may illustrate the challenge that Europe is faced with when talking about a truly European HSR network.

7.3.1 Czech Republic

Current status and future plans

Currently there are no HSR lines in the Czech Republic and no HSR lines are under construction. Studies and plans to consider the development of HSR in the country are in process. At this moment older rail corridors are in process of modernisation to a maximum speed of 160 km/h, which is achievable only on certain track sections (Ministry of Transport of the Czech Republic, 2014).

Construction of HSR in the Czech Republic was considered from the 1970s. The purpose of such plans was to free capacity for freight transportation. In 1995, a land-technical background study was conducted "HSR corridors in the Czech Republic" and approved by the Ministry of Transportation and former Ministry of Economy. The study proposed optimal routes in terms of profitability of HSR and its results served as a basis for territorial security of planned corridors. In 2004, a coordination of a HSR lines study was prepared in order to minimise the variability of routes. This study served as a basis for the land-use planning process. In 2009, a study forecasting traffic flows on HSR was prepared. In 2011, the Ministry of Transportation began to use the name "Quick links" for HSR, which includes not only the new HSR sections, but also conventional lines (up to 200 km/h) (Ministry of Transport of the Czech Republic, 2014).

In the Czech Republic about 700km of HSR lines in total are planned (including the upgrading of older lines to 200 km/h). Most HSR sections are already entered in land use plans as protected zones (Ministry of Transport of the Czech Republic, 2014).

Planned corridors (Ministry of Transport of the Czech Republic, 2014):

- HSR 1: Prague – Brno – Ostrava – Poland;
- HSR 2: Germany – Usti n. L. – Prague – Brno – Breclav – Austria / Slovakia – Hungary;
- HSR 3: Germany – Pilsen – Prague.

The most important part of the HSR network in the Czech Republic will be a new section Prague – Brno and following part Brno – Ostrava (partial upgrade).

According to current traffic flows (railway and highway) is assumed that HSR will carry the most passengers of all national transport (Ministry of Transport of the Czech Republic, 2014).

Construction Schedule of HSR in the Czech Republic (optimistic estimate) (EnviWeb.cz, 2014)

- 2014 > Approval of the concept and financial framework "Development of HSR in the Czech Republic";
- 2014 - 2015 > modernisation of the signaling equipment on line Brno - Breclav for 200 km/h;
- 2018 - 2025 > modernisation and construction of double track on line Brno – Prerov up to 230 km/h;
- 2016 - 2020 > completion of HSR1 and HSR2 in land use plans;
- 2017 - 2025 > design and acquisition of land for HSR1;
- 2021 - 2030 > construction of HSR1 Prague – Brno.

The cost of HSR construction

Average cost of a new HSR for speed of 300 km/h is 600 million Czech Crowns (CZK) per kilometre (CZK/km) (€21.6m). Average cost of HSR lines upgraded for speed 200 km/h is 400 million CZK/km (€14.4m). It means that HSR1 Prague–Brno–Ostrava would cost about 190 billion CZK (€6.8bn). Investment cost on the backbone HSR would be 95 billion CZK (€3.4bn) for the Czech Republic budget, with the average EU subsidies of 50%. In the case of a 15 year construction period, this makes 6.3 billion CZK (€226m) per year for HSR (Ministry of Transport of the Czech Republic, 2014).

Main implementation problems

- Uncertainty of demand levels, considering the economic situation of the concerned countries;
- Lack of funds;
- Modernisation of the current railway network.

7.3.2 Lithuania, Latvia and Estonia (BALTICA)

Introduction

The RAIL BALTICA project represents HSR, which would connect Lithuania, Latvia and Estonia. RAIL BALTICA is planned as an important element for economic recovery in Central and Eastern Europe, which would strengthen economic cooperation with the EU and reduce economic dependence on Russia (AECOM, 2011).

BALTICA project corresponds to national planning strategy of the three Baltic States and contribute to the improvement of national transport networks and economic growth of these countries. An important factor in national and international planning is to increase the standard of transport infrastructure for the defence and security of the Member States of the EU.

In October 2001, during the TEN-T guidelines modification, the European Commission identified the Rail Baltica axis as a priority project No 27. Conference "TEN-T Days 2010" was held in Zaragoza in June 2010. There was signed a memorandum, which expresses the political will of the transport ministries of Poland, Lithuania, Latvia, Estonia and Finland continue the process of implementation of the RAIL BALTICA project.

Conclusions for the future development

RAIL BALTICA has been in project preparation stage since 1994. However, its realisation remains uncertain, mainly because of lack of funds. Future steps will depend mainly on the planned budget increase on investment projects in the transport sector funded by the European Commission. The main cause of delays is primarily the economic and political rivalry between the participating Baltic States. Finland and Estonia are the biggest supporters of the project due to dislocation of these states from Central Europe, while Lithuania and Latvia raise a number of objections regarding routing (in terms of connections with airports and major ports).

The essence of the problem lies in the fact that some local monopoly railway operators in these countries are closely connected with the Russian monopoly

operator and focus primarily on transport between ports in the Baltic States and Russia, Central Asia and China. Therefore they prefer the connection from West to East and not North to South.

The establishment of a Programme Steering Group (PSG), which will have total control over the strategic direction of the RAIL BALTICA programme, is recommended to improve implementation of the project. PSG should include representatives of the major Member States and supported by key stakeholders, including the European Union. An integrated programme organisation (IPO) should be established after implementation of the programme, a technically-based organisation that will be able to reflect on national, regional and local impacts on the project in a short period of time. Such an IPO would be financially and organisationally separate from the existing national and international bodies.

Main implementation problems

- Uncertainty of demand levels, considering the economic situation of the concerned countries;
- Lack of funds;
- Economic and political rivalry between Member States;
- Connection monopoly operators in the Russian transport market.

7.3.3 Poland

Introduction

All preparatory works and studies for the construction of HSR in Poland are suspended until 2030. In particular, preparatory works for construction of 350 km/h HSR line connecting Warsaw and Wroclaw. Since the construction of HSR and modernisation of current railway network would be too expensive, higher priority is given to the modernisation of current railway network.

Most large cities in Poland are currently connected by railway with maximum speed of 160 km/h. Some parts of the network are constructed for 200 km/h; however, the Polish carrier (PKP) does not possess any suitable traction vehicles for such speed. A planned railway corridor from Warsaw to Kalisz through Lodz (Corridor Y) was planned for speed 350 km/h and should be constructed in 2014 – 2019. Considering current political conditions, the line is not expected to be completed until 2040 (Randelhoff, 2011).

Cost of HSR construction

The decision to interrupt HSR construction in Poland is connected with the reduction of financial subsidies from the European Union. A large amount of the financial support came from EU subsidies, which have now been reduced to €6.6 billion, for the period 2014 – 2020.

The cost of the Y corridor is about €7.8 billion this is about one third higher than the originally planned costs, which makes it difficult to find appropriate financial sources (Randelhoff, 2011).

Main implementation problems

Main problem in the implementation of the project:

- Lack of funds;
- Modernisation of current railway network.

7.3.4 Romania

Introduction

Romania is currently in the process of completing a HSR corridor project, linking Bucharest with Constanta and then connecting with Budapest and Vienna. The project has been realised with the financial support of a Chinese partner. The project is expected to be completed in 2014 and builds on initiatives developed at the summit China – Eastern and Central Europe, held in Bucharest in 2013. The HSR route may be ready by 2020 and it is expected that the connection of the Black Sea coast with the capital of Austria could be realised with a ground speed of 200 km/h. Time to connect the Romanian and Hungarian border would not take more than 3.5 hours, which corresponds to the current driving time between Constanta and Bucharest.

Costs of HSR construction

Total price of HSR sector development in Romania is estimated at €11bn. Tests of HSR train "Hyperion" (Softronic Engine Craiova) was already carried out as part of the preparatory work. The Romanian authorities have a problem with justifying the allocation of huge sums of money for the construction of HSR, when the current railway network in the country is dysfunctional. Journey times on current network are excessively long and financial resources would need to be invested to complete the reconstruction of the existing rail network.

Main implementation problems

- Lack of funds (could be solved with allocation of foreign capital and PPP funding);
- Political obstacles (justification for prioritising the allocation of funds for HSR);
- Current unsatisfactory railway network requiring a complete reconstruction (connecting HSR to the regional transportation network is problematic here).

7.3.5 Conclusion – HSR in Central and Eastern Europe

The current situation of HSR development across Central and Eastern Europe shows many similarities, in spite of the different geopolitical conditions. Planned corridors are in the stage of studies, project or pre-project preparation. In some cases their preparation was interrupted due to modification of investment priorities (e.g. investment in the modernisation of the existing railway network in Poland). The situation in Poland shows the significant importance of financial subsidies from the EU funds for the construction of HSR.

Generally, HSR development in Central and Eastern Europe initially requires a political decision to invest. For the development of HSR a long-term financial framework several years in advance is necessary (minimum 10 years). Moreover there is substantial investment required for in this type of transport, which makes up 33% of the total investment in transport in some Western Europe states (Ministerio de Fomento, 2005). Another recommendation would be to take advantage of a foreign strategic partner, such as is the case of HSR preparation in Romania.

The optimal construction of the HSR can be enhanced by an advisory group. This is being used for RAIL BALTICA; the group consists of Member State representatives and is supported by key stakeholders, including the EU. Furthermore, there must be a significant shift from road transport to railway. This can be achieved through internalisation of external costs of transport or by giving less priority to the construction of new motorway sections in favour of HSR.

Connection of regional integrated systems to HSR would contribute to the overall economic development of the region and therefore construction of HSR should be supported by larger cities, territorial authorities and regional governments.

Construction of HSR must be initiated as soon as possible.

8 Conclusion: Reflections on the magnitude of the challenge

The challenge raised by the HSR White Paper goal is huge. Not only does it call for extended HSR infrastructure, but it explicitly calls for a structural change to the passenger transport market. This market is characterised by continuously rising passenger volumes and this means that moving the majority of medium-distance passengers to rail implies an even more significant increase in rail ridership. Because this should not happen at the cost of greater overall transport volume increases (which would further increase environmental burdens etc.), the perspective of the White Paper goal at the same time implies that the road and air transport modes not only experience a decrease in relative modal shares, but as well in absolute transport volume numbers.

Figure 3 is designed to illustrate this challenge – it does not represent a prediction of the actual development. The TRANSFORuM team appreciates the uncertainty of concrete developments in the field, but deems this illustration necessary to highlight the magnitude of the challenge.

The diagram is therefore only indicative (and refrains from using ay-axis scale), as concrete numbers on transport volumes and modal shares specifically for the medium-distance sector are scarcely available. There are numbers available for several cases where new HSR lines were analysed and numbers were compared for the different transport modes (cf. Dobruszkes, 2011; Givoni & Dobruszkes, 2013), but these still lack a perspective that would include the complete segment all across Europe.

The diagram does also illustrate how the TRANSFORuM policy packages are designed to deal with this challenge. They aim to address the complex issue by approaching it from various sides: Four policy packages ("Extending the HSR network", "Providing good access at stations", "Integrating with local/regional/national services", and "A focus on service and attractiveness of rail services"; see sections 5.1 to 5.4) and the additional recommendations regarding PPPs (see section 5.6) directly aim at the rail sector itself, contributing to improving its competitiveness. The policy package on "Improving the relative competitiveness of rail" (see section 5.5) completes TRANSFORuM's perspective with measures aimed at managing the balance between rail and air and road. All policy packages together need joint and harmonised effort and full commitment of all involved actors; otherwise it will be very difficult to reach any part of the goal – both more HSR infrastructure and the majority of medium-distance passengers going by rail.

As if these structural considerations were not enough of a challenge, further issues remain to be clarified on the content side of the aspired policies: Stakeholders believe that a choice has to be made between a market-driven policy and a politically-driven economy. **A political 'masterplan' towards the HSR goal can only work if it takes the former into account.**

Policy-makers and **operators** must collaborate in order to move towards a socially viable HSR system, as demonstrated in projects where the public interest is considered in territorial planning and have some influence on the distribution of stops along the HSR line etc. (see section 5.3). **This collaboration is of strategic relevance** in order to achieve the White Paper goal. However, this is also related to the issue of who is paying for the investments. Despite any public justifications for investments that are not fully economical in the operator's perspective (and only in the social perspective instead) this issue reopens the funding debate – or as stakeholders put it: "Who wants to take a decision needs to pay."

EU-wide thinking is required, especially considering the wider issue of rail capacities and bottlenecks. From the EU perspective, missing (cross-border) links with a high demand potential should be the top priority. Furthermore, because the main planning activities regarding HSR infrastructure are taking place at the national level, the overall role of the EU should be to put the national plans together and create a momentum towards moving forward in a balanced way. Still, the particularities of the different European regions and countries must be taken into account, so despite a certain value of harmonisation, some differences might remain and contribute to efficient solutions, fitting the respective mobility needs – and adding value to the rail system as a European backbone.

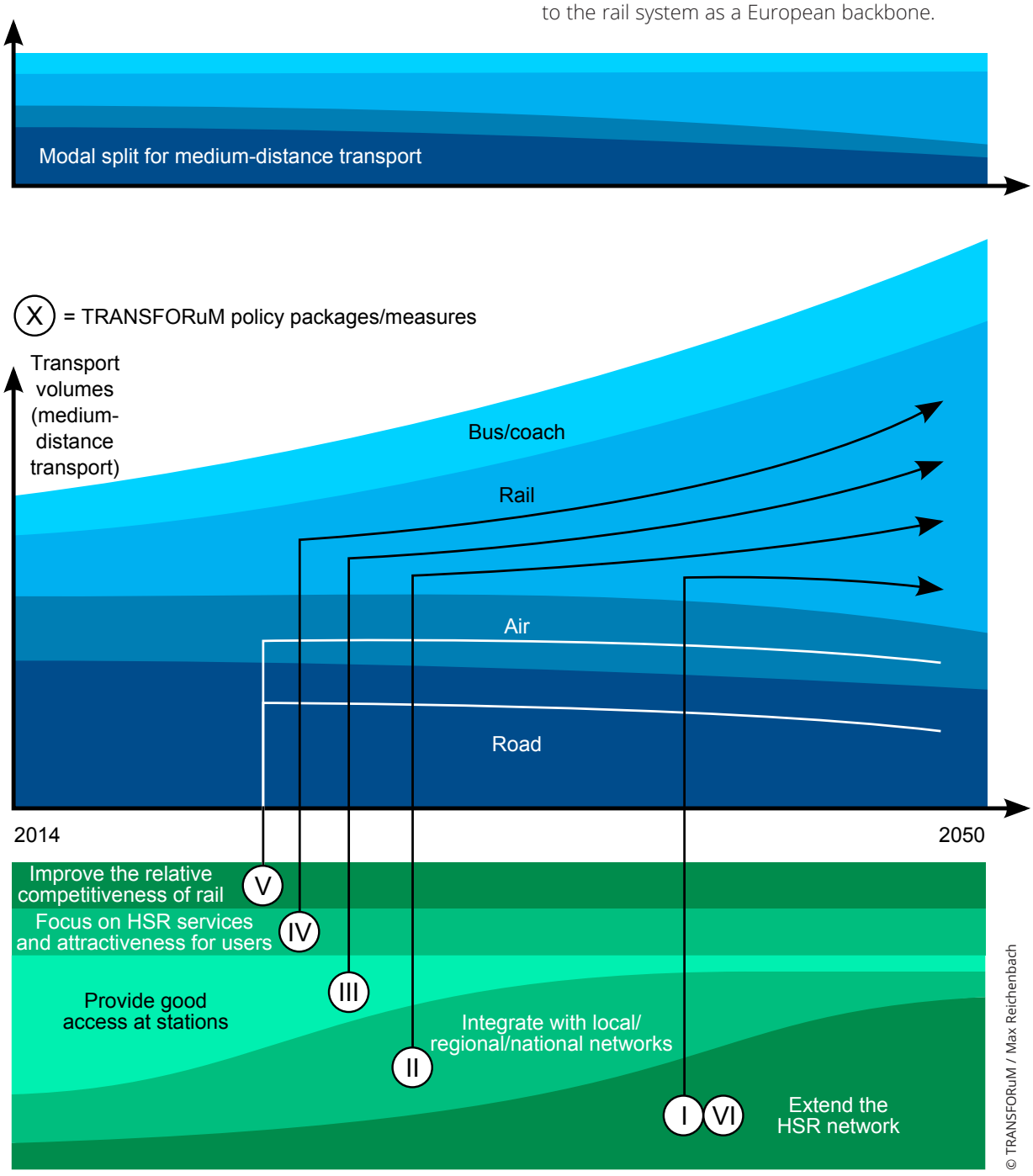

Figure 3: The White Paper's passenger rail section: moving towards the majority of medium-distance passengers going by rail by 2050. The diagram is only indicative, as exact numbers are not available. It illustrates how the development of transport volumes and modal shares should happen in order to allow reaching the White Paper goal. Strategies and policy packages are shown in the lower part of the diagram.

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A word on the independence, credibility and relevance of TRANSFORuM's results

Goals raise expectations and attract criticism but without them, we could only stumble into the future. So TRANSFORuM's starting point was to take the goals as formulated in the European Commission's White Paper on Transport (2011) seriously. A second constitutive principle of TRANSFORuM was to listen to those whose job it is to implement these goals, that is, all kinds of stakeholders in the European transport arena. Because transformation requires, by definition, innovative ideas, products, policies, services and new actors we made sure that the stakeholders we consulted included the entire spectrum from incumbent market players to emerging niche creators. For the same purpose, our workshops were held under the Chatham House rules and their minutes as well as list of attendees are available to the public on our website.

At times, these two principles (loyalty to the White Paper goals and a stakeholder-driven approach) got into conflict when stakeholders questioned the sensibility, operationalisation or feasibility of certain White Paper goals. We consider this in itself a worthwhile finding and as such this is recorded at appropriate points in the Roadmaps. On such occasions, the TRANSFORuM team felt called upon as a neutral broker to think about possible amendments of the goals to ensure that they are more widely accepted and therefore more likely to be implemented. A similar phenomenon occurred where stakeholders highlighted that certain aspects of a White Paper goal are already outdated, for example, due to technical developments since 2011. It is worth emphasising in this context that the perceived appropriateness of these goals varied across the four thematic areas pursued by TRANSFORuM.

In other words, we had to find a balance between our loyalty to the White Paper goals and to the principle of a stakeholder-driven process. An ideological dominance of either of them would not have led to a coherent set of policy packages. To put it bluntly: TRANSFORuM is not a frictionless communication channel of stakeholders' wish lists to the European Commission. Neither is it the Commission's unconditional servant. Instead, TRANSFORuM used the strength of its members' scientific calibre and independence in the process. Our results are therefore "based on" stakeholders' views but essentially TRANSFORuM's. There is, however, a slight "division of labour" across TRANSFORuM's different outputs.

For the **Roadmaps**, we tended not to question the White Paper goals as such. They are designed to be implementation-oriented, focusing on actors, bud-

"A wish is a dream until you write it down. Then it's a goal!"
(Anonymous)

gets, time horizons, etc. TRANSFORuM has released four Roadmaps, corresponding to its four thematic areas: Urban mobility, long-distance freight, high-speed rail and multimodal travel information, management and payment systems.

The **Recommendations** are also contained in a separate document, covering all four thematic areas in combination. They highlight proposed actions by all relevant actors and show how coordinated action can be more than the sum of isolated efforts.

The **Strategic Outlook** will be released in January 2015 and is essentially a sensitivity analysis to assess the robustness of the current Roadmaps and recommendations against the inevitable insecurity of long-term trends beyond the year 2030.

We hope this suite of products is not only useful to practitioners, stakeholders and policy-makers but also of particular value for the forthcoming review of the Transport White Paper. And even if not every page abounds with radically new ideas, the added value of TRANSFORuM is still:

- A new robustness and independence of the suggested prioritisations;
- A cross-disciplinary and cross-sectoral consolidation of what has been done in silos before;
- A fresh approach, based on a balanced chorus of voices, including incumbent and new actors;
- A refreshing sensitivity to the national and cultural differences across Europe;
- A rare legitimacy and credibility of our conclusions based on the transparency of the entire process;
- A first-ever attempt to build a Roadmap specifically towards the Transport White Paper goals;
- A holistic view, manifest in suites of suggested measures in the form of "policy packages";
- An encouraging and transferability-aware good practice collection across four White Paper themes;
- A novel and thorough participatory process with stakeholder-backing throughout;

Ralf Brand
(Project coordinator)

Acknowledgements

TRANSFORuM would not have been possible without the help and contributions of a very large number of people, many of whom worked tirelessly in the background, facilitating, supporting, commenting etc. Amongst them all, we would like to express our explicit gratitude to the following:

- Eight external reviewers provided comments on our near-final Roadmaps. One of them prefers to remain anonymous; the other are: James Tate, Laetitia Dablanc, Wiktor Szydarowski, Francesca Pagliara, Jacques Beltran, Eric Sampson, Stephane Kaba, Jaime Borrell and Jennie Martin.

- All members of our Advisory Board: Stefan Back, David Banister, Ivo Cré, Yves Crozet, Torsten Fleischer, Sylvain Haon, Krzystof Kamieniecki, Niels Buus Kristensen, Gunnar Lindberg, Lars-Göran Mattsson, Martin Pipa, Cristina Pronello, Siegfried Rupprecht, Martin Russ, Dennis Schut, Jolanta Skalska, Inge Vierth, Marcin Wolek.

- 34 stakeholders and experts, who agreed to being interviewed by a member of the TRANSFORuM team.

- 127 stakeholders who attend one or several of the 10 TRANSFORuM workshops.

- Ulla Kaisa Knutsson for the perfect organisation of these events.

- The European Economic and Social Committee (EESC) whose premises TRANSFORuM was allowed to use for the final conference on 8 December 2014. Special thanks to the members of the EESC's permanent study group "Implementation of the White Paper on Transport".

Ralf Brand
(Project coordinator)

List of Deliverables

TRANSFORuM's final results are primarily based on the views of stakeholders we consulted through various means, in particular through a series of 10 face-to-face workshops. In the spirit of complete transparency and credibility we made the essence of these events available online at www.transforum-project.eu/resources/library.html.

Our conclusions also build upon a dovetailed set of background research and genuine analysis, which was condensed into a number of Deliverables we produced along the way. These are:

D2.1: “Shaping the TRANSFORuM Network”. This document spells out the criteria that guided the selection of stakeholders to TRANSFORuM events;

D3.1: "Summary on main policies, funding mechanisms, actors and trends";

D4.1: "Challenges and barriers for a sustainable transport system – A state of the art report“;

D4.2: "Challenges and barriers for a sustainable transport system – exploring the potential to enact change";

D5.1: "Good Practice Repository - Transformation is possible!";

D5.2: "Good practice in the context of delivering the White Paper";

D7.1: “Communication and Outreach Strategy”. This document defined TRANSFORuM´s target audience and the best means and channels of communication with them.

These documents are also available at www.transforum-project.eu/resources/library.html


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CONTACT DETAILS

Questions or comments about the High-speed Rail roadmap:

Yves Crozet
Direct: +33 4 72 72 64 37
yves.crozet@let.ish-lyon.cnrs.fr

Laurent Guihéry
Direct: +33 4 72 72 64 03
laurent.guihery@let.ish-lyon.cnrs.fr

Cécile Chèze
Direct: +33 4 72 72 64 40
cecile.cheze@gmail.com

Max Reichenbach
Direct: +49 721 608-22313
max.reichenbach@kit.edu

General questions about TRANSFORuM:

Ralf Brand
Direct: +49 221 60 60 55 - 18
r.brand@rupprecht-consult.eu

RUPPRECHT CONSULT
Forschung & Beratung GmbH
Clever Str. 13 - 15
50668 Köln (Cologne)/ Germany
Tel +49 221 60 60 55 - 0
www.rupprecht-consult.eu
www.transforum-project.eu