

TRANSFORuM

THE ESSENCE



This project is
co-funded by
the European Union



"What TRANSFORuM is all about"
Summaries of all four Roadmaps
... of the "Recommendations"
... of the "Strategic Outlook"

The TRANSFORuM consortium:



The TRANSFORuM Project was coordinated by



Copyright 2014 | TRANSFORuM project | www.transforum-project.eu

Suggested citation: Gudmundsson, H.; Schippl, J.; Leiren, M.; Brand, R.; Sørensen, C. H.; Anderton, K.; Reichenbach, M. (2014) TRANSFORuM Roadmap Urban Transport. 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

GENERAL INFORMATION

This document represents the essence of TRANSFORuM's key outputs: The four thematically specific "Roadmaps", the "Recommendations on Joint Actions across Thematic Areas" and the "Strategic Outlook".

For further information please visit 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	
Title	TRANSFORuM – The Essence
Deliverable no.	In addition to the officially required deliverables
Dissemination level	Public
Work Package	WP7
Author(s)	TRANSFORuM Consortium
Status	Final
Suggested citation	TRANSFORuM Consortium (2015). TRANSFORuM – The Essence. Cologne: Rupprecht Consult



TABLE OF CONTENT

Key facts about the TRANSFORuM project	6
Recommendations	8
Summary of the Roadmap on Urban Mobility	15
Summary of the Roadmap on Long-distance Freight	28
Summary of the Roadmap on High-speed Rail	39
Summary of the Roadmap on Multimodal Transport Information, Management and Payment Systems	47
Strategic Outlook	55

Key facts about the TRANSFORuM project

KEY FACTS ABOUT THE TRANSFORUM PROJECT

The Project

- TRANSFORuM was an FP7 project, running from February 2013 until January 2015.
- The consortium consisted of 11 renowned partners organisations from 9 countries.

Key assumption

- Policymaking should be based on an in-depth understanding of all stakeholders' positions.
- Coordinated action among stakeholders is more effective than any solo attempts.

TRANSFORuM's mission

- TRANSFORuM aimed to contribute to the implementation of four goals of the European Commission's White Paper on Transport from 2011.
- "Who needs to do what by when in order to reach the White Paper goals?" This was the guiding question for every step of the project.
- In this sense, its mandate was to help transform the European transport system towards more competitiveness and resource efficiency.

TRANSFORuM's thematic foci (= selected White Paper goals)

- Clean urban transport and CO2-free city logistics (White Paper goal 1);
- Shift of road freight to rail and waterborne transport (White Paper goal 3);
- Complete and maintain the European high-speed rail network (White Paper goal 4);
- European multimodal information, management and payment system (White Paper goal 8).

TRANSFORuM's method

- TRANSFORuM followed a systematic approach to elicit the views of key stakeholders from all relevant sectors of the European Transport arena.
- These conversations were conducted through many direct interviews, 130 responses to our on-line survey, via various social media channels and the feedback function of our project website.
- Most importantly, TRANSFORuM organised 11 face-to-face events with 130 stakeholder participants. They were held in Oslo, Gdansk, Reading, Lyon, Basel, Tallinn, Copenhagen, Duisburg, Rome, Vienna, Brussels.

The validity of TRANSFORuM's results

- We always ensured 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.
- Participants represented all kinds of sectors: city administrations, developers and producers of vehicles and energy technologies, transport operators, mobility service providers, long-distance freight and urban logistics experts, citizen organisations, think tanks and other NGOs.
- To ensure complete transparency the list of attendees at each TRANSFORuM event is publicly available online.
- Our mix of consultation measures was designed to identify stakeholders' views about the challenges, barriers, trends, opportunities and win-win potentials related to the respective White Paper goals.
- All roadmaps were carefully reviewed; internally as well as by two external experts

Recommendations

THE WHITE PAPER GOALS CONSIDERED IN TRANSFORUM

Urban transport

“Halve the use of ‘conventionally-fuelled’ cars in urban transport by 2030; phase them out in cities by 2050; achieve essentially CO₂-free city logistics in major urban centres by 2030.”

Long-distance freight

“30% of road freight over 300km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050, facilitated by efficient and green freight corridors. To meet this goal will also require appropriate infrastructure to be developed.”

High-speed rail (HSR)

“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.”

Multimodal information, management and payment (MIMP)

“By 2020, establish the framework for a European multimodal transport information, management and payment system.”

1 Recommendations on joint actions across thematic areas

The transport system is complex. This complexity does not only relate to technicalities within separate sub-elements of the transport system – e.g. which alternative propulsion technologies to choose in road transport or how to design effective intermodal freight hubs. Here, we discuss the more politically challenging questions and the open issues that arise from the fact that all sub-elements of the transport system are closely interrelated. Developments and decisions in the transport system are likely to affect each other to varying degrees. These interrelations cover important cross-cutting issues and the impacts of policies beyond their primary purposes are often not fully addressed when debating transport policies. The present document therefore wants to specifically highlight questions and findings of a more cross-cutting nature and take a look at overarching challenges.

With its specific focus on cross-cutting issues this document is NOT a summary of the 4 roadmaps, but it draws on the roadmaps.

In a comparative perspective on the four roadmaps, we identified three specific action areas that are relevant across all four thematic areas (the three areas are visualised as blue rings in Figure 1):

1.1 Improving communication, coordination and cooperation

Only by enabling joint actions on the basis of adequate coordination and communication activities the four targets can become achievable. Important technical progress in specific fields can be expected from single actors or organisations, but to reach the four White Paper goals, this is generally not enough. There is a need, but also the potential for policy packages of various measures enabled by joint actions involving various actors. Diverse forms of communication and coordination are needed that go far beyond people just talking and temporarily working together in projects or similar contexts. It is about addressing the following points more strategically and systematically: Identifying potential for cooperation, broad and early engagement of stakeholders to enable involvement and buy-in to and ownership of ideas, raising awareness among all relevant stakeholders, and identifying common targets and related strategies which secure longer-term commitment from relevant stakeholders.

1.2 Increasing efficiency and service quality on the basis of existing infrastructures

It is widely acknowledged that transport is a derived demand. Users and customers demand high quality, affordable and reliable service. It is not primarily the infrastructure that is at the heart of public and private interests. Therefore the roadmaps include an explicit perspective on measures that help to improve efficiency and service quality without huge investments in infrastructures. Strategies should not only focus on new technologies and infrastructures. Approaches to improve the quality of service and reduce cost of transport options are an integral part of strategies towards reaching the White Paper goals.

1.3 Extending infrastructures

Infrastructure extensions are still needed, but resources and public acceptance are limiting factors. High-quality transport services need high-quality infrastructures. However, the extent to which the achievement of the White Paper goals depends on – more or less costly – infrastructure investments differs considerably between the four roadmaps as well as between different European regions.

It is a particularly noteworthy finding of TRANSFORuM that the first area – coordination and communication – in itself offers huge potential for improvement that can be tapped at relative low costs.¹ Together with the two other areas, Figure 1 illustrates the fact that, while content and concrete challenges may differ between the themes, the three areas mentioned above represent generic challenges that are relevant in all parts of transport policy.

¹ Of course, funding still remains an issue in all thematic areas in TRANSFORuM. During the TRANSFORuM project, partnership approaches were frequently mentioned as a useful tool not only in terms of financing models via public private partnerships, but also in terms of clearly delineating roles and responsibilities. Partnerships have in many cases proven to be an important factor for successful collaborations. Moreover, there remains a debate about which investments and costs for users are most useful to help achieve the White Paper goals. The White Paper itself states that it must be expected that higher costs will need to be carried by transport users in the future. The White Paper goals are therefore challenging but promise better and more sustainable mobility for the future; and it may therefore still be worthwhile for Europe to carry the drawback of higher transport costs for users.

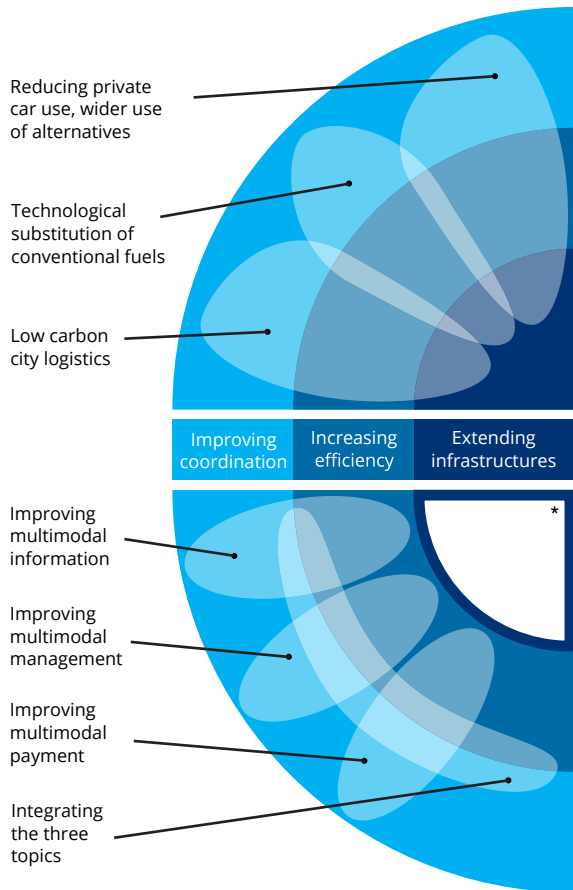
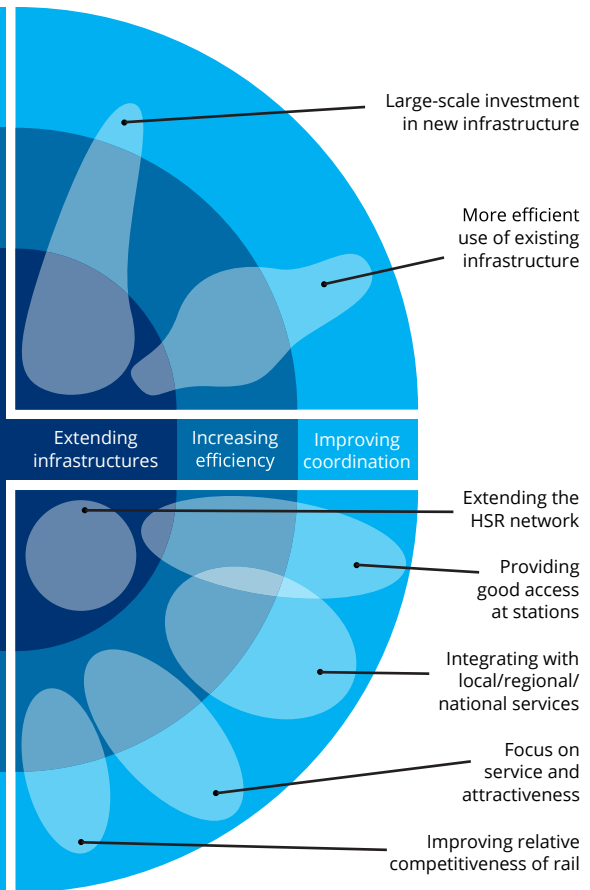
Urban transport**Policy areas** (here: building blocks)**Policy areas** (here: topics)**MIMP*****Long-distance freight****Policy areas** (here: policy packages)**Policy areas** (here: policy packages)**HSR**

Figure 1: TRANSFORuM's four thematic areas and their respective policy areas towards the White Paper goals. Within each thematic area, the balance of the specific policy areas between the categories of 'improving coordination', 'increasing efficiency', and 'extending infrastructures' should only be taken as an approximate indication.

* Due to the special character of the White Paper goal on creating a framework for MIMP systems (goal to be achieved by 2020, instead of the 2030/2050 timeframe of the other thematic areas), the roadmap for this thematic area does not consider policies that focus on the actual build-up of new infrastructures.

2 Trade-offs and synergies across the roadmaps

Between TRANSFORuM's four different roadmaps, a number of interrelations can be identified, both trade-offs and synergies. These can only be briefly outlined

here, more details can be found in the full version of the recommendations on joint actions across thematic areas (available at www.transforum-project.eu).

2.1 Information and communication technologies (ICT): a ubiquitous enabler and a ubiquitous need for cooperation

Information and communication technologies (ICT) offer significant potential for innovation and a more efficient transport system, including interrelations with the built environment, e.g. by facilitating inter-modal transport and changing physical infrastructure needs. In some cases, there will be a need for a political decision whether ICT innovations are left to the private sector with its own interest or whether ICT applications should also be strategically used and influenced in order to help with the implementation of political visions and measures. This balance must be transparently negotiated.

2.2 The last mile: a crux for both passenger and freight transport

The convenience and flexibility of road transport (for both passengers and freight) is a major advantage of this mode. When policies and strategies work on the multiple negative impacts of road transport (e.g. noise, pollution) they should therefore keep this flexibility in mind. It is crucial to facilitate intermodal trips for both passengers and freight. Whereas the first and last mile of trips will often be the most complicated ones, these can be facilitated e.g. by well-planned public transport hubs linked to shared vehicle stations for passengers, or by setting up city logistics service centre schemes to ease urban freight flows.

2.3 A matter of rail capacity: Long-distance freight and HSR

Basically, HSR and freight trains use the same kind of infrastructure, and even when there are dedicated lines for one or the other, they will still come together somewhere in the rail system. For the existing problems and capacity deficits, TRANSFORuM has therefore identified four priorities for investing in the rail system: 1) working on key network nodes that are relevant for both HSR and freight rail, 2) investing in rail freight corridors (longer trains, ERTMS) for increasing capacity, 3) improving dual-mode cross-border links (again HSR and freight rail), and 4) investing in the remaining rail network.

3 Conclusions and key lessons learned

Having in mind both the four thematic roadmaps and the cross-cutting perspective applied in this section, a number of concrete conclusions can be drawn. At the same time they outline a way to develop further the roadmaps and the stakeholder forum established in TRANSFORuM:

1. A key conclusion of TRANSFORuM is that the **all four selected White Paper goals are helpful to achieve progress in their respective fields**. Transitions need orientation in the form of visions that are able to generate long-term commitment. The White Paper goals point in the right direction but further benefit could be derived from them if the following was improved:
 - The White Paper goals should be further communicated and developed;
 - The White Paper goals should be differentiated between regions (e.g. EU-15 vs. EU-28 Member States), including different time frames;
 - Indicators should be developed to monitor the success in moving towards achieving the White Paper goals. The TRANSFORuM roadmaps can serve as a basis for this.
2. **Deliberative fora provide the means for all parties to engage in constructive debates** to further ensure the fulfilment of the White Paper goals and the related visions. In all of the thematic areas, the stakeholders in TRANSFORuM identified significant potential that can be exploited by improved communication, cooperation and coordination. However, to ensure stakeholder commitment, these fora **need clear objectives** ("Why do we talk?"), **a clear mandate** ("What happens with the results?") and **a clear structure** ("How do we get to the results?"). Stakeholders' commitment can only be achieved if the benefits of such fora can be identified. This is also a process of learning. Roadmaps, such as the ones produced in TRANSFORuM, appear to be a good basis to structure, trigger and orient the debates in stakeholder fora – and they help to **transfer the outcomes of the debates into concrete policy options**. While there is virtually

no way around deliberative fora, the limitations of deliberative processes and the existence of such limitations must yet be kept in mind. They should as well be transparently communicated, accepting future dissent and conflict as a source of further development of political goals and visions as well as policy measures.

- Ensure an ongoing debate about (the implementation of) the White Paper goals;
 - Communicate the objectives and potential benefits of these debates;
 - Be aware of and transparent about the limitations of a deliberative process (clear mandate).
3. There is a need to further **improve our knowledge** about what is happening in the transport system and which trends and factors determine the mobility of goods and peoples now and in the future. For example, there is a clear lack of data about urban freight movement, but such a data base is crucial to enable reasonable debates, coordination and planning in this field.
- EU to support public research and development of coherent data basis.
4. Generally, there is **too much focus on the most successful examples** and on making the strong ones even stronger. A good example is the field of urban transport where the majority of the 800+ cities in Europe are not amongst the front-runners pushing towards clean urban mobility. Simple measures, that have been implemented elsewhere long ago, can help here. In all thematic areas such “reverse salients”² can be identified. It is not always the case that new and innovative approaches are needed. **“More of the same” is a necessity as well.** In this context, more of the same means to further promote exchange of knowledge about what already exists with various internet platforms and projects. But funding mechanisms should also be open to

foster the implementation of “old” measures as long as they promise to break up lock-ins and trigger change in areas where there has been not much change so far. An approach could be to set up a funding scheme where a key criterion for the allocation of funds is the size of the bottleneck towards a White Paper goal that can be removed – and not the general novelty or innovative character of the approach.

- Do not only focus on what is new and innovative; a clear focus on the diffusion of older but good approaches is essential for achieving any of the White Paper goals;
 - Tackle more explicitly the “reverse salients”.
5. It has been a key finding of the TRANSFORuM process that stakeholders and actors agreed that **“where there is a will there is a way”**. But often, a missing culture of change creates a significant hurdle for moving towards any specific goal in transport policy. **A culture of change** is about enabling transition, keeping eyes open when designing policies, being prepared to experiment, reflect on progress, and alter course as necessary. It is also about taking up experiences and learning from good practices. The many good practice cases emerging during the course of the TRANSFORuM project show this potential in an exemplary way. The culture of change is closely related to a culture of communicating it – which allows **learning from each other** and also strategically thinking about the transferability of good practice cases. Moreover, learning from ‘bad’ practice was also identified as important across the thematic areas. Ideas or initiatives that don’t work offer valuable insight that prevents similar mistakes being made elsewhere. The culture surrounding the reticence of failure and the need to forget such experiences in favour of high-profile success stories is something that could be altered for the greater good.
- Develop indicators for a “culture of change”;
 - Lose the fear of failure, and embrace this as part of the process of change.

2 In contrast to “best practices” or “front-runners” that show and apply innovative approaches in transport policy, including proactive communication of their efforts, “reverse salients” refer to the cases at the other end of the spectrum, where up-to-date approaches in transport policy are rarely taken up, where competences are missing, or where existing transport policy challenges are not even recognised.

6. The **balance between infrastructure investments and low-hanging fruits** needs to be thoughtfully considered. Measures to make better use of existing infrastructure must be more developed and prioritised before making big investments. It should also be taken into account that this is the most robust strategy since it does not depend so much on good economic development and on the availability of financial resources.

- Focus more explicitly on improving efficiency and service quality.

7. The **stakeholder forum** established during the TRANSFORuM project has proven to be valuable in its own right. The workshops that were held over the past two years were more than just talking for the sake of talking. Instead, people at the workshop were talking in order to learn and share experiences. The roadmaps and the reflections in the present document are therefore truly a result of the **continuous dialogue with and between all involved actors and stakeholders**. Policy making is a dynamic and not a static process; decisions taken today have to prove their usefulness under tomorrow's conditions. This is parti-

cularly true when it comes to the transition of complex socio-technical systems such as the transport system. Working towards long-term goals requires a continuous and structured stakeholder engagement over time. This can help breaking down barriers for change as well as enabling reaction to new developments (e.g. in science and technology but also societal trends and changing attitudes) and changing framework conditions (e.g. global economic development, accelerating climate change).

- Further support for stakeholder fora such as TRANSFORuM.

The roadmaps and the recommendations at hand show that the extent to which the different political levels are relevant or even dominating differs between the four roadmaps. However, the conclusions and policy recommendations listed above illustrate well that there is huge scope for action at the European level – in all four thematic areas. The Commission should continue to support the development of frameworks and databases through research, monitoring and dialogue with stakeholders. The development of frameworks and databases through research, monitoring and dialogue with stakeholders.

ACRONYMS AND ABBREVIATIONS

ERTMS	European Railway Traffic Management System
HSR	High-speed rail
ICT	Information and communication technologies
MIMP	Multimodal transport information, management and payment

Summary of the Roadmap on Urban Mobility

URBAN MOBILITY – ROADMAP SUMMARY

1 The goal for Clean Urban Mobility

This is the official wording of the White Paper goal on Urban Mobility. It sets an unprecedented level of ambition for policy-driven change in urban mobility across Europe; no goal of this kind has been formulated on a continental scale before.

Yet, it corresponds well with the visions of and initiatives in many European cities. It also resonates well with policies formulated by stakeholders, governments and the European Community itself in areas such as transport, energy, climate change, innovation and technology, urban planning, health and the environment.

However, existing commitments and policies are not sufficient to ensure that the White Paper goal will be reached. In fact, it has so far been quite unclear how urban transport stakeholders and policymakers across Europe view this particular goal and how they consider it could be fulfilled in practice, if at all.

For this purpose, TRANSFORuM has developed a roadmap, which aims to provide an answer to the question “Who needs to do what by when in order to reach the White Paper goal?”

Halve the use of ‘conventionally-fuelled’ cars in urban transport by 2030; phase them out in cities by 2050; achieve essentially CO₂-free city logistics in major urban centres by 2030

2 From Goal to Strategies

The roadmap is based on stakeholder consultations informed by studies on conditions, trends, opportunities and barriers with regard to urban transport in Europe. The aim of this process was to translate the overall goal into feasible strategies and significant actions.

Stakeholders involved in TRANSFORuM included representatives of:

- city administrations;
- producers and developers of vehicles and energy technologies;
- transport operators and mobility service providers;
- businesses and experts involved in freight and urban logistic services;
- representatives of citizen organisations, think tanks, and other NGOs and;
- members of national and European programmes and platforms supporting clean urban mobility.

All stakeholders participating in TRANSFORuM's consultations confirmed the usefulness of a clear and measurable goal. They also highlighted, however, the danger of ‘tunnel vision’, that is, a mechanistic pursuit of a single goal without consideration for context, side effects, or new opportunities. Stakeholders must have opportunities to adopt and freedom to adapt the goal to local circumstances. In short, the White Paper goal for clean urban mobility cannot stand alone but must be seen as an element of a wider approach towards sustainable, competitive and resource efficient urban development.

Stakeholders considered a broad range of solutions and measures as potential building blocks for the roadmap. It is clear that reaching the goal will require substantial transformations of technologies, services and behaviour within the entire area of urban mobility and transport. It will imply fundamental changes to the development, adoption and use of vehicles and propulsion systems, and to the provision of logistics services in cities all over Europe.

However, it was also recognised that many existing examples demonstrate that such transformations are not impossible. A key to enabling transformations is enhanced governance frameworks at all levels from

European to local, emphasising dialogue, coordination, experimentation, and learning, but also regulations and incentives.

The following three strategic routes towards the goal emerged as distinct but equally valid and complementary options. They form the backbone structure of the urban mobility roadmap:

- Technological substitution of conventionally-fuelled passenger cars and fuels;
- Reduced use of private passenger cars for transport combined with an increase in public transport usage and non-motorised forms of travel;

- Increased utilisation of low carbon city logistics technologies and practices.

The following figure illustrates the strategic areas and building blocks for urban mobility, related to the three mentioned routes. Red lines indicate blocks that may interact.

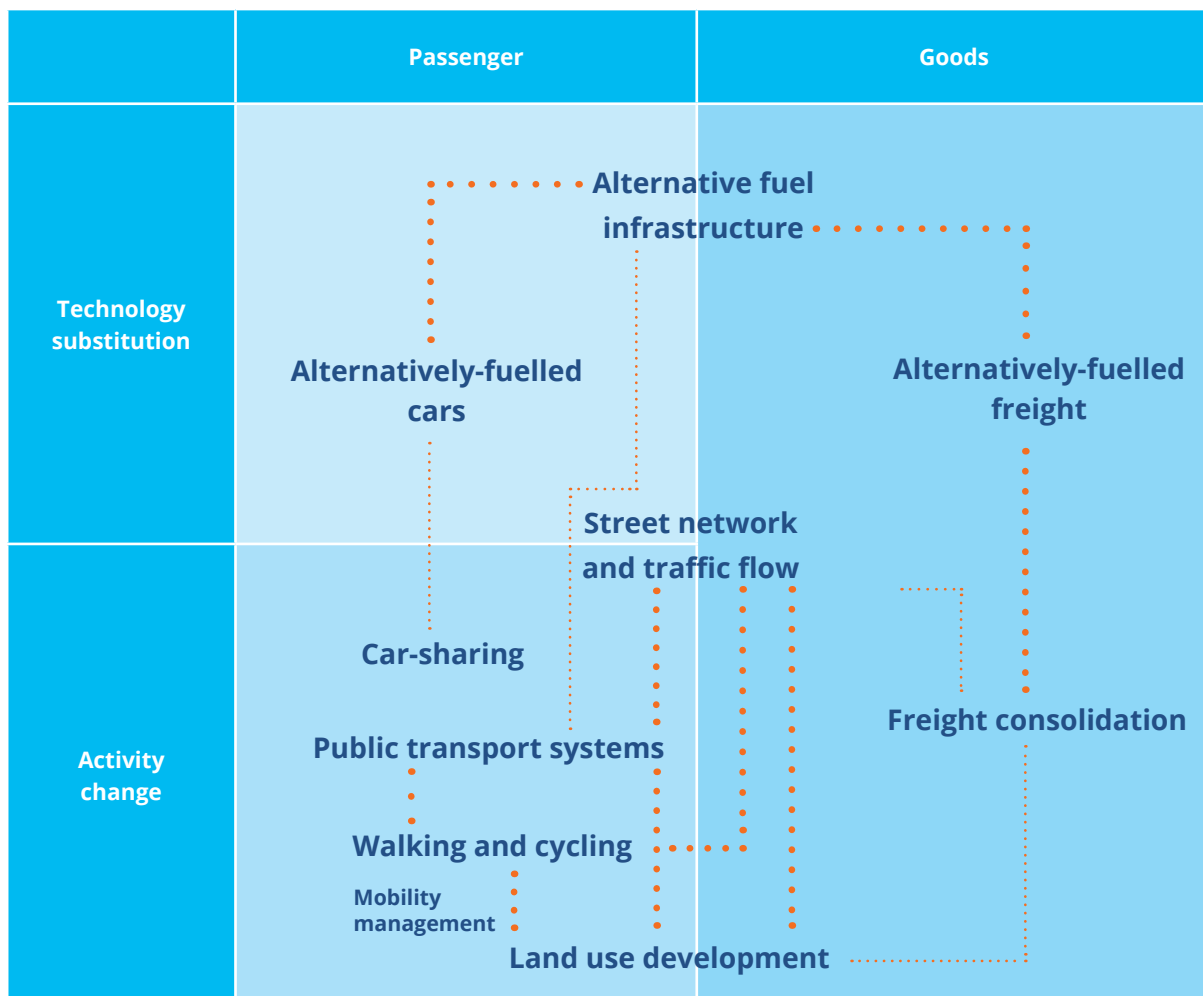


Figure 1: Strategic areas and building blocks for urban mobility. Orange lines indicate blocks that may interact.

3 Exemplary pathways

The urban mobility roadmap contains one separate chapter about three different speculative urban transformation pathways towards the White Paper goal. This was inspired by the strong stakeholder views that there is a need to take into account the widely differing conditions for reaching the goal across Europe.

Each pathway – or fictive city – is described for a specific urban context that in some respects resembles ones existing in Europe. Their key characteristics are as follows:

	Waterberg	Viga	Valanov
Key strategy	Technical substitution: “technophilic” approach	Modal sharing: Reduce use of private cars	‘Starter’ pathway: Developing enabling conditions to ‘catch-up’ with frontrunner cities
Characteristics	Approximately 500,000 inhabitants University, local car manufacturer, low urban density Hilly, large lake	Approximately 900,000 inhabitants University, local car manufacturers, fairly high urban density Flat; sprawling	Approximately 250,000 inhabitants No University, regional cultural centre, ageing population, no car industry, medium density Border city; very hilly
Transport system	Good public transport, tramway, cycling network, Electric vehicle (EV) charging points	Good public transport, metro, cycling network	Poor bus system, no cycle lanes
Modal split (passenger)	65% drive/10% public transport/10% cycle/15% walk	45% drive/20% public transport/20% cycle/ 15% walk	53% drive/25% public transport/2% cycle/ 20% walk

Table 1: Main characteristics of the three fictive cities – Waterberg, Viga and Valanov

The differing situations, chances, barriers, contexts, histories etc. in these different cities leads to different approaches, different policies, different milestones,

funding requirements and so forth. As a consequence, they approach the urban mobility goal with different emphases as illustrated below and overleaf.

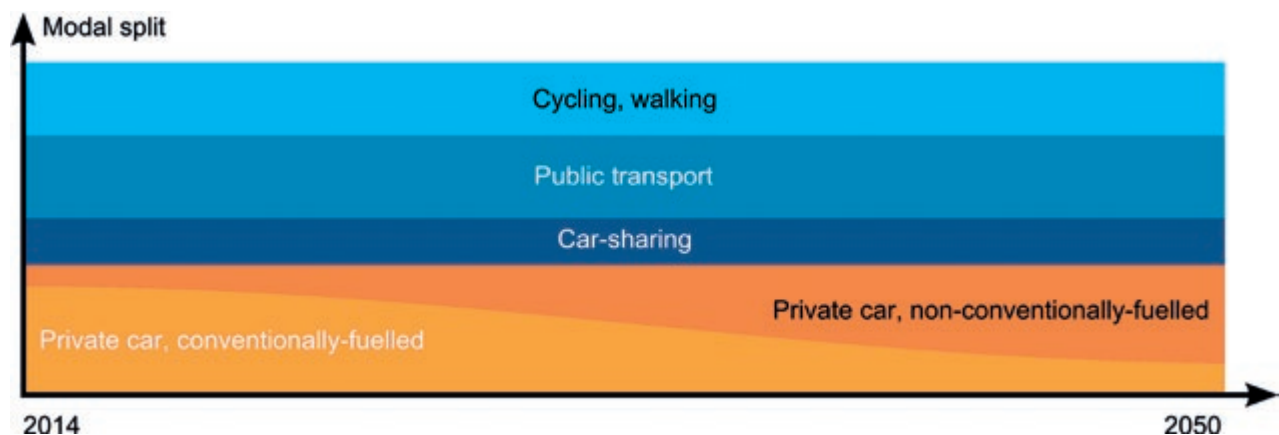


Figure 2: Imagined pathway for fictive city “Waterberg”

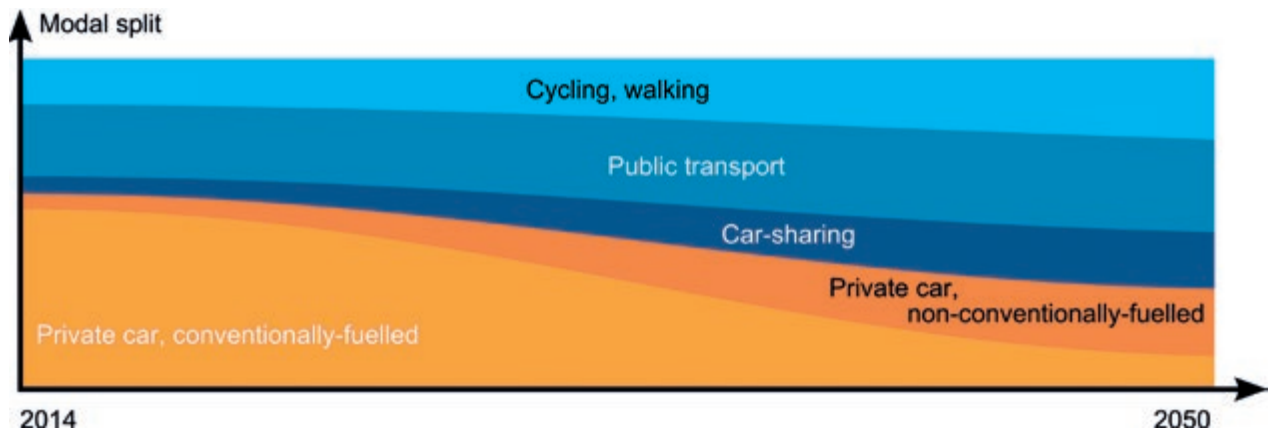


Figure 3: Imagined pathway for fictive city "Viga"

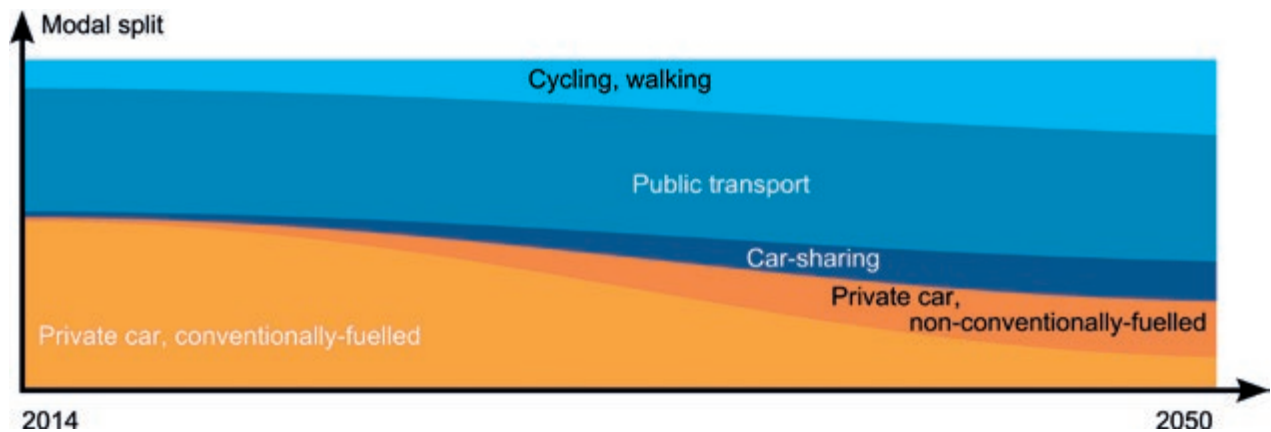


Figure 4: Imagined pathway for fictive city "Valanov"

4 Seven key messages

4.1 Transforming urban mobility requires an open approach

A European roadmap towards the implementation of the White Paper goal needs to adopt a broad and open approach because the required processes of transformation cannot be prescribed from above, given the diversity and specific historical, cultural, economic, environmental and other conditions of each urban area.

Stakeholders share the view that urban mobility needs to become more sustainable and resource efficient. However there is no overall agreement over which solutions are most appropriate to implement in which cities at this point. There is a need to experiment with new types of technology, organisation and governance.

A roadmap must take into account these broader strategic conditions and cannot presently assume the form of a European-wide 'deployment plan'.

4.2 European goals must be aligned with local visions and benefits

The overarching concerns for climate change and fuel independence must be aligned with concerns and rationales at the urban level such as improved accessibility, quality of life, safety, health, and prosperity. While offering a climate responsible approach for urban businesses, improved city logistics is, for example, not the main solution to reduce global CO₂ emissions, whereas it is essential for increasing local safety, efficiency and viability. Fortunately there is a significant potential for correspondence between local and overarching goals, in as much as many low carbon transport solutions are also supportive of convenient, city-friendly and healthy urban transport. If the White Paper goal is to motivate action it must first and foremost become associated with understandable and measureable benefits for a wide range of stakeholders in each city.

4.3 Replacing vehicles and fuels is important but not sufficient alone

Specific technological solutions such as electromobility still suffer from various limitations. In some Central and Eastern European countries there are hardly any EVs on the market and citizens have yet to see a dedicated charging point. In other cities knowledge and technology may be present on various non-conventionally-fuelled alternatives for both passenger and freight, but vehicles and systems remain expensive, impractical, or based on energy carriers that may be far from CO₂-free or sustainable.

The roadmap for the White Paper goal must therefore embrace a much wider scope of transport options than simply replacing conventionally-fuelled vehicles with non-conventionally-fuelled ones. Otherwise too many challenges would be left unsolved and too many synergies with regard to accessibility, mobility, congestion, safety and the attraction of inner cities would be left unexploited.

The most promising solutions may be the ones that combine new technologies with new mobility solutions such as sharing and partnering models for EVs, electric freight vehicles (EFV) or bicycles. The roadmap should help tease out the new and yet unknown solutions and combinations

4.4 Limiting conventionally-fuelled vehicle use can be low cost

Investments needed for new technologies and infrastructures may seem like impediments for transformation of urban mobility systems, especially in times of economic contraction with limited funds available and weaker demand.

However, TRANSFORuM's review of possible building blocks for change (see chapter 4 of the full urban mobility roadmap) has emphasised the great potential of many less costly options for limiting the use of conventionally-fuelled vehicles. This includes measures to enhance walking, cycling, e-bikes and car-sharing that are not yet widely exploited in many cities. Also measures where up-front investments can lead to significant efficiency gains over time have been identified; for example, the introduction of electric propulsion and efficient ticketing systems for public transport, or the deployment of ITS solutions in urban traffic and logistics management.

Some options like the introduction of road pricing, parking charges, or the revision of company car benefits and taxation schemes can even release economic resources to support investments in other attractive solutions. In city logistics there are examples of commercially viable models such as the 'Binnenstadt' concept of some Dutch cities that combine the use of clean distribution vehicles with the provision of additional logistics services, although large-scale solutions of this kind are still rare.

4.5 Political momentum must be fostered in many cities

Stakeholders have repeatedly pointed out that the most fundamental impediments to start the transformation process in many cities is often a the lack of a culture of and governance arrangements to facilitate innovation. There is a strong need to identify ways to inspire cities to take action at the political level. Although a number of cities stand out as already progressing towards a more sustainable urban transport situation in various areas, the majority of cities have not made any significant steps towards the goal or no ambitions to do so are apparent.

Partnerships for change at the political level are needed to embody the transformation of urban transport

and logistics as a ‘winner’ case for cities, and to support underlying processes of analysis, planning, deliberation, and innovation.

4.6 National and state frameworks must support European goals and local actions

Whether starters or more advanced, cities need active support from national, state and regional governmental levels.

There is a clear but differentiated need across Europe for both hard and soft infrastructures in areas such as planning regulations, taxation rules, investment support, ICT solutions, monitoring procedures, and capacity for experimentation, in addition to systems and standards for cleaner vehicles, fuels, infrastructures, and products.

While certain standards are best defined at the European level, the benefits and even necessity of national/regional support should not be underestimated, even if stakeholders do not all agree about the role of central government. Cities advancing today – such as Oslo in terms of electromobility, Copenhagen in terms of cycling, and many other cities in terms of modernised public transport systems – do so not least because of favourable background conditions supported by national tax incentives, legislation, investment support and research and development (R&D).

New actions at Member State and regional level are essential in areas such as deployment of alternative fuel infrastructure, rules on access restrictions and charging schemes, fiscal incentives, and national frameworks for planning to enhance sustainable urban mobility planning (SUMP).

4.7 Communication, coordination, and knowledge consolidation will advance the learning curve

The most widely shared observation emphasised among stakeholders is the strong need for continued communication, coordination and dialogue on sustainable urban transport solutions and transformations. A reinforced dialogue among stakeholders should be prioritised at all levels, and across them,

because enhanced dialogue is the best way to move upwards on the learning curve.

Given the subsidiarity principle, action at the local political level is important to support innovations, initiatives and developments that are underway in a ‘bottom-up’ manner. City governments need to work as catalysts supporting local ideas and initiatives just as much as authorities exercising power. Particularly in the area of freight and logistics a need for a dialogue and partnership-based approaches has been pointed out.

A lack of data is a serious factor hampering progress, in the passenger and, in particular, in the logistics sector. The European Commission has a key role to consolidate the knowledge base for European-wide dialogue and learning. The Commission should continue to support the development of frameworks and databases through research, monitoring and dialogue with stakeholders.

5 Action steps – Who has to do what by when?

To reach the urban mobility goal of the White Paper coordinated actions must be taken by stakeholders at all levels of decision making over an extended period of time starting now. The following tables and text show proposed actions including ‘processes’ (communication and coordination actions) and ‘measures’ (direct policy, regulation, intervention and investment). In practice there are some overlaps between these types of actions.

The actions mainly refer to activities to be carried out by policymakers and authorities at the different levels, acting on behalf of the common good as convenors, catalysts, or regulators in regard to urban transport technologies, systems, markets and users.

Proposed milestones are inserted in both tables, and explained in Table 7. The milestones refer to combined results at the European level, and not to milestones for individual Member States or for individual cities (as were exemplified in Chapter 6 in the longer version of the roadmap). The proposed milestones are examples that reflect important indicators of progress.

6 Action at the European level

Action at the European level is especially relevant in order to set common technical standards for vehicles, fuels and refuelling systems, to define frameworks for common national and local actions, and to support research in common urban transport problems and solutions with a view to exchanging good practices, and monitoring performance and results. The following are proposed key processes and actions at the European level.

6.1 Processes

- Evolution of the Urban Mobility Observatory (UMO) into a centre for knowledge co-production and co-utilisation;
- Deployment and further development of the SUMP framework;
- A platform for political commitment with explicit reference to the White Paper goal on urban mobility should be facilitated at the European level;
- A special platform should be established to engage 'starter' cities and who are not yet ready to commit to ambitious goals.

6.2 Measures

- European technical standards for vehicles, fuels and infrastructure should be continuously reinforced and extended;
- The Commission should support national plans and strategies for the deployment of alternative fuel infrastructure – and research related to their effectiveness;
- European institutions (funds, banks, programmes) should continue and extend financial and practical support to sustainable urban mobility initiatives in European cities;
- Current campaigns like 'Mobility Week' and 'Do the right mix' should be reinforced. There could be a stronger emphasis on solutions on the freight side.

7 Action at the national level

Urban planning frameworks and general transport policies as well as taxation and charging rules remain largely within national jurisdictions. The national level is especially important to align country-specific legislation, fiscal regulations, and planning frameworks with transformations needed to accomplish European and local goals for urban transport systems, as will be outlined in the following.

7.1 Processes

- Systematic review of national policies and frameworks and national support for sustainable urban mobility goals;
- Integration of SUMP into national planning laws and frameworks. Also related national training schemes, network formation, and benchmarking activities should be introduced;
- Member States should deploy effective campaigns to promote awareness of alternative solutions to the use of conventionally-fuelled vehicles in cities.

7.2 Measures

- Member States need to develop ambitious, effective and realistic deployment strategies for alternative fuel infrastructure, including for example 'smart charging' options;
- Member States should provide the legal framework to allow cities to charge and restrict unsustainable vehicle traffic;
- Systematic review of national taxation schemes (vehicle taxes, VAT, company car tax exemptions);
- Support for City Logistics Service Centres (CLSC) to effectively tackle urban freight-related problems (harmonised regulations, requirement for publicly procured goods etc.).

8 Action at the city level

Action at the city level is obviously extremely important. Options for urban and regional governments include measures such as spatial planning, parking regulations, access restrictions, and provisions for public transport, walking, cycling and low carbon freight vehicles. However, as emphasised by TRANSFORuM stakeholders, cities face highly diverse spatial conditions, transport needs, resource constraints, mobility cultures, and policy priorities which makes it impossible to define specific combinations of actions with detailed timeframes that all European cities should follow.

The local processes and actions proposed here refer to generic areas of activities that all cities should consider to exploit to some degree and in some form. The specific actions and measures cannot be meaningfully prescribed in a European roadmap but only exemplified.

Nevertheless it is necessary that cities do in fact take action in most or all of the proposed areas if the goal is to be fulfilled. ‘Starter’ cities should begin by adopting basic versions of each process and action, while cities already ‘advancing’ would build on existing results and adopt more ambitious and transformative developments of some of these processes and actions.

8.1 Processes

- The basis for successful transformation at the city level is to bring local stakeholders together and engage them in dialogue and visioning processes;
- All European cities should develop and implement some form of SUMP platform to connect political visions, strategies, plans, measures and evidence utilisation in a common approach;
- Cities need to develop “freight partnerships” that involve business and transport operators in joint efforts to analyse problems and develop solutions and strategies;
- Join one or more platforms of European cities committing to specific urban transport goals.

8.2 Action areas

- All cities should adopt an integrated transport and land use plan, as appropriately defined in national planning frameworks;
- Public transport should be further developed in terms of infrastructure and service. Public transport vehicles should be based mostly on fossil free fuels by 2030;
- Every city should have a walking and cycling network. Also more advanced plans and strategies should be deployed towards making these truly convenient forms of mobility;
- Support car-sharing by providing for example, reserved parking, promoting it and procuring mobility services from car-sharing organisations;
- Develop mobility management strategies, helping workplaces integrate sustainable mobility;
- Make use of their sovereign power over their street network through access restrictions, road charging (depending on national regulations);
- Adopt a set of strategies to support more efficient logistics (e.g. through support for private CLSC initiatives). The measures are best identified through freight partnerships;
- Cities should support the deployment of infrastructure for alternative fuels in accordance with national strategies and plans;
- Adopt procurement policies in areas such as waste collection, public transport service and health services that favour mobility based on alternative fuels.

ACTION TABLES

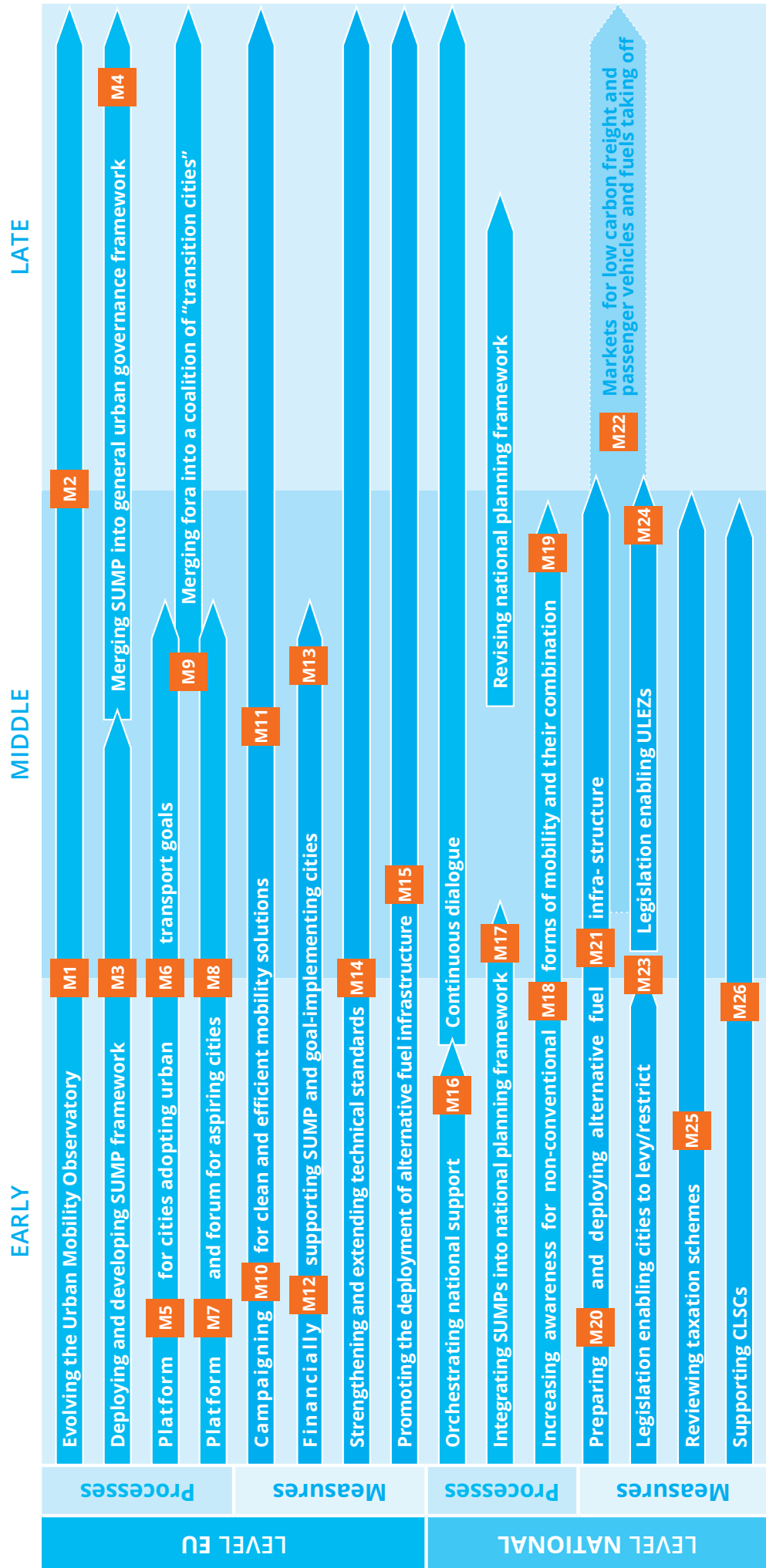


Table 2: Proposed processes and measures at the EU and national levels

No.	Milestones for the European and national levels
M1	Data, indicators and procedures to measure urban mobility goal performance resolved
M2	A comprehensive benchmarking system for clean and efficient urban transport defined
M3	Concept of SUMP recognised by all cities in Europe; 2 nd generation SUMP framework adopted
M4	3 rd generation SUMP integrated as part of wider urban development frameworks adopted
M5	European platform for cities committing to urban mobility goal formed with 20 Mayors
M6	100 Mayors have committed their cities to urban mobility goal
M7	A European platform for aspiring cities formed with 50 Mayors
M8	500 Mayors have joined the aspiring cities platform
M9	All European cities have committed to urban mobility goal; The platforms are merged
M10	Prestigious award for clean and efficient urban transport launched
M11	Survey demonstrates high awareness of European urban mobility goal and strategies
M12	Funding schemes adapted to support aspiring cities investing to reach urban mobility goal
M13	100 cities have received European support; All funding efficiently spent on relevant projects
M14	All relevant technical standards to support clean and efficient urban transport revised/proposed
M15	National programmes for promoting alternative fuels evaluated and new measures proposed
M16	All Member States have defined how to orchestrate national support for urban mobility goal
M17	All Member States have reviewed national planning frameworks to support SUMP
M18	All Central and Eastern European Member States have launched campaigns or similar
M19	85% of citizens in Central and Eastern European Member States express support to non-conventionally-fuelled vehicles
M20	All Member States have communicated convincing plans for deployment of alternative fuels
M21	All Member States have implemented effective plans for deployment of alternative fuels
M22	Efficient markets for affordable alternative fuels emerging in all Member States
M23	All Member States have reviewed legislation to allow cities necessary leverage over access
M24	All Member States have reviewed legislation to allow cities to restrict non-zero-emission access
M25	All Member States have reviewed taxation schemes
M26	All Member States have national programmes supporting CLSCs

Table 3: Milestones for the European and national levels

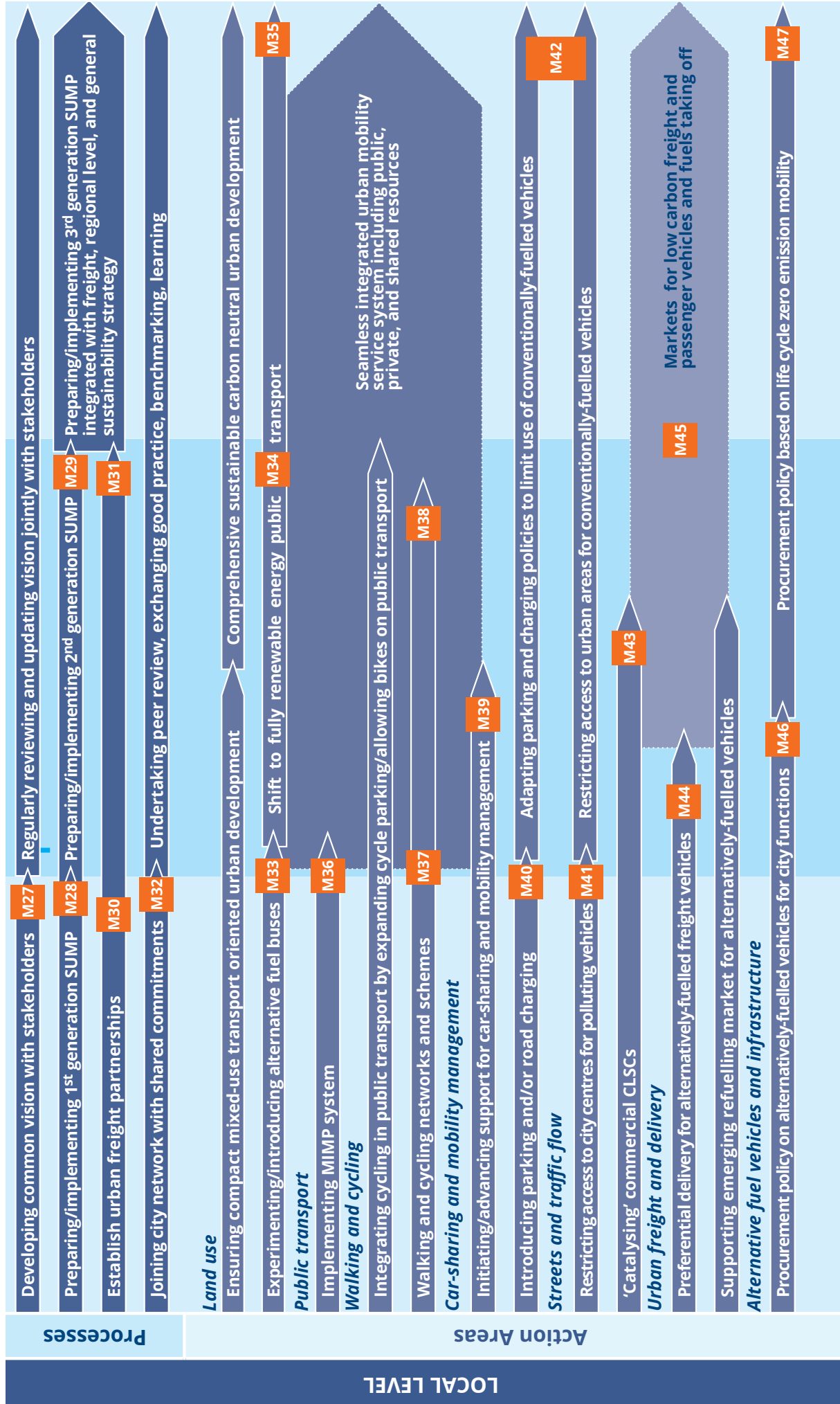


Table 4: Proposed processes and actions at the urban level - key examples

No.	Milestones for the urban level
M27	All cities have conducted a stakeholder dialogue on urban mobility goal and strategies
M28	All cities have adopted a certified SUMP by 2020
M29	25% of cities have adopted a second generation certified SUMP by 2025
M30	Half of the major cities have established some form of freight transport partnership
M31	All major cities have established a freight transport partnership following 'good practice'
M32	Most cities have joined city networks for urban mobility goal (=M6 and M8)
M33	At least 50% of the cities are experimenting with or have implemented alternatively-fuelled buses
M34	At least 50% of cities committed to only use renewable energy for public transport
M35	At least 50% of cities have fully switched to renewable energy for public transport
M36	At least 50% of cities have multimodal transport information, management and payment (MIMP) system in place
M37	800 cities have adopted basic pedestrian and cycling networks and strategies, cycling in European cities increased on average 100% between 2015 and 2020, with minimal reduction in walking and public transport
M38	400 cities have extensive bike-sharing systems with e-bikes and/or large secured bicycle parking at public transport nodes; cycling in European cities has increased on average 200% between 2015 and 2025, with minimal reduction in walking and public transport
M39	Most cities provide support to car-sharing initiatives, and have adopted Mobility Management strategies jointly with employers and business parks
M40	At least 25% major cities (that have a legal basis to do so) have introduced road and/or extensive parking charging favouring non-conventionally-fuelled vehicles (according to a standard definition)
M41	At least 25% of major cities (that have a legal basis to do so) have introduced access restrictions favouring non-conventionally-fuelled vehicles (according to a standard definition)
M42	All major cities have introduced charging or access restrictions favouring non-conventionally-fuelled vehicles (according to a standard definition)
M43	In 40% of major cities one or more CLSCs have been established, based on a review of needs and opportunities in the particular context
M44	10% of urban freight is carried by zero emission vehicles (ZEV)
M45	25% of urban freight is carried by zero emission vehicles (ZEV)
M46	At least 75% of cities have adopted a procurement policy for alternatively-fuelled mobility
M47	All publicly procured mobility in European cities is zero emissions and based on renewables

ACRONYMS AND ABBREVIATIONS

CLSC	City Logistics Service Centres	SUMP	Sustainable Urban Mobility Planning
EV	Electric vehicle	UMO	Urban Mobility Observatory
EFV	Electric freight vehicle	ZEN-T	Trans-European Transport Network
ITS	Intelligent Transport Systems	TKM	tonne-kilometre
MIMP	Multimodal transport information, management and payment	ZARA	Zeebrugge, Antwerp, Rotterdam, Amsterdam
R&D	Research and development		

Summary of the Roadmap on Long-distance Freight

LONG-DISTANCE FREIGHT – ROADMAP SUMMARY

1 The EU White Paper goal on long-distance freight in a nutshell

30% of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050, facilitated by efficient and green freight corridors. To meet this goal will also require appropriate infrastructure to be developed.

The White Paper states that freight shipments over short and medium distances (below some 300 km) will mostly remain on trucks. For the longer distances, options for road decarbonisation are more limited and efficient options for freight multimodality are needed. With its particular focus on the facilitation through “efficient and green freight corridors”, the goal emphasises the importance of coordination, of bundling activities and packaging policies in these corridors.

Furthermore, the goal clearly addresses the relationship between trucking on the one side and rail freight and waterborne transport on the other side. It implicitly aims at increasing the relative competitiveness of the latter.

The overall objective of the TRANSFORuM roadmap on long-distance freight is to analyse “Who needs to do what by when?” to achieve the White Paper goal, which milestones are suitable to track progress in the field and which recommendations for European transport policies can be drawn from the findings.

2 Mapping of the long-distance freight field and outlook

The focus of the White Paper goal is the segment of road freight covering distances above 300 km. This segment constitutes 11% of tonnes lifted and 56% tonne kilometres (tkm) within road freight.

A projection that was developed in the “EU Energy, Transport and Greenhouse Gas (GHG) Emissions Trends to 2050 Reference Scenario 2013” (EC, 2013a)

shows an increase in the total freight transport activity by about 57% (1.1% p.a.) between 2010 and 2050. Road freight is projected to grow by 55% during the same period while rail freight is projected to grow by 79% and inland waterway (IWW) freight by 41%.

This means that road freight is projected to amount to 2721 billion tkm in 2050. If we assume that 56% of this volume still consists of freight on distances over 300 km, then 760 billion tkm need to be shifted from road to rail and waterborne until 2050, according to the goal. In addition the reference scenario assumes increases of 300 billion tkm for rail freight and of 60 billion tkm for IWW shipping. If road freight shifted to rail and waterborne according to current market shares (only including container and Ro-Ro transport for maritime), this would imply nearly a tripling of transport volumes by these modes between 2010 and 2050, as can be seen in Figure 1. Although the split between rail and waterborne may differ from this calculation in the different scenarios, the Figure shows the magnitude of the required changes.

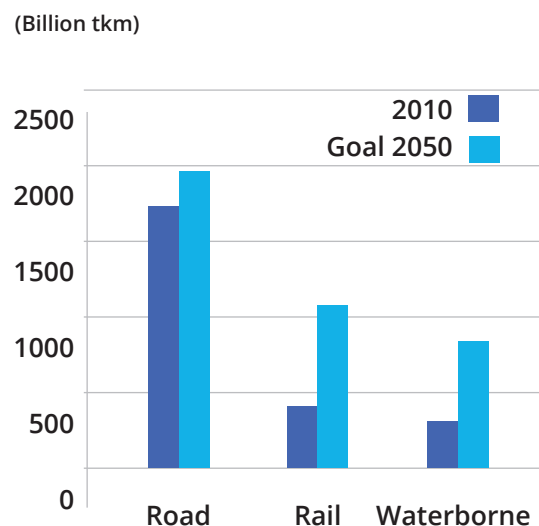


Figure 1: Indicative modal shares in 2050 if the goal is to be reached

In the longer version of this roadmap a brief mapping of the freight sector is provided together with an overview on selected key trends influencing long-distance freight markets.

3 The building blocks of the long-distance freight roadmap

Key elements that required consideration in building the freight roadmap can be related to the following three basic strategies:

- Make rail freight more competitive by improving service quality, lowering costs and increasing transport capacity;
- Make waterborne freight more competitive by improving service quality, lowering costs and increasing transport capacity;
- Realise a level playing field. Make road freight (and all other modes) pay fully for its external costs. Enforce existing rules for road freight regarding cargo weight, speed limits and working conditions, for example.

The stakeholder consultations carried out in the project actually highlighted that a combination of different approaches is needed to achieve significant modal shift. However, for reasons of clarity in this section we introduce three key areas separately. We will explicitly deal with their combinations later in the following sections.

3.1 Rail freight

The most important factors for customers are that transport fulfils some basic quality requirements and that the cost is acceptable. Customers will not pay much of a premium for environmentally-friendly transport. It is therefore important that all modes pay for external effects like emissions or noise. To get more customers to choose rail the following measures are essential:

- Deregulation of freight railways, in combination with other measures, to improve service and cut costs;
- Establishment of rail freight corridors to improve service in international transport;
- Better maintenance of tracks and operation planning for freight;
- More efficient intermodal transport systems, not least regarding hubs;
- Information systems about available supply of rail transport;

- Information systems for tracking and tracing consignments (KTH Railway Group, 2013).

In many forecasts, freight demand in Europe is projected to increase by around 60% until 2050. With business as usual, road will maintain or increase its modal share. With a mode shift scenario, rail may increase its market share from 18% to 36%, meaning that there will be more than three times more rail freight than today. There are several measures to increase rail capacity; longer and heavier freight trains; faster freight trains enabling more freight to run between passenger trains; improved signaling systems, like shorter block sections and the European Rail Traffic Management System (ERTMS); and investments in longer crossing stations and new tracks.

3.2 Waterborne freight

The building blocks that are required to improve service quality and/or reduce shipment cost for waterborne transport, and thus increase its modal share are:

- Time in port savings (simplification and automation of all administrative issues);
- Online freight information platforms for all intermodal transport;
- Efforts to increase co-operation among the multitude of stakeholders in the intermodal chains;
- Reduction of damages or cargo losses;
- Research and development (R&D) for improved technology and optimisation processes;
- Fuel savings (by more efficient hull designs, engines and propellers).

An advantage for maritime transport vis-à-vis road and rail transport is that capacity increases at the system level are usually less costly, since the connections between ports are largely free. Measures to increase intermodal capacity include reduced time for transshipments (automated technologies), increased storage capacity in ports, improved punctuality and increased capacity of waterborne vessels. R&D efforts to improve transshipment technologies are important.

3.3 The internalisation of external costs

Pricing of the external effects of transport has for a long time been considered a key component in achieving a sustainable European transport system (EC, 2001; EC, 2008a; EC, 2009), not least because it would help to deliver a modal shift from road to rail and waterborne freight (EC, 2011a). It is important for such internalisation to address external effects in the form of congestion, accidents, air pollution, noise, infrastructure wear and climate impact.

Although there are large deviations in specific cases, in general the level of internalisation is currently lower for road freight than for rail and waterborne freight. The level of internalisation in the EU27 is 55-75% for heavy trucks (>32 tonnes), 90-95% for freight trains and 85-90% for IWW transport (EC, 2008b).

4 Policy packages towards achieving the long-distance freight goal

The long-distance freight roadmap outlines two potential policy packages; alternative strategies that may be used to reach the White Paper goal. Rather different actors need to be involved in achieving the White Paper goal. The role of the EU can change significantly, depending on the kind of measure that needs to be applied. However, policy package elements need to be implemented in a coherent way and overall co-ordination is required. The EU can play an important role, but in particular corridors it is crucial that private actors (e.g. port authorities, train operators etc.) are involved as well, and that clear and transparent roles and leadership are assigned.

4.1 Policy package A: More efficient use of existing infrastructure

In policy package A the main emphasis is on making smaller investments (longer sidings, more powerful locomotives, upgrading of inland ports, seaports, IWW, etc.) in order to increase capacity of rail freight and waterborne transport, and stimulate an efficient use of existing infrastructure. The shift to waterborne transport will be high in this package (30-50% of freight shifted from road transport) since increasing capacity of waterborne transport requires comparatively small infrastructure investments. Push measures – making

road freight pay for its external effects – are important, especially because the current uninternalised effects are particularly large for road freight (EC, 2008b). Although this policy package focuses on efficient utilisation of existing infrastructure, some new infrastructure is built, including port transshipment facilities and port hinterland rail connections.

4.2 Policy package B: Large scale investments in new rail tracks

This policy package entails a radical increase in rail capacity. Many new tracks are built, in most cases for high-speed rail (HSR) passenger trains. This allows for a separation of slow and fast trains, which yields a high capacity increase (with two parallel double tracks, instead of one, capacity increases by a factor 3-4). Focus is on making full use of the economies of scale associated with rail transport.

The high capacity freight corridors connect mega-hubs, forming a highly efficient industrialised multimodal transport system. This may be an economically-efficient system in the long-term (although the initial investments are large), but only if the transport demand matches the huge capacity of the network. In this package, waterborne transport receives less attention (15-30% of freight shifted from road transport). If this package is accepted and implemented, both the HSR and the freight goals of the White Paper may be achieved, even in a scenario with strong drivers for (road) freight growth.

5 Applying the policy packages on two important freight corridors

The freight goal is expressed as an average for the EU. Given the substantial geographical and economic diversity among European countries and regions, the TRANSFORuM long-distance freight stakeholders made a selection of highly relevant concrete corridors, as per the White Paper stipulation, for demonstrating the elements of the roadmap. The cases shed light on the question to what extent the policy packages can be 'customised'. This helps to understand the relevance of policy measures in different contexts. With this selection, we cover a wider range of rather different situations of European goods flows with clear growth prospects.

5.1 Case 1: The Rhine-Alpine corridor

Operating along the major transport axis across the Netherlands, Belgium, Germany, Switzerland and Italy, huge amounts of Europe's freight traffic volume are handled along the Rhine-Alpine Corridor. With some 100 terminals on the entire route, the corridor connects the ZARA seaports (Zeebrugge, Antwerp, Rotterdam and Amsterdam), as well as ten major inland ports with the Mediterranean port of Genoa. It is a long-established route for North-South freight and a core element of the Trans-European Transport Network (TEN-T). It is well connected to other TEN-T corridors (Rhine-Alpine; Atlantic, North Sea-Mediterranean and Rhine-Danube). The overall length of the Rhine-Alpine Corridor is 1,400 km. Many efforts were undertaken in the last decades to improve traffic flows along the corridor. In the meantime, with the European Economic Interest Grouping (EEIG), a management structure was implemented that is dedicated to the corridor.



Figure 2: Area of the Rhine-Alpine corridor (Verband Region Rhein-Neckar, 2015)

Road, rail and waterborne transport play different roles in the different sections of the corridor. With the Alps, it includes a section where rail is the only alternative to road. North of the Alps, both rail and water provide alternatives.

With the Betuweroute in the Netherlands and the Lötschberg and Gotthard tunnel in Switzerland, the Rhine-Alpine corridor integrates some of the most important infrastructure projects in Europe. Shifting around 700 million tonnes of freight per year in an area involving some 70 million inhabitants (Saalbach, 2012).

Based on the analysis and calculations presented in the long version of this roadmap it can be concluded that much progress can be made relying solely on policy package A – smaller investments to increase capacity. Measures that stimulate an efficient use of infrastructure should be implemented promptly.

However, given the envisioned growth rates in the freight sector, fully achieving the 30% goal in this corridor is hardly possible without significantly extending the infrastructure, as it is envisioned in policy package B. For some of the crucial bottlenecks in term of rail capacities, it is not only financial resources that impose a barrier for progress. An even higher barrier seems to be the large public resistance in some areas such as Southwest Germany, which could delay the realisation of increased capacity for decades. Political communication, awareness raising about the sustainability of freight rail, and participation of relevant actors in early stages of development are all aspects that need to be considered in policy package B as well.

It is also important that the capacity on all parts of the corridor is adequate in order to remain competitive. It must be clear that any part of the corridor that has its own specific needs should be accounted for in the planning process. Bearing this in mind, the goal set of shifting 30% from road to rail (and the required 180% increase in rail freight by 2050) is only within reach if all countries along the corridor develop infrastructure adequately. Furthermore, a coordinated planning process is crucial to avoid bottlenecks that may affect the economic development of the entire region.

5.2 Case 2: Netherlands – Poland

The Netherlands – Poland corridor also includes the ports of the ‘North Range’, but in contrast to the first case consists only partly of the official TEN-T network. Besides the West-East Corridor also includes many other parallel rail and maritime connections and, in addition, has significant IWW potential to be extended in the future, if significant modernisation takes place. The case illustrates the important role of maritime transport for serving the East-West connection.

Although parts of the West-East route are not well developed, the connection between the port of Rotterdam and Poland is one of the best developed transport corridors in the EU (covering an area with 85 million people), especially inland transport on the route Rotterdam – Duisburg – Frankfurt Oder and maritime transport from Rotterdam to Gdańsk/Gdynia by short sea shipping, ocean lines and feeder services.

The route is also important for longer-distance transport, especially to Belarus, Ukraine, Russia, Kazakhstan and the Black Sea Area.

Based on interviews and stakeholder discussions it was perceived that the waterborne element of the freight goal is most relevant for policy package A and focusing primarily on the improvement of existing infrastructure and service quality will help to achieve the modal shift required.

On the Poland–Netherlands corridor most of the rail container services fulfil current market expectations and offer two-day carriage on average or three-day maximum. All maritime connections pass through few other ports or go directly, thus offering relative short transit time (3-6 days). This aspect therefore does not need much improvement. In addition, the existing schedules are quite dense and can be modified by ship owners at short notice when required.



Figure 3: Poland – Netherlands trade connections (PCC intermodal transport, 2014)

6 Key messages

Most stakeholders consulted in TRANSFORuM consider the 30% 2030 target to be achievable, whereas there were more doubts about the 2050 target. Three main fields of action were identified: make rail freight more competitive; make waterborne freight (maritime and IWW) more competitive; and create a level playing field between modes.

The crucial question is how to achieve progress in these different fields. Since the goal is rather challenging, almost all of these measures/initiatives need to be

combined. However, the intensity of each will need to be adjusted to account for different external developments (e.g. economic growth, supply of fuels, etc.), as well as to different regions of the EU. The balance between building completely new infrastructure and upgrading existing networks is a case in point. A more rapid growth of freight volumes will (ceteris paribus) tend to shift the balance towards building new infrastructure and vice versa. In a similar way, increasing strains on public budget (due, for example, to an ageing population), will require more emphasis to be put on cost effectively upgrading the present transport system.

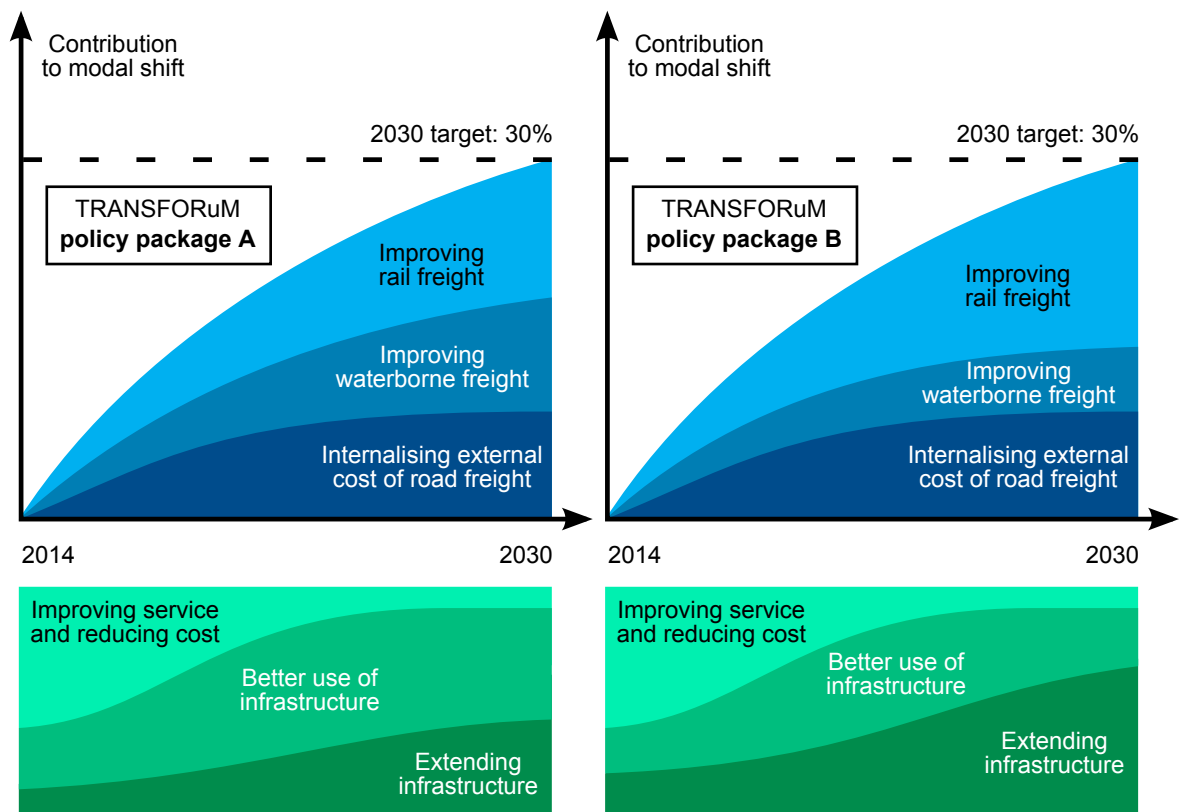


Figure 4: Feasible pathways towards the White Paper goal

7 Summary

1. The discussion with stakeholders revealed that a stakeholder forum is needed to enable significant changes to the structure of freight transport. It was pointed out many times that communication and coordination between responsible organisations is indispensable for coming close to the targets in the envisioned timeframe.

> EU and Member States to trigger and co-ordinate stakeholder collaboration.

2. The focus on corridors is necessary. Establishing freight corridors is definitely a useful approach, not only for technical reasons but also for enabling the organisational structures that are needed to convene the relevant actors in a coherent and efficient way. Efficient governance structures with clear leadership are needed to successively develop the corridors.

> EU to further improve the corridors by offering financial support and promoting efficient management structures.

3. Efficient feeder transport and smoothly working terminals are also essential components. The last mile problem is a serious barrier for modal shift and it might be overlooked by approaches focusing only on corridors. More efficient transshipment technologies in ports and other hubs are also necessary to reduce intermodal transport costs.

> EU and Member States to support city logistics service centres (CLCS), planning and market introduction of innovations, e.g. automatic transshipment facilities in hubs.

4. Substantial capacity increases may be achieved by making more efficient use of existing network/infrastructure, without costly extensions of infrastructure. Measures cover, for instance, building longer sidings and purchasing more powerful locomotives in order to allow for longer trains, or introducing faster freight trains that will increase capacity on lines with mixed traffic. A requirement for success here will also be cooperation among intermodal freight operators in order to fill the longer trains. Finally, running longer trains must be economical for the operator, and so the structure of fees needs to be adjusted.

> EU and Member States stimulate and financially support a range of small cost-efficient investments, including improved track maintenance, which together may have a substantial effect on capacity. EU to promote efficient charging schemes.

5. IWW and short sea shipping still have substantial potential to be tapped with comparatively small funding needs. A key measure in a scenario of tight public budgets is to raise the capacity of inland ports by careful spatial planning and financial support. The bottlenecks for short sea shipping are mainly the capacity and efficiency of ports and hinterland connections.

> EU, Member States and cities to jointly raise capacity and efficiency of inland ports and sea-ports. Also to raise status of IWW as a modern and sustainable transport mode.

6. Port hinterland development by financing new dedicated freight tracks is important. Goods that arrive by ship need transshipment anyway, whether it is to trucks, trains or barges. With new transshipment technologies, the extra (expensive) transshipments required can be reduced from two to one, compared to a shift from dedicated road transport.

> EU and Member States to contribute to financing infrastructure, but in return request ports to achieve a certain (high) modal share for rail and waterborne in hinterland transport.

7. A different way of reaching the long-distance freight goal would be large-scale investments in new rail tracks, as highlighted in policy package B. Such a development might be triggered by a will to radically extend the HSR passenger network, which would entail a significantly increased capacity for freight trains (and local/regional passenger trains) on old tracks. Such a scenario would require massive public funding. One of the few alternatives to achieve this would be to shift funding from road investments to investments in rail and waterborne transport.

> EU and Member States to raise awareness of the importance of modal shift.

8. If infrastructure is to be extended, it is important to communicate the overall benefits to the public and other stakeholders. The linkage between a high quality transport system and improved quality of life needs to be at the centre of debates.

> EU and Member States to trigger public debates about freight and to increase acceptance of corresponding investments.

9. Achieving a level playing field across modes is essential. The EU and Member States can level the playing field by implementing two types of measures. The first is to levy taxes that fully internalise the external effects of road transport (and of other modes), e.g. in the form of heavy vehicle fees such as those used in Switzerland. The second type covers a much better enforcement of current regulations in road transport. This refers to weight limits, speed limits and working time rules.

> EU to trigger and coordinate further action in this field. Member States to levy appropriate fees and to strengthen control of existing regulations and imposing more effective punishments.

10. Improved quality of services and reduced costs are necessary to attract customers to rail and waterborne transport. Continued and synchronised liberalisation of rail freight is one of the measures needed. Improved maintenance of rail tracks and IWW are also paramount in order to achieve satisfactory reliability and punctuality. Cooperation and alliances between actors need to be promoted to achieve customer-friendly intermodal services and utilise economies of scale. The booking of intermodal transport must be easier. 'One stop shops' that embrace all modes in the intermodal chains are much needed.

> EU to accelerate and monitor progress in this field and support good practices that enable a high level of cooperation in a liberalised market. The setting up of 'one stop shops' should be facilitated.

- M5: Shifting investment funding: 50% to rail, 50% to road (compared to 30%-70% in 2010)
- M6: Dedicated network for freight in 50% of the corridors
- M7: Extension of 90% of the corridors finalised
- M8: One stop shops established
- M9: 1,500 m long trains are widespread across the EU
- M10: Improved maintenance of infrastructure to ensure reliability
- M11: At most ports terminals are not a major bottleneck
- M12: Share for rail and waterborne transport in port hinterland transport exceeds 70%

8 Milestones

- M1: Stakeholder Forum established
- M2: Level playing field, all external costs are internalised
- M3: ERTMS fully operational
- M4: CLCS as a common element of EU transport systems

Based on the key findings of the project, the roadmap shown overleaf in Figure 5 was developed. It identifies key milestones, which are ordered according to which actors have primary responsibility for their realisation. Since several of the milestones are associated with considerable inertia, rapid action is necessary. As with the main messages, the importance of the respective milestones will vary with different external developments.

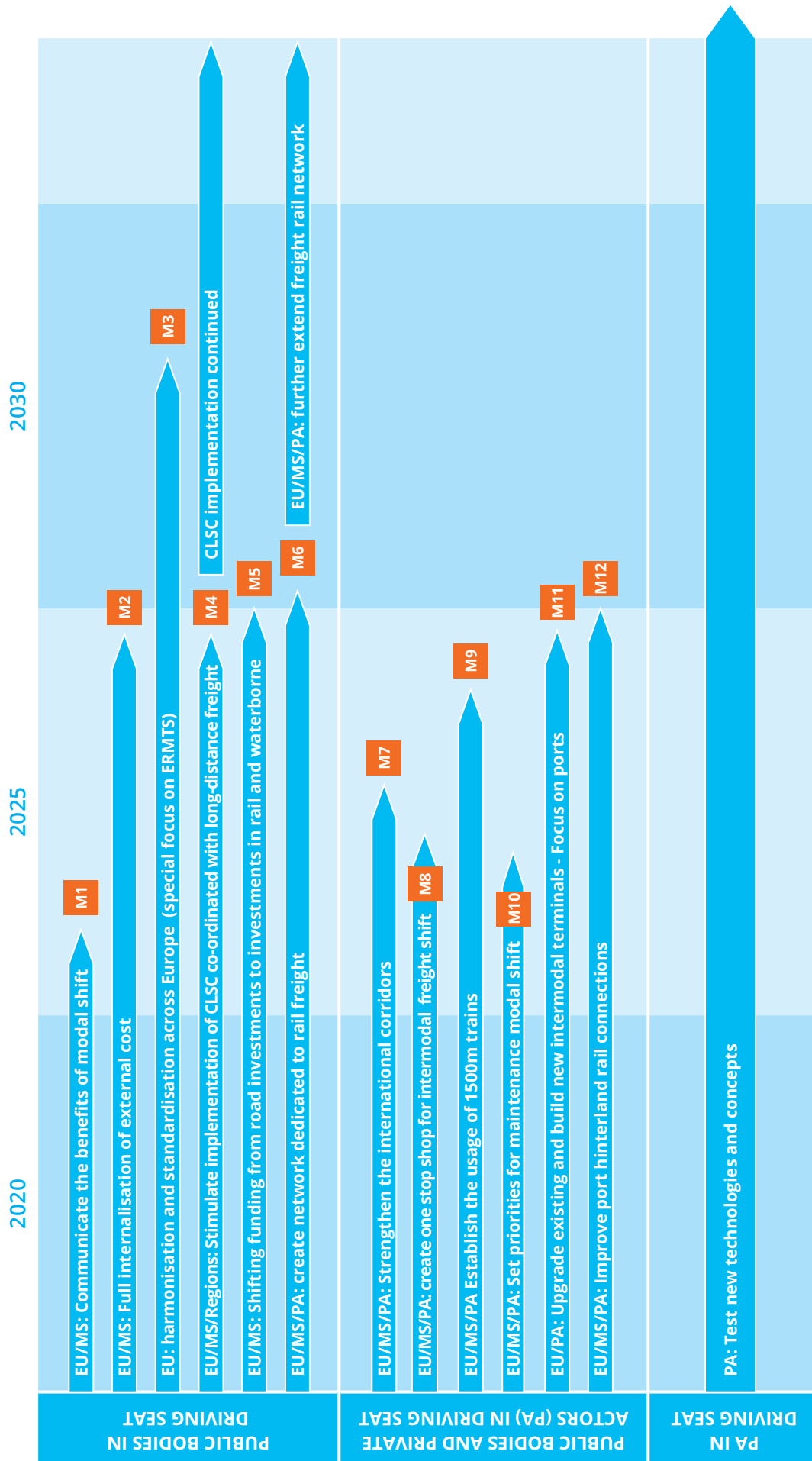


Figure 5: Long-distance freight roadmap

9 References

- European Commission, (2001). White paper – European transport policy for 2010: time to decide.
- European Commission, (2008a). Strategy for the internalization of external costs. COM(2008) 435 final.
- European Commission, (2008b). Impact assessment on the internalisation of external costs. SEC (2008) 2208.
- European Commission, (2009). A sustainable future for transport: Towards an integrated, technology-led and user-friendly system. COM (2009) 279 final.
- European Commission (2011). Connecting Europe: The new EU core transport network, MEMO/11/706 - 19/10/2011 Retrieved October 17 2014, europa.eu/rapid/press-release_MEMO-11-706_en.htm
- European Commission, (2013a). EU Energy, Transport and GHG Emissions Trends to 2050 Reference Scenario 2013.
- European Commission (2013b) Trans-European Transport Network: TEN-T Core Network Corridors.
- KTH Railway Group, (2013). Roadmap for development of rail and intermodal freight transportation – high capacity transports for rail – green freight train, Forum for innovation in the transport sector, Stockholm, April 2013.
- PPC intermodal transport [Figure 3]. (2014). Retrieved November 14 2014 from www.pccintermodal.pl/bazy/pccintermodal.nsf/id/EN_Intermodal_connections
- Verband Region Rhein-Neckar [Figure 2]. (2015). Retrieved February 15 2015 from www.m-r-n.com/en/home.html. See also <http://code-24.eu/>

ACRONYMS AND ABBREVIATIONS

EEIG European Economic Interest Group
 ERTMS European Railway Traffic Management System
 GHG Greenhouse gas
 IWW Inland waterway
 R&D Research and Development

Ro-Ro Roll-on-Roll-off
 TEN-T Trans-European Transport Network
 TKM tonne-kilometre
 ZARA Zeebrugge, Antwerp, Rotterdam, Amsterdam

Summary of the Roadmap on High-speed Rail

HIGH-SPEED RAIL - ROADMAP SUMMARY

1 The White Paper goal on High-speed Rail (HSR)

TRANSFORuM's Thematic Group on HSR deals with goal no. 4 of 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.

Any discussion about the European HSR system has to take into account a number of key principles as they emerged from the stakeholder consultation process:

1. A sensible extension of the network must obviously go hand-in-hand with an increase in demand for HSR. It is therefore necessary to focus on improvements to the quality and diversity of services as well as to improve capacity assessment methods in order to optimise the utilisation rate of the existing infrastructure and rolling stock.
2. Justice needs to be done to the different national rail system models. According to Pagliara (2014) they can be classified into:
 - the French HSR system, conceived of only for passengers, set up on new lines with peak speeds of 300 km/h and non-stop connections between metropolitan areas (focus: high speed);
 - the German HSR system, mixed traffic (passengers and freight), also serving 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 of 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.
3. The underlying rationale for HSR has conventionally been speed; but travel time is not necessarily a waste – it can be used for productive activities (Givoni and Banister, 2012). The focus on speed thus needs to be complemented with consideration of on-board and off-board services (e.g. work and leisure facilities on trains) that enhance users' experience and for connectivity with the urban and international transport networks (airports, intermodal services, local stations etc.)
4. Insofar as time and costs obviously do matter, it's the door-to-door journey that counts, be it inter-modal or not. Therefore, the European HSR network should be integrated in the wider transport system, including its local and regional branches.
5. The perception of the White Paper goal among the consulted stakeholders was 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, an extension of the HSR network and an improvement of the infrastructure service. Conversely, in currently poorly-equipped countries, these investments will be dedicated to the creation of a network on a high-demand axis. 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 in the case of Eurostar or Thalys), as well as the literal construction of new HSR lines where there are none.

2 Pathways towards the goal: HSR within the Single European Railway Area

The measures identified through TRANSFORuM's stakeholder consultation process are depicted overleaf.

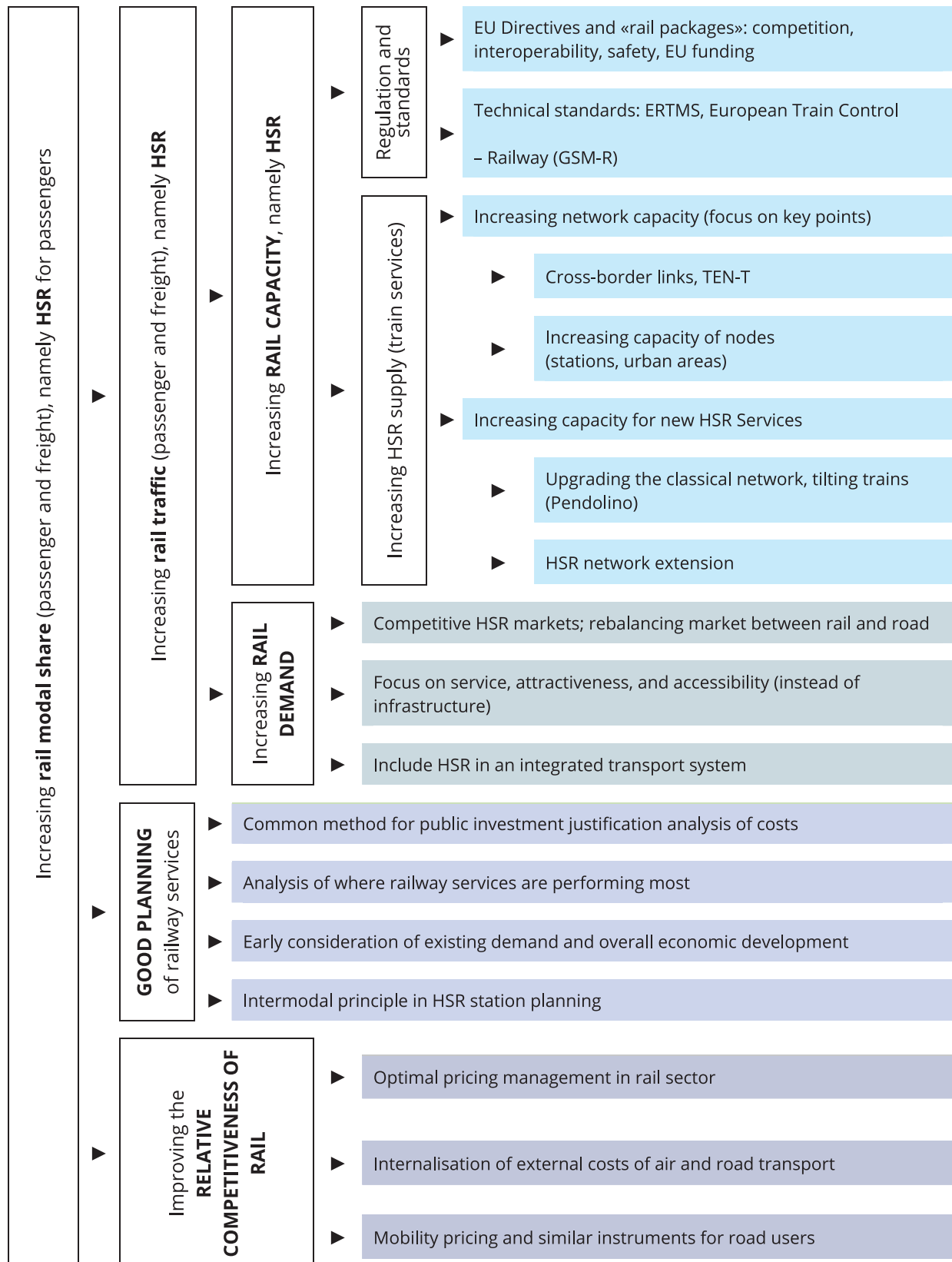


Figure 1: Structure of measures towards the HSR White Paper goal

(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).

3 Trends

During TRANSFORuM's Gdansk workshop in June 2013, major trends that influence most HSR planning schemes – whether constraining or supporting them – were identified. TRANSFORuM's deliverable 3.1¹ highlighted the most important cross-cutting and HSR-specific trends. They include the quite recent widening of the HSR rationale from its previous exclusive focus on speed towards a perspective that more consciously takes service quality (incl. internet access and power sockets) and improved connectivity into consideration (through seamless transport measures, corridors and station design etc.). In this summary, we present the following, non-exhaustive, list of some important trends:

- Research on HSR across the world highlights the weight of territory-specific potentialities in defining national HSR network. TRANSFORuM's HSR group and the various stakeholders consulted during the project all agreed on a closer cohesion between urban and territorial planning, and the expectations of HSR impacts on the urban and rural socio-economic landscapes. These factors can be called the “external” factors of success of HSR (as opposed to internal ones: speed, costs, number of stops etc.). Such particular potentialities are hard to assess and hard to anticipate. It therefore lies in the responsibility of project managers and researchers to consider territorial geography as one major factor of whether HSR is or not relevant to serve a region.
- The current scarcity of public funds increases the opportunity costs of projects (or cost of sacrifice) and burdens of project schemes. Being capital-intensive, HSR projects are being prioritised regularly, along this cost of public funds, in order to reduce pressure on subsidies. Coping with this issue is also the main reason for the growing interest in public-private partnership (PPP). But to attract private companies and to match their requirements (in terms of return on investment and profits) guarantees are to be carefully considered. Not only is the investment enormous, but lifecycle costs have been identified by our stakeholders as one major criterion of private players' willingness to invest in a project. Information and estimations are to be as precise as possible, but to create incentives for private firms to invest in HSR; public authorities must guarantee traffic risks (or commercial risk) in case their levels don't reach expectations. It also implies a consideration of the danger uncertainty represents for private firms and a potential compensation plan that copes with this particular issue. Conversely, such practices would enable higher efficiency allowed by the application of private firms' traditional optimisation of costs.
- The reinforcement of the need for a better political and institutional understanding of the projects and their financial implications over a long-term 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 and information 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 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.
- Technological needs for global transport data (or big data) in order to orientate pricing strategies and offer adjustments to a more precise knowledge of demand. This implies a strong cooperation between actors (sometimes competitors), but also between infrastructure managers and operators, and between operators of different modes. A successful result could be the improvement of frequency and connections between modes. The development of door-to-door and seamless transport could logically follow.

¹ Summary on main policies, funding mechanisms, actors and trends – see www.transforum-project.eu/resources/library.html

4 Processes and policy packages towards achieving the goal

The table overleaf is the proposition TRANSFORuM's HSR Thematic Group and its stakeholders established in order to tackle the major development challenges European HSR faces. The policy packages were developed after a process which identified the two main issues addressed by the White Paper goal: the existing capacity and new infrastructure development on the highest demand corridors and the expected shift of demand towards rail that HSR, through the reinforcement of its competitiveness, can support. But as pointed out in the workshops organised throughout the project, there are, across Europe, various national railway networks that need different adjustments, some incremental (improvement of service, of connectivity, of utilisation rate, of the existing capacity) and some radical (building of new infrastructure).

In other words, creating new high speed lines is, in some countries, not necessarily the answer to cope with demand. Indeed, few high speed lines in Europe are saturated and, on developed networks, capacity issues are mainly concentrated around hubs. Such variety of situations is the reason why TRANSFORuM developed 4 different policy packages, each addressing one particular HSR issue and offering relevant solutions. They are not exclusive but give a clue about how public and private funds can be spent more wisely and more efficiently in order to improve or reinforce HSR's competitiveness for consumers.



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 multi-level governance (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)

5 References

- French Court of Accounting (Cour des Comptes). (2014). La grande vitesse ferroviaire: un modèle porté au-delà de sa pertinence (Rapport public thématique) (p. 173). Cour des Comptes. Retrieved from www.ccomptes.fr/Publications/Publications/La-grande-vitesse-ferroviaire-un-modele-porte-au-dela-de-sa-pertinence
- Givoni, M. and Banister, D. (2012) Speed: the less important element of the High-Speed Train. *Journal of Transport Geography*, 22: 306-307
- Nash, C. (2010). Cost-benefit analysis of transport projects - a critique. In *Applied Transport Economics - A Management and Policy perspective* (De Boeck, p. 596). Eddy Van der Voorde, Thierry Vanelander
- Pagliara, F. (2014). A quantitative analysis of High Speed Rail Systems impacts. *Mémoire d'Habilitation à Diriger les Recherches (HDR)*

ACRONYMS AND ABBREVIATIONS

CBR	Cost benefit ratio
ERTMS	European Railway Traffic Management System
HSR	High-speed rail
MLG	Multi-level governance
PPP	Public-private partnership
PSO	Public service obligation

Summary of the Roadmap on Multimodal Transport Information, Management and Payment Systems

MULTIMODAL TRANSPORT INFORMATION, MANAGEMENT AND PAYMENT- ROADMAP SUMMARY

1 The White Paper goal on Multimodal Transport Information, Management and Payment (MIMP)

TRANSFORuM's Thematic Group on MIMP deals with goal no. 8 of the European Commission's 2011 Transport White Paper (European Commission, 2011):

By 2020, establish the framework for a European multimodal transport information, management and payment system.

Establishing a common European multimodal transport information, management and payment system has the potential to ensure that any kind of transport is carried out in the most efficient manner, while taking into account various mode-specific features and limitations (e.g. comfort, price, speed, flexibility, reliability, etc.). Such systems should allow users to optimise their choice of transport mode(s) depending on their different selection criteria (e.g. cost minimisation, speed, emissions, schedule and ease of use). This way it is possible to make efficient use of existing infrastructure resources and at the same time to ensure cost efficiency and minimal environmental impact while meeting user needs and thus helping to achieve the overall emission reduction target.

2 Understanding the White Paper goal

TRANSFORuM understands the term ‘framework’ in the wording of the White Paper goal in the sense that it only provides necessary preconditions for MIMP systems to be implemented on a national and, ultimately, a European scale. The framework considers general conditions and specifies the actors that need to be involved. It does not, however, in itself encompass the implementation of the actual techni-

cal systems. Instead, it must ensure a common legal and technical basis to lower the access barriers for passengers and at the same time guarantee efficient and fair participation in the market for the different operators and service providers.

In practice, we may be looking at a framework made up of different parts, one for information, one for management and one for payment and ticketing. This would allow for the different requirements these different components have, their different levels of maturity and the different challenges involved in each of them to be taken into account. An important task of the overall framework is to ensure that the respective parts are not in conflict but, in fact, complement each other and support integration and harmonisation where it is needed and beneficial.

3 Background, trends and barriers

3.1 Brief mapping of the field

In order to make the whole transport system greener, more sustainable and more efficient, the provision of seamless multimodal door-to-door mobility is crucial. A MIMP system will also play an important role to support several other targets of the White Paper. On closer examination, this system actually consists of three different systems – information, management and ticketing and payment – each adding an additional layer of complexity.

The ‘information’ part is more integrated than the other elements like payment or ticketing. If an integrated system includes ticketing and payment functions, higher demands must be met, especially with regard to privacy, liability and security. To ensure efficient management, reliable real time information is one of the basic prerequisites. A lot of different players from different modes with different (commercial) interests and business models are involved. Each system on

its own can contribute to the overall efficiency of the transport system, but they must be seen in combination in order to get the optimal benefits.

For example, better information on availability increases the likelihood that a transport option will be used. On the other hand, even the best information will not be sufficient if booking options are unclear or not easily accessible (e.g. due to the need to change between different portals). How far this integration must go is of course a matter of debate and eventually it must be a trade-off between costs and benefits. So ultimately, it is not necessarily one single MIMP system but rather a combination of systems that are linked to each other that will offer the necessary services and support multimodal transport.

Currently, numerous individual solutions exist at local, regional and national levels. It is a very dynamic field, but systems usually only cover certain geographic areas and data availability is often limited due to proprietary solutions by established operators. The limitations of existing legislation would need to be overcome, with clear terms and conditions for the use and re-use of data. Legislative measures at the EU level may support data sharing and thus encourage industry to devise different solutions. A step-by-step approach and process is necessary, as the field can develop in different directions with different advantages and disadvantages.

The potential benefits of integrated transport, both in monetary and non-monetary terms, have been shown in different studies (e.g. Preston, 2012). However, the key challenges in achieving a more integrated European system are not primarily technical but rather relate to 'soft' areas like having a clear vision of the future of the European transport system, and the willingness of all actors to cooperate in a competitive market and agree on a level-of-service quality which is necessary to ensure efficient and seamless mobility. This requires the commitment of all relevant stakeholders as well as funding to support the initial decision-making process.

3.2 Relevant trends

There are a lot of different trends which may have an impact on future developments in this area. Some may be highly relevant in the future although their possible impacts cannot yet be fully grasped (e.g. social media).

Nevertheless these must be considered and observed carefully in the future. Some of the trends covered in the TRANSFORuM MIMP Roadmap include:

- A shift away from the perception of cars as status symbols towards other technological consumables, such as the smartphone. Indeed, mobile computing, in the form of tablets and smartphones will continue to have a large impact on how users access MIMP systems;
- Social media, computers, smartphones, etc. have increasingly led to bottom-up approaches to information provision, filling gaps left by the transport operators, which puts on an enormous pressure on operators to provide better service quality;
- The willingness to pay for information only exists if a service provides notable additional value to the users, since a lot of free services are available. In this area, new inventions like for example, smart-watches or Google Glass (Google, 2013) could have a significant impact, but could also bring up discussions about data protection and privacy issues for the user and the people around;
- The question of possible surveillance is one that is being asked more frequently than in the past and any MIMP systems must stand up to public scrutiny and ensure that privacy and security issues can be addressed satisfactorily. If this is not the case, then this might be an issue where, in the long run, public acceptance could be lower than expected and thus a European MIMP system may have very little impact on modal choice.

All these and other trends must be seen as opportunities to which one has to react rather than as threats. It should also be seen as an encouragement for further cooperation both within one mode (e.g. different train operators) as well as between modes to offer the best services for customers and make multimodal transport more attractive.

4 Steps towards a MIMP system

In order to reach the White Paper goal, we actually have to deal with three different systems (information, management and payment). These systems are closely related to the data they use, to infrastructure and communication channels. At the same time, they are very different with regards to timeliness, security, trust, liability and so forth. Different actors are involved to differing degrees as well. What binds them together is that they all rely on information, either as a user or as a provider – and very often as both. We already see some problems involved – privacy and security. The closer it gets to being a real time system; the more this becomes an issue. It is not yet clear how and to what extent the three systems will ultimately be integrated.

In the next sections the three topics of information, management and payment will, as a first step, be treated separately, trying to capture the status quo and suggest possible ways forward. The last section relates to the potential of integrating the three systems.

4.1 Topic A: Multimodal information system

Multimodal information is currently the most developed of the three topics in Europe. Current Directives (e.g. PSI, ITS, INSPIRE) also already address how and what data must be made available. Nevertheless, there is still a long way to go before reaching a truly European multimodal information system. This is due to enduring concerns over data availability, the willingness to share existing data and certainly also a lack of a convincing business models. Moreover, clear, shared expectations concerning the role of the public and the private sector are also missing.

What has become clear through the TRANSFORuM process, however, is that a truly European information system must take into account all systems already in place and provide interfaces to help connect them. In addition, it must be ensured that all those participating in such a system will not have a competitive disadvantage. In the long run, such a system should

be advantageous to all actors involved and the general public as well, and a detailed assessment should be carried out to evaluate this.

4.2 Topic B: Multimodal management system

A multimodal management system should help make best use of the available transport resources, avoid or reduce congestion and react to different kinds of disruption. This is furthest developed in urban areas, where there is a direct interest to manage different modes of public transport in an efficient manner, especially if only one actor is involved.

The TRANSFORuM Roadmap highlights many possible steps that need to be taken in order to reach this sub-goal. Some of the most important ones are:

- Management system operating on all geographic levels and data exchange between regions and countries are crucial to ensure seamless medium- and long-distance transport. Therefore, for cross-border transport, interfaces must be defined in order to provide relevant information to all users;
- Awareness that there may be no business case, unless it helps to increase efficiency of a particular network – but intermodal management systems are of high public value and the EU should support further development and implementation of these over the coming years;
- A perspective on specific corridors (i.e. a core network connecting Member States and regions) may be helpful as these are cases where multimodal management has a larger potential impact. These may also benefit from existing protocols between transport management institutions;
- Awareness that multimodal management may not be the most useful instrument to make the transport system more efficient (e.g. by encouraging modal shift). Instead, this can only happen if other improvements like better public transport infrastructure or the introduction of fair pricing across transport modes take place in parallel.

4.3 Topic C: Multimodal payment and ticketing system

Fare management is most complex when combining different modes and operators. How to deal with promotions, group discounts, weekly or monthly passes etc.? Many actors are involved in setting up a multimodal payment and ticketing system, e.g. customers, public transport authorities and operators and the payment industry. For the transport industry, the long-term advantages would be that services become more attractive to customers and should also lead to a reduction of costs. Integrated ticketing is beneficial for both daily commuters who have to use different modes of transport as well as those who have varying or less frequent/regular travel patterns.

Achieving these systems would mean changing many back-office processes. Public acceptance is very important, and the introduction of any new system will probably encounter resistance unless it is well-communicated. The awareness-raising related to privacy and security is also something to consider. In the field of ticketing, standards are already well-established, e.g. the ISO/IEC 24014-1 standards for fare management systems (implementation specification for the use of smart ticketing published in 2013) which is due to the high sensitivity of any payment and ticketing operation.

Of course, many problems remain: the distribution of collected fares among different operators might be one of the most challenging. But robust suggestions also exist about how progress can be made. The full version of the TRANSFORuM MIMP Roadmap contains 15 of them.

5 Considering different contexts across Europe: A perspective on Central and Eastern Europe

The current process of expanding the EU through the accession of a number of new Member States began in 2004. Countries in Central and Eastern Europe which were formerly under the regime of socialism wanted to join the project of European integration. To affiliate to the EU, a state needs to fulfil economic and

political conditions. The transport sector is an important area for the national economies of Central and Eastern European countries, influencing virtually all domains of public and private life as well as the business sphere. It is a very financially demanding sector but at the same time it also contributes significantly to public budgets. This sector represents a necessary condition for improving the competitiveness of Central and Eastern European countries, as with the rest of Europe, mobility is a key part of modern life. Private and business travel has become possible and affordable for increasing numbers of people in the EU. Multimodal information is an important factor for smart and seamless door-to-door mobility. The potential societal, environmental and economic benefits of multimodal travel information and planning services are huge (European Commission, 2014).

Every state, every city has its own historical, geographical, socio-economic, demographic and business characteristics. That is why transport requirements are not the same everywhere – each region has its own requirements and priorities which fit with its distinct administration, institutions, organisation and planning. Local policies are influenced by both EU regulation and specific national legislation. Many cities are implementing systems utilising different MIMP elements, but they are not compatible with each other because they use different technologies, or are based on different formal and legal solutions (Catch-MR, 2012).

It is clear that MIMP systems are being developed at a very slow pace, in Central and Eastern European Member States, as well as in the rest of the EU, on the basis of voluntary coordination of key players and by means of incentive funds from public budgets. This allows defined strategies and transport policies to be met at both national and European level. This is long-term process which often exceeds the lifespan of the implemented systems.

There are not specific challenges that could be generally considered in relation to just new Member States or Central and Eastern European countries. Within Central and Eastern Europe we can find diverse public transport organisation. We can say that in a majority of these countries, public transport has a long history. In the Communist era public transport organisation worked quite well as there was no competition between carriers and central management

was applied. The subsequent privatisation of public transport has resulted in fragmentation into functional units.

Then there are systems where services are run by several competing companies. The resultant situation means that if you buy a train ticket, you have to know not only where and when you want to go, but also with which transport company. The tickets are valid only for one transport company and not necessarily for others. Also competition can lead to situations where connections do not function.

Such a complicated situation obviously causes problems for information as well. There are search engines that enable journey planning but often cannot provide information about transfer connections (although they may say that they do) and none of them have data from all carriers (such cases can also be found in Western countries).

On the other hand we can also find well-organised public transport within Central and Eastern Europe, for example in the Czech Republic where (urban) public transport still has a high modal share in comparison to EU-15 countries (Union of Passengers in Public Transport in Czech Republic, 2013). This success began with the development of integrated transportation systems at the beginning of the 1990s. Nowadays the individual systems, formally administered by counties (municipalities), are integrated at various levels.

Generally we can say that within cities in most of Central and Eastern Europe, the public transport works and is organised very well – even from a MIMP point of view. After the privatisation of city public transport companies, a business model similar to a joint-stock company – where a city is the only shareholder – has often been applied. The reason for this is simple – such a small company is much more flexible than the city administration. We can find competition between carriers and reluctance for MIMP integration more in intercity or regional public transport.

6 European integration

It is assumed that eventually there will not be one European MIMP system but a number of systems, be it local, national and sometimes European, for either

information, management and payment and ticketing or a combination of these. The essence of a future truly intermodal European system is in the interfaces, data formats and standards, security and privacy systems, defined minimum service levels and in general, a common understanding of what is being done and why. Such an approach must, however, reconcile contradictory interests.

As a first step there must be an agreement as to how far the integration of the different systems should go and what benefits can be achieved by this integration. Benefits must be examined both for the different actors and for the European transport system, and alongside the achievement of the White Paper goals in general. When looking at actors, the role of the public and private sector is extremely important. On the one hand they must cooperate to a certain extent; on the other hand they are in competition.

In the different areas of information, management and payments systems, this applies to varying degrees. One actor perhaps plays the most important role in speeding up integration – the traveller. As instant information and comfortable interfaces are seen as a minimum requirement nowadays, all actors in the transport sector must try to meet these expectations or otherwise lose potential customers. So when we talk about the willingness of actors to participate in integrated MIMP systems – whatever form these might have – this will soon not be a matter of choice, but of survival. At the same time the wider policy dimension must be considered, e.g. reduction of greenhouse gas (GHG) emissions, optimal use of infrastructure, maintaining a certain level of service, and so forth.

At the ITS European Congress Helsinki in June 2014 it was shown that there are already many projects implementing cross-border multimodal travel services, but in order to reach full interoperability and real cross-border solutions with existing services, international agreements are necessary to avoid the need for new middleware-platforms. If interoperability between services throughout Europe is to be achieved, this would require a central platform, with a central actor operating it.

Other approaches to achieving cross-border functionality include the standardisation of interfaces/protocols or the exchange of data among various regions or countries such as the EDITS project proposes. It

might be the case that total interoperability will be unachievable because of limited demand, relatively high cost to address organisational issues, and the necessity of multiple platform interfaces (ITS European Congress Helsinki 2014, 2014).

The figure below is designed to illustrate the multifaceted integration challenge. The TRANSFORuM Roadmap outlines a multitude of measures towards a framework for each sub-topic – information (A), management (B), and payment (C). This corresponds with the fact that it will not be possible to create a single all-encompassing system that fulfils the requirements of all three topics (see above).

However, the preparation (1) and creation (2) of systematic interfaces between the topics and systems must be kept in mind throughout the process – and this is where the measures proposed in the present section play their role. The current unsystematic and sometimes confusing practice of linking single systems needs to be overcome by agreements and a reasonable balance between cooperation and competition as outlined above. While the White Paper goal itself 'only' refers to establishing a framework until 2020, such constructive collaboration will allow for fully functional systematic links between information, management and payment systems to be made in the more distant future.

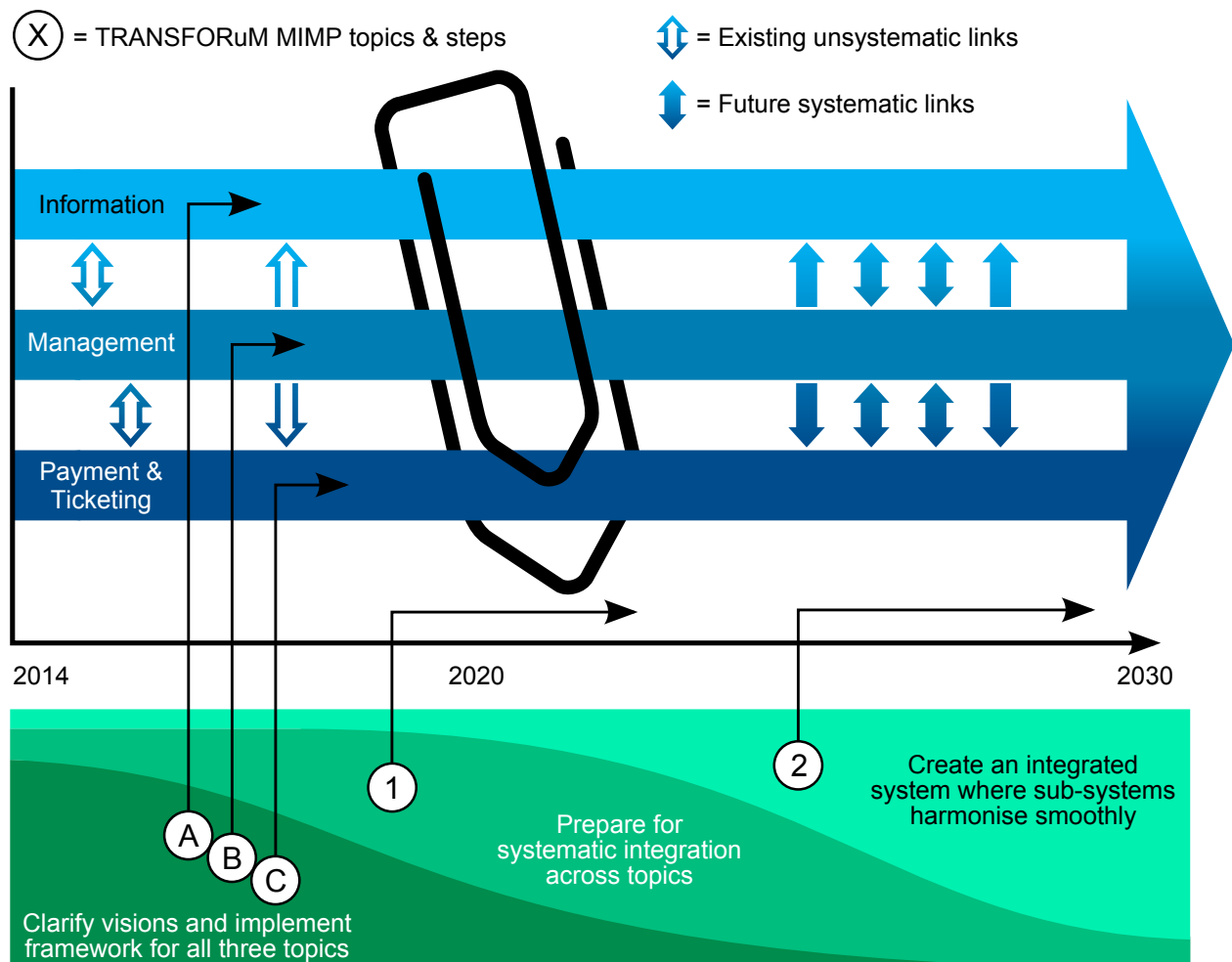


Figure1: Moving towards the White Paper MIMP goal

7 References

- Catch-MR (Cooperative approaches to transport challenges in Metropolitan Regions) (2012). Moving People: Towards Sustainable Mobility in European Metropolitan regions. Retrieved July 17, 2014 from www.catch-mr.eu/public/DB_Data/files/Downloads/Catch-MR_Guide_Towards-Sustainable-Mobility-in-MRs.pdf
- Digital Agenda for Europe. A Europe 2020 Initiative. Connected Continent legislative package. Retrieved November 1, 2014 from ec.europa.eu/digital-agenda/en/connected-continent-legislative-package
- Digital Agenda for Europe. A Europe 2020 Initiative. Data. Retrieved November 1, 2014 from ec.europa.eu/digital-agenda/en/content-and-media/open-data
- Digital Agenda for Europe. A Europe 2020 Initiative. Roaming. Retrieved November 1, 2014 from ec.europa.eu/digital-agenda/en/roaming
- European Commission (2011): White Paper on transport 2011: Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system. Retrieved November 1, 2014 from ec.europa.eu/transport/themes/strategies/2011_white_paper_en.htm
- European Commission (2014). Towards a roadmap for delivering EU – wide multimodal travel information, planning and ticketing services. Commission staff working document. SWD(2014) 194 final. Brussels. Retrieved July 17, 2014 from [ec.europa.eu/transport/themes/its/doc/swd\(2014\)194.pdf](http://ec.europa.eu/transport/themes/its/doc/swd(2014)194.pdf)
- European legislation on reuse of public sector information. Retrieved November 1, 2014 from ec.europa.eu/digital-agenda/en/european-legislation-reuse-public-sector-information
- Google (2013). Google Glass. Retrieved May 1, 2014 from www.google.com/glass/start
- ITS European Congress Helsinki 2014 (2014). Congress Report. Retrieved September 11, 2014 from www.itsineurope.com/its10
- Platform for cooperation and a coordinated approach for establishing ticketing interoperability for the Public Transport sector. Retrieved November 1, 2014 from www.smart-ticketing.org
- Preston, J. (2012). Integration of Seamless Transport, International Transport Forum Discussion Paper 2012-01. Retrieved July 20, 2014 from www.internationaltransportforum.org/jtrc/DiscussionPapers/DP201201.pdf
- Rail. ERTMS - European Rail Traffic Management System. Retrieved November 1, 2014 from ec.europa.eu/transport/modes/rail/interoperability/ertms/index_en.htm
- Union of Passengers in Public Transport in Czech Republic (2013), Sustainable urban mobility: New challenges or a new label for old problems? - The perspective of an association. Retrieved September 22, 2014 from fsr.eui.eu/Documents/WorkshopPaper/Transport/2013/130930EUUrbanTRSummarySustainability.pdf

ACRONYMS AND ABBREVIATIONS

GHG	Greenhouse gas
ITS	Intelligent Transport Systems
MIMP	Multimodal transport information, management and payment
PSI	Public sector information

Strategic Outlook

1 Strategic Outlook

The Strategic Outlook builds on TRANSFORuM's previous deliverables and looks into the future of the European transport system and attempts to derive conclusions for EU transport policies. Distinct from the roadmaps, this document takes a look at the period between 2030 and 2050¹, with a clear long-term perspective and focuses primarily on the uncertainties and unknowns that this time period presents for the delivery of the White Paper goals and beyond. These uncertainties facilitate the 'vision-character' of this document – it focuses on where Europe could be in 2050, and how we could achieve this.

The Strategic Outlook pays particular attention to the main trends – both cross-cutting and theme-specific – that will influence future developments, which have been identified throughout the TRANSFORuM project, and reflects on these over the longer term.

2 Cross-cutting trends

A number of cross-cutting trends (i.e. relevant in some way to all thematic groups of TRANSFORuM) were identified in Deliverable 3.1: "Summary on main policies, funding mechanisms, actors and trends"². It is not possible to consider the impact of each of these trends over the long-term exhaustively, so focus is given to the three trends expected to be particularly relevant in the context of the White Paper for this duration.

These are Europe's ageing population; trends associated with climate change (long term impacts and actions to address or build resilience to these); and GDP (in general terms as well as related to production and consumption). In the following, we explore the outlook for each of these trends and offer insight into how Europe can best plan or account for likely changes in the interim.

2.1 Ageing population in Europe

The total EU population is projected to be stable between 2010 and 2050. However, the share of

people over 65 will increase by 70% and the share of people over 80 will increase by 146%. This will entail fewer people of a productive age needing to support an increasing number of elderly people and has implications for transportation too.

Active mobility (e.g. walking and cycling) may be less plausible for the older population and more compact urban development may be required. Access to services, including high-speed rail (HSR), should account for an older clientele, with attention paid to enabling those with decreased mobility to retain or gain access. And whilst uptake of MIMP will increase, access to new technologies as they emerge, should not forget this tranche of society. Consumption patterns shifting towards services may have diverse impacts on the freight sector. A reduction in the need for long distance freight transport could be coupled with increased urban freight movements. Longer term planning to account for such demographic trends would ensure that financing is directed towards the most appropriate developments. Engaging aging populations, across Europe and locally, in the planning and development of transport and mobility systems, will facilitate more effective solutions that take into account needs and wants of this growing group. This should include representatives that will reach this age bracket over the next 35 years.

2.2 Energy and climate-related trends

According to recent 5th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) the transport sector accounted for 27% of final energy use and 6.7 Gt CO₂ direct emissions globally in 2010, with baseline CO₂ emissions projected to approximately double by 2050; and more than triple by 2100 (IPCC, 2014). Transport emissions could rise even faster than other sectors' and reach 12 Gt CO₂ equivalents annually by 2050. However, reductions in total transport CO₂ emissions of 15-40% are possible (Ibid.).

Aggressive and sustained mitigation policies are required. The decarbonisation of the energy sector is of increasing significance to the transport sector and these areas should work together more to find

1 Because the multi-modal information, management and payment (MIMP) goal is concerned with the period until 2020, the Strategic Outlook considers the period 2030-35 as opposed to 2050 for this goal.

2 Available at: www.transforum-project.eu/resources/library.html

solutions that are mutually beneficial. A major contributor to these reductions will be policies, which deliver much less reliance on oil, coal and gas in these two sectors by 2050 and significant investment in all types of renewables will be required in both energy and transport.

Recently industrialised and emerging economies will experience even greater emissions increases than Europe. Therefore, it is important that Europe plays a role in knowledge exchange, sharing experiences and good practices in lower carbon transport to facilitate reductions elsewhere. Additionally, impacts on the transport sector are highly unpredictable and it is difficult to envisage how the 2050 system will be affected by a changing climate. However, allocating more resources to improve resilience and accounting for risk in planning processes are certainly necessary in the interim. Awareness raising and long-term support is important, as is advanced information and control systems, contingency planning, staff training, and proper maintenance strategies. Current investment patterns in new infrastructure may need reconsidering, accounting for the increasing costs for repair and maintenance of the existing networks.

2.3 GDP-related trends

Economic stability is inherently short-term and prospecting the economy 35 years into the future is difficult and perhaps ultimately unhelpful. Nonetheless, a macro-perspective which considers trends related to growth is important.

Global GDP is predicted to rise from \$72 (€58) trillion (2010) to \$380 (€305) trillion by 2050 (Bassanini and Reviglio, 2011). Europe (the EU-28) will account for just 9% by 2050, down from 28% in 2010 (Ibid.). The implications of this decline may be far-reaching, but are difficult to predict. Europe could recentralise around particular sectors, or reindustrialise around new technologies and innovation – it is impossible to know for sure. Longer term investment in infrastructure, renewable energy and technological innovation are all-important in shifting the European economy onto a more low carbon trajectory and public-private partnerships (PPP) will play an increasingly important role in funding and supporting such comprehensive projects now and in the future.

3 Reflecting on long-term urban mobility in Europe

We know that more people will live in cities by 2050 and urban form and infrastructure will need to take account of this change. There are numerous specific issues that could be examined in the long-term context of Europe's urban mobility. Here three key trends are considered: alternative fuel investment, young people and urban deliveries as they will be important over the long-term.

The type of fuel and the technologies they will be powering in the longer term are difficult to predict. The IPCC suggests that until at least 2050 liquid petroleum fuels will continue to dominate the sector. However, breakthrough developments, most likely including the electrification of road vehicles, can help to drive emission reductions to 2050 and beyond (IPCC, 2014). The EU should continue to foster innovation around both technologies and fuels and strive to bring energy and transport sectors together to help push the boundaries, bring costs down and solutions to market.

As the current younger generations age, it is unclear whether we will continue to see the changing mobility behaviours that are demonstrating endure. Perhaps the current non-drivers will learn to drive in later life. Rapid changes in information and communication technologies (ICT) may continue to drastically change the current systems – driverless cars may be commonplace by 2050, perhaps urban development will have removed cars from our cities. As this section of the population will become one of the smallest, the influence that their behaviour has on overall urban mobility trends may decrease. As with the older populations, young people can play an important role in guiding the policy direction of Europe's cities and the EU should help to engage young people in the dialogue of the future of our cities.

Urban logistics and last mile need to get more attention in the medium- and long-term future. Understanding the current and future links between the White Paper and Sustainable Urban Mobility Planning (SUMP) is one such area where action now can help steer a clear path towards sustainable urban freight in the future. The many successful pilot projects that Europe's cities have showcased in recent years should be ramped up. There is vast potential for non-motorised and clean

energy technologies to play a significant role in reducing the environmental impact of the freight sector whilst ensuring the prosperity of the economy. New business models, consolidated delivery and a focus on service over products will be developed before 2050. Efficiency, interoperability and flexibility will be increasingly important considerations that can be promoted across Europe.

4 Reflecting on long-term long-distance freight in Europe

According to a comprehensive reference scenario (EC, 2013), total freight transport activity is expected to increase by 57% between 2010 and 2050 (1.1% p.a.). Road freight will grow by 55%, rail by 79% and inland waterway (IWW) by 41% (EC, 2013). Assuming a continuing share of 56% for tonne kilometres (tkm) above 300 km this means that, according to the White Paper goal, 760 billion tkm need to be shifted from the roads by 2050. This would imply that the growth in road freight would be limited to 12%; still a growth, but far from the projected 55%. To achieve the White Paper goal of switching 50% of road freight to rail and waterborne modes by 2050, a 180% increase in rail and waterborne modes would actually be required.

There are several key trends and unknowns that influence the possibility to reach this White Paper goal. Some of these concern the competitiveness of road freight. Due to the higher energy intensity of road freight it is more sensitive to increased energy prices. The reference scenario used places oil prices to around \$140 (€118) per barrel in 2050, but this projection faces considerable uncertainty (as has been witnessed since the middle of 2014). Following recent price spikes, the oil price has been in decline, reaching a quasi-historical low of under \$50 (€43) per barrel at the time of writing (NASDAQ, 2015). The availability and cost of unconventional oil in 2050 will constitute a key factor, as will the availability and price of viable alternatives. The ageing population will also mean there will (*ceteris paribus*) be less money in public budgets to allocate to infrastructure investments. A key challenge will then be to reallocate funding from road to investments in rail and waterborne.

Wages are an important component of road freight costs. There is a clear trend in road freight towards

an increasing share of drivers from Member States with comparatively low wages (indicatively €6,000 – Poland vs. €26,000 – Germany). The pace at which wages across the EU converge is important for the competitiveness of rail and waterborne freight. Moreover, a rapid increase in wages in countries like China may imply a relocation of some earlier outsourced production back to Europe (The Economist, 2013). A transfer of “cheap labour production” to regions like Africa is also possible.

As mentioned with relation to urban freight, changed consumption and investment patterns are obviously important for the development of freight demand and the possibility to reach the White Paper goal. E-commerce may impose challenges relating to the bundling of goods in order to achieve efficient rail or waterborne transport. If ‘the sharing economy’ is strengthened, it may decrease the need for larger consumer goods like cars. It would then also decrease the need for parking and road space, which in turn would decrease the need for transport of steel, concrete and asphalt.

There are substantial uncertainties regarding total demand and the breakdown of the demand for freight transport in 2050. To manage some of these unknowns, cooperation between and within sectors should be increased, cost-efficient upgrading of infrastructure, addressing key bottlenecks in the current system and plans for a more holistic network should be prioritised in the short-term.

5 Reflecting on long-term HSR in Europe

In order to deliver a long-term shift of medium distance journeys to rail, it is important not only to densify and optimise existing HSR (and conventional rail) infrastructure by increasing capacities on congested railway hubs, but also to improve accessibility and intermodality at HSR stations, and increase the competitiveness of the sector by providing better on-board experiences. Focusing on these measures in the medium-term could lead to a broader horizon in 2050, which has identified high-demand corridors and enabled the prioritisation of where additional projects should be developed.

The financing of HSR projects will remain an important consideration. Lifecycle costs need more consideration in existing and new infrastructure financing. Member States should acknowledge and provide for the specific long-term requirements that private sector partners will have when funding infrastructure. In addition, PPP frameworks need to account for long-term risk to be minimised and profit (or return on investment) maximised.

Another area that needs more consideration in the long-term than it currently receives is the changing fuel sources that will come into play, both within the rail sector and across other modes. As the road sector moves towards electrification, HSR should be doing the same, considering not just the electrification of those remaining lines not yet connected, but also working alongside utilities to push for the development of greener electricity sources, striving to make HSR more sustainable.

HSR needs a strong and clear definition that reflects the reality of diversity and complexity of the numerous different (national) operational models across Europe. Instead of harmonising models, perhaps there is a need to understand each model and orientate long-term HSR visions towards considering the pros and cons of each and facilitating their co-existence. Indeed, long-term management of the HSR network needs to be multi-level, cross-border and supranational and linked to other modes in order for it to operate smoothly and to maximise the benefits it can offer across the continent. Promoting knowledge-gathering and sharing platforms would facilitate the development of an efficient European HSR network in a common framework. This would help to improve acceptability among all stakeholders.

6 Reflecting on long-term MIMP in Europe

Because the White Paper goal for MIMP considers the timeframe until 2020, our Strategic Outlook cannot plausibly look much further beyond 2030 and in this respect it is a unique case.

In the long-term we expect the three different systems (information, management and ticketing/payment) to

grow together. At the moment they remain three distinct systems. In some cases more functions may be offered by one platform, but these very often deal with a single transport mode and/or a specific operator. Whilst numerous solutions exist across Europe, they are very often regionally specific or city-based. The biggest stumbling blocks are still interoperability between (and often within) modes, between different operators and across borders. However, developments such as social platforms, mobile computing, open data initiatives and a sharing culture, to name but a few, offer a promise of positive change and will continue to pressure established operators to offer accessible services. As establishing MIMP systems in Europe should help improve accessibility to public transport and support a shift from individual motorised transport, minimal information and quality standards must be ensured. Otherwise, the impact they can have on delivering this change could be very low.

Ultimately, the system should make it irrelevant to the traveller who the operator is, who carries out billing and payment and who provides the data. For the traveller it is relevant that everything is accessible (for example, removing language barriers), ideally provided through a single platform, reliable and trustworthy. Moreover, transaction costs must be kept to a minimum to ensure continuous usage. What and who is behind this, how all these systems are integrated should be of no direct concern to the traveller.

Whether it is one integrated system, or a number of different systems linked together through interfaces should, in the end, make no difference to the travellers. This, of course, raises a number of issues regarding, privacy, data security, sharing of confidential information which are not only of a technical nature but also concern the interests of travellers, operators and service providers alike.

7 Policy recommendations

Whilst specific recommendations have been offered throughout this condensed Strategic Outlook, relevant to specific trends and to each of the White Paper goals, there are a number of common recommendations, which would facilitate the long-term visions for European transport to be realised. Some of the recommendations below relate specifically to the Euro-

pean Commission, others to the Member States or the general population – some of them relate to a societal need for change and it is unclear who the drivers of such change should be, but perhaps this is where the Commission again could facilitate the dialogue to deliver against it in the long-term. The role of Europe in facilitating the wide exchange of good practices has been flagged by the OECD (OECD, 2012). In exporting around the world its model for environmentally sustainable infrastructure systems and smart energy policies, as well as the finance and know-how to produce them, Europe can help to move the rest of the globe towards a healthier, cleaner and more prosperous long term future.

- The EU should provide long-term perspective and goals, financial support and concrete, but flexible legislation as well as a framework to support and encourage long-term investment;
- All political levels should address the mismatch between short-term political cycles and long-term goals/issues, as well as about how short-term distinct projects fit with the longer term future;
- All actors need to mainstream and ‘be aggressive’ with low carbon to work towards a different reflection of current reality;
- Much more money needs to be allocated to building resilience and coping mechanisms;
- Much more attention on ageing is required in all policy-making areas;
- The inherent inequalities in mobility need to be addressed;
- The EU should promote sharing and exchange.

8 Conclusion

Whilst this Strategic Outlook offers a glimpse into some of the issues that will likely continue or rise to prominence in the long-term in Europe, it is clear that there is great uncertainty about how develop-

ments in the coming decades will affect our future. But it is clear that we can start to plan and help to shape this future. Some of the issues outlined in the TRANSFORuM roadmaps will endure. Locally-specific context for example will not go away and it is important not to advocate for one-size-fits-all approaches, but **adopt a more sensitive and flexible approach** to tackling the common issues that exist in specific, context-relevant ways. Things will continue to be different in different places; wants, needs, aspirations, trade-offs and priorities will range from city to city and across Member States and uncertainty makes any large-scale outlook complicated.

There are areas that the Commission can have a direct influence over – **promoting more diverse modal shares, facilitating knowledge exchange and planning for long-term investment** are but a few. Other elements, like the global system, economy, population trends, and changes to them, are out of their control and remit. Nonetheless, awareness and preparedness for likely changes can be deliberated and planned for. **Flexibility and reflection, learning by doing and broad engagement with diverse stakeholders** are elements of the policy making process that have been discussed time and again throughout the TRANSFORuM process and they should be taken forward, in the short-, medium- and long-term work that the Commission undertakes.

Vision and leadership are fundamentally important to realise the future we need as well as the future we want, so perhaps thinking now about the trends and measures that will have the largest impacts, as well as those that will be the most uncertain would be a good place to start.

The best recipe for resilience to unknown future trends is to **foster diversity**. Diversity is a rich store of adaptation capabilities. The opposite are monocultures and we must avoid monocultures of transport systems as well. In other words: we need to not put all of our eggs into one basket. More than 50% of modal share given over to cars is a systemic risk, as is investing solely in road freight, or new HSR lines. We have the tools to avoid such risk, we just need to implement them.

9 References

- Bassanini, F. and Reviglio, E. Financial Stability, Fiscal Consolidation and Long-Term Investment after the Crisis, OECD Journal: Financial Market Trends, Vol 2011, Issue 1, 1-45
- Climate adaptation (2014), Transport, Infrastructure and Building: European Scale: Vulnerabilities: www.climateadaptation.eu/europe/transport-infrastructure-and-building-european-scale/
- Doll, Claus, Klug, Stefan and Enei, Riccardo (2014), "Large and Small numbers: options for quantifying the cost of extremes on transport now and in 40 years", Natural Hazards, Vol 72. Issue 1, 211-239
- European Climate Foundation (2010) Roadmap 2050: A Practical Guide to a Prosperous, Low-Carbon Economy: Technical Analysis, www.roadmap2050.eu/attachments/files/Volume1_fullreport_PressPack.pdf
- European Commission (2011) Global Europe 2050, ec.europa.eu/research/social-sciences/pdf/global-europe-2050-summary-report_en.pdf
- European Commission, (2013). EU Energy, Transport and GHG Emissions Trends to 2050 Reference Scenario 2013
- Hazeldine, T. Pridmore, A. Nelissen, D. and Hulscombe, J. (2009) Technical Options to reduce GHG for non-Road Transport Modes. Paper 3 produced as part of contract ENV.C.3/SER/2008/0053 between European Commission Directorate-General Environment and AEA Technology plc www.eutransportghg2050.eu
- Hill, N., Brannigan, C.; Smokers, R.; Schroten, A., van Essen, H., and Skinner, I. (2012) Developing a better understanding of the secondary impacts and key sensitivities for the decarbonisation of the EU's transport sector by 2050. Final project report produced as part of a contract between European Commission Directorate-General Climate Action and AEA Technology plc www.eutransportghg2050.eu
- IPCC, (2014): Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA
- OECD (2012) Medium and Long-term Scenarios for Global Growth and Imbalances, in Economic Outlook, Volume 2012/1, www.oecd.org/berlin/50405107.pdf
- NASDAQ (2015) Crude Oil: WTI Nymex Price, 19th January 2015, www.nasdaq.com/markets/crude-oil.aspx?timeframe=18m
- PwC, (2013) World in 2050 The BRICs and beyond: prospects, challenges and opportunities, www.pwc.com/en_GX/gx/world-2050/assets/pwc-world-in-2050-report-january-2013.pdf
- Skinner I, van Essen H, Smokers R and Hill N (2010) Towards the decarbonisation of EU's transport sector by 2050 Final report produced under the contract ENV.C.3/SER/2008/0053 between European Commission Directorate-General Environment and AEA Technology plc www.eutransportghg2050.eu

ACRONYMS AND ABBREVIATIONS

GDP	Gross Domestic Product	MIMP	Multimodal transport information, management and payment
HSR	High-speed rail	PPP	Public-private partnership
ICT	Information and communication technologies	SUMP	Sustainable Urban Mobility Planning
IPCC	Intergovernmental Panel on Climate Change		
IWW	Inland waterway		



CONTACT DETAILS

Please direct your
correspondence to:

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

RUPPRECHT CONSULT
Forschung & Beratung GmbH