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GENERAL INFORMATION

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LIST OF ABBREVIATIONS

BAU	Business as Usual
CO2	Carbon Dioxide
EC	European Commission
GDP	Gross Domestic Product
HSR	High-speed rail
IPCC	Intergovernmental Panel on Climate Change
MIMP	Multimodal information, management and payment
PPP	Public private partnerships
tkm	tonne/kilometre

1 Information about the TRANSFORuM project

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

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

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

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

We paid careful attention to ensure a balanced representation of all types of stakeholders: Men and women, established large companies and innovative start-ups, representatives from all corners of Europe, suppliers and users, hardware and software companies etc. . This selection process was based on TRANSFORuM's first official deliverable ("Shaping the TRANSFORuM Network" – available on our website¹), which spells out the criteria that guides our stakeholder selection. To ensure the complete transparency of this process we made the list of attendees of our events always publicly available on our website. Our participants included representatives of city administrations, transport operators and mobility service providers, businesses, representatives of passenger organisations and other NGOs and members of national and European programmes and platforms.

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

This Strategic Outlook has taken the stakeholder debates in the following workshops as the starting point for consideration:

- A two-day workshop in Gdansk, Poland, in June 2013, which provided basic identification of key policies, actors, funding mechanisms and trends in each of the thematic areas, as well as an identification of barriers, challenges, and ways to overcome them;
- Four two-day workshops on good practice lessons and learning processes in the context of each of the thematic areas were held in carefully selected locations;
- A two-day workshop in Vienna, Austria, in January 2014 with a particular focus on cross-cutting issues between TRANSFORuM's four White Paper goals and a discussion of the preliminary roadmaps;
- Four two-day workshop to discuss each of the draft roadmaps 2.0, again in carefully selected locations.

2 Approach of the Strategic Outlook

This Strategic Outlook builds on TRANSFORuM's previous deliverables, particularly the four thematic roadmaps², 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 2050, 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. Focusing on where Europe could be in 2050, it identifies themes and areas that would enable a continuation of positive action towards the 2050 goals from where the TRANSFORuM roadmaps leave off in 2030.

There is one notable exception here, because the MIMP goal is concerned with the period until 2020, and with establishing a framework. The Strategic Outlook therefore focuses on the period to 2030-35 because it is difficult to envisage developments in this area over a longer timeframe once the framework is up and running.

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. These include changing societal trends – such as the implications of an ageing population – but also economic and environmental trends, such as extreme energy prices or the impacts of climate change, amongst others.

During stakeholder consultation in the TRANSFORuM project, it was acknowledged that the general framework conditions of transport policy will have changed in 2050, and as such, it is important not to lose the current vision of moving the transport system away from its oil dependence. This Strategic Outlook therefore explores visions of 2050 and works back to the 2030 in the roadmaps to understand where gaps or weak points can be identified. These will be highlighted as recommendations for relevant further research and policy activities. It was suggested by stakeholders that the recommendations for policy should be focused as high-level 'catalytic actions'; as such broad recommendations are made, instead of detailed and specific measures.

As well as drawing on reflections from the stakeholder engagement elements of the project, it also looks to other studies focused on the long-term to 2050. Chapter 3 takes a look at selected cross-cutting trends, chapters 4-7 reflect on each of the thematic goals of TRANSFORuM in turn, before chapter 8 offers some long-term 'catalytic' policy recommendations for Europe.

² The TRANSFORuM roadmaps will be made available at: <http://www.transforum-project.eu/resources/library.html>

3 Cross-cutting trends

A number of cross-cutting (i.e. relevant in some way to all Thematic Groups of TRANSFORUM) trends were identified in Deliverable 3.1: "Summary on main policies, funding mechanisms, actors and trends"³. 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 the 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.

3.1 Ageing population in Europe

It is clear that by 2050, the make-up of the European population will look very different from today. The total EU population is projected to be stable over the period 2010 to 2050. However, the share of people over 65 will increase by 70% and the share of people over 80 will increase by 146%. The ratio between the total population and those between 15 and 65 is thus projected to increase from 1.44 in 2010 to around 1.76 in 2050 (Lanzieri, 2011). This means that there will be fewer people of a productive age needing to support an increasing number of elderly people. Although upping the retirement age could counteract this to some extent, the associated costs of an older population (for healthcare etc.) may mean that funds that could be allocated to other policy areas, including transportation, may be reduced.

This also has implications for the types of passenger transport services that need to be offered. Focusing attention on active mobility (e.g. walking and cycling) may be less plausible for all people within the older sections of society and more compact and smart development may be needed, offering more public services in closer proximity to where people live. Land use planning needs to account for the entire population, but if the proportion of older people is going to increase, perhaps more attention to the needs of older people is required, particularly those that may be or become disadvantaged in some way. Access to services, including HSR should account for an older clientele, with attention paid to enabling those with decreased motility to retain or gain access. And whilst uptake of MIMP will increase,

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

it is important that more online/smart services do not preclude those without access to new technologies, even if this refers only to a marginalised minority to 2030-5..

Another effect of an ageing population is that consumption patterns may be shifted more towards services, which will to some extent reduce the need for freight transport. This however will also depend on where ageing people choose to live and to what extent policies encourage a shift of the older populations from rural to urban retirement. That the population growth in the EU is projected to diminish may also decrease the need for extending the stock of buildings, which in turn may also reduce demand for freight transport. Longer term planning to account for such demographic trends would ensure that financing is directed towards the right projects and the needs of the changing population can be accounted for.

3.2 Climate-related trends

By 2050, the impact of a changing climate will be increasingly felt in all areas of society, including on European transportation. And much more work will be needed in the interim to reduce the contribution of the transport sector to European and global emissions. 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 GtCO₂ direct emissions in 2010 globally, with baseline CO₂ emissions projected to approximately double by 2050; and potential to more than triple by 2100 (IPCC, 2014).

Whilst Europe is likely not to experience such continued radical growth, transport is the only energy-related sector where emissions are expected to continue rising to 2050 when considering a business as usual (BAU) scenario. Growth in emissions from increasing passenger and freight activity could partly offset future mitigation measures that include fuel carbon and energy intensity improvements, infrastructure development, behavioural change and comprehensive policy implementation. Overall, reductions in total transport CO₂ emissions of 15–40% could be achieved in 2050 (*Ibid.*).

There are indications that a vision of 2050 where the transport sector has been decarbonised is ambitious, as the world's leading scientists predict that 40% reduction in emissions is a best estimate. It is clear that much more work will be needed up to and beyond 2050 to achieve the goal of 60% reduction outlined in the White Paper. Indeed, aggressive and sustained mitigation policies are called for. If these are not delivered, then transport emissions could rise even faster than those of other sectors and reach up to 12 GtCO₂eq annually by 2050 (*Ibid.*). The decarbonisation of the energy sector could have vast implications for the transport sector and these areas should work together more over the coming years to find solutions that are mutually beneficial.

It is clear then, that efforts to date need to be significantly ramped up in order to mitigate the climate impact of the European transport sector. And because the Asian market and other emerging economies will be experiencing even greater emissions increases than Europe, it is important that Europe plays a role in knowledge exchange, sharing experiences and good practices in lower carbon transport both within its boundaries and in facilitating reductions elsewhere.

According to a recent study by Doll et al. (2014), in the period 1998-2010, very extreme weather events inflicted some €2.5 billion damages across all transport modes in Europe. The figure is estimated to be 10 times higher when all adverse weather damage is considered and an additional 20% could be added to include indirect (production losses, cargo damage, business trips cancelled etc.) The road sector currently takes the majority of the impact but it is estimated that by 2050, rail traffic costs, for example, may rise up to 80% due to increased flooding and unpredictable winter weather (*Ibid.*).

Future impacts are highly unpredictable and it is difficult to envisage how the 2050 system will be affected by a changing climate. However, increasing resources allocated to improved resilience and accounting for instability and 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. Improved vehicle technology and communication system can also help (Climate adaptation, 2014).

As well as introducing measures that can better plan for an uncertain future, current investment patterns should perhaps be reconsidered. Infrastructure investment should be carefully conceived of, reflecting the need to account for the increasing costs for repair and maintenance of the existing networks.

3.3 GDP-related trends

The stability of the economy, domestic, European or international, is an inherently short-term consideration and prospecting the economy 35 years into the future is difficult and perhaps ultimately unhelpful. Nonetheless, perhaps taking a more macro-perspective and considering trends related to growth, to production and to consumption is important in order to glean insight, which may be of use for present decisions with a long-term impact.

It is anticipated that the population will grow to nine billion people by 2050 and that GDP will rise in the same timeframe from \$72 (€58) trillion (2010) to \$380 (€305) trillion (Bassanini and Reviglio, 2011). Europe however, is expected to account for just 9% of global GDP by 2050, down from 28% in 2010 (*Ibid.*). The implications of this decline, as more emerging economies begin to exert their influence, may be far-reaching, but it is difficult to predict what they might be, for example, we will see a

centralisation and focus on particular industries in Europe, or a reindustrialisation of the continent, based perhaps on new technologies and innovation – it is impossible to know for sure. But the policy objectives stated in the White Paper need to be framed within this important long-term context.

Indeed longer-term investment in infrastructure, renewable energy and technological innovation are all-important in order to shift the European economy towards a low carbon trajectory and as stakeholders throughout the TRANSFORuM consultations emphasised, public private partnerships (PPP) may play an increasingly important role in funding and supporting such comprehensive projects now and in the future. In addition, at the EU level, PPPs provide leverage for key projects that deliver against more than one policy objective, such as: combating climate change; resource efficiency; investment in renewables; supporting sustainable transport; and affordable health care, for example (*Ibid.*).

4 Long-term perspectives for urban mobility in Europe

We know that more people will live in cities by 2050; indeed it is estimated that up to 70% of the global population will be urban in the next 35 years, up from more than 56% today. For the EU-28, where more than 70% of the population already lives in urban areas, the share is expected to grow beyond 80% over the same time period. As a result, it is clear that urban form and infrastructure will need to take account of this change. As was noted in the TRANSFORuM Urban Transport Roadmap, the diversity between cities cannot be ignored; there is no 'one size fits all' approach to sustainable urban planning as the needs, context and aspirations of each city will be different. The roadmap highlighted the governance frameworks and processes required to address both these differing contexts. Indeed promoting knowledge exchange and harmonising efforts through common frameworks such as sustainable urban mobility planning (SUMP) will remain essential enablers of change beyond 2030. More cities could start to introduce longer-term visions into their policymaking and efforts should be made to ensure that cities adopt more challenging long-term goals and implement significant measures in practice. Extending the city networks that were advocated in the 2030 roadmap past 2050 would be a means to deliver some harmonisation across the approaches undertaken, but such schemes will probably remain self-selecting and so will not be representative of the whole of Europe. Whilst we cannot envision a standard European model city of the future, it is possible to identify numerous specific issues that will have an impact on Europe's future urban mobility. Here three key trends are first considered: alternative fuel investment, young people and urban deliveries as they will be important across all cities 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 fictive city pathways that were developed in the roadmap all take different routes to 2030, each with a decreasing focus on internal combustion engines across all types of vehicles. Whilst the White Paper goal envisions that conventionally-fuelled vehicles will be phased out by 2050, it is unlikely that in 2050 there will be no fossil fuels being used in any vehicles across all of Europe's cities. It is likely that some of the visionary/leading cities are starting to realise their carbon neutral/fossil fuel free aspirations, but particularly in 'starter' cities, transformative efforts will have a later starting point and a focus on enhancing efficiency of the current system for some time to come and fossil fuels may still factor in the fuel mix by 2050. Major technological breakthroughs may of course occur in the next 3 decades, which have the potential to fundamentally alter the current situation and these cannot be discounted, however nor can they be anticipated or relied upon. In order to improve the situation and promote an

earlier, more ambitious switch to cleaner fuels, 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 grow older over the next 3 decades, it is unclear whether we will continue to see the recent changes in social norms, with respect to private car ownership and driving licence abstinence for a growing number of the young population endure. Perhaps the current non-drivers will learn to drive in later life, or as urbanisation and densification trends continue, perhaps they will opt out of obtaining driving licenses altogether. The change is very recent and unprecedented over the last century, where driver numbers have continually increased, so only time will tell if this is a short-term trend, or something which will become more societally embedded. It is of course possible that we may also see more of the middle age and older populations give up driving as alternatives, or driverless cars come to fruition in more urban areas across Europe.

Rapid changes in ICTs may continue to drastically change the current systems and facilitate such shifts. Perhaps urban development will have removed cars from our cities, but in the given time horizon this is unlikely. As the younger generation becomes one of the smallest across the population spectrum in Europe, the influence that their behaviour has on overall urban mobility trends may decrease and meeting the needs of the aging population may become more of a mainstream precursor to altering policy direction than perhaps it has been in the past. Either way, 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 the last mile of any given freight trip needs to be given more attention in the medium- and long-term future. Understanding the current and future links between the White Paper and Sustainable Urban Mobility Plans 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 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. Moreover, some of the trends identified as cross-cutting might have knock-on implications that will become clearer with time. For example, whilst an ageing population, or a sharing economy might reduce the need for long-distance freight transport, they may in fact generate an increase in the demand for local, urban freight – with deliveries being more localised and individualised. Such impacts need to be considered when developing plans for sustainable urban freight transport to ensure that new means of delivery can withstand such increased demand. 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.

In the urban roadmap that land use and urban form act as long-term drivers to mobility needs. While most strategic building blocks presented in the roadmap can be implemented within the 2030 timeframe, land use planning and (re)development are slow evolving processes likely to influence travel patterns as well as travel demand far into the future. In effect, integrated land use and transport planning can curb the overall *need* for transport – or at least curb the dependence on energy- and space-hungry modes such as private passenger vehicles. More compact and smart development, setting physical limits to city expansion, developing essential public services in closer proximity to where people live, encouraging localised production and consumption, and generally taking into consideration the feedback loops between land use and transport issues with consideration for individual needs, abilities, and opportunities (Geurs and Van Wee, 2004) would help to facilitate such longer-term changes. In essence, a vision of sustainable urban transport system for 2050 may well benefit from building “sustainable mobility into the patterns of urban form and layouts, which in turn may lead to a switch to green modes of transport” (Banister, 2008). This planning effort ought to start now and will require both a macro and a micro perspective on city planning.

5 Long-term perspectives for long-distance freight in Europe

According to projections from the EC (EC, 2013) road freight is projected to increase by 55% between 2010 and 2050, that is, from 1756 to 2721 billion tonne/kilometre (tkm). Assuming a continuing share of 56% for tkm above 300 km this means that, according to the White Paper goal, 760 billion tkm need to be shifted away from the roads until 2050. This would imply that also the proportion of long distance freight transport by road would still grow, it would need to be limited to 12% instead of 55% as in the reference scenario. Combined with the projected increase within rail and waterborne this means that a 180% increase in transport by rail and waterborne will be required by 2050. If these modes increase to the same relative extent it would mean that rail freight need to increase from 391 billion tkm in 2010 to around 1100 tkm in 2050.

There are several key trends and unknowns that influence the possibility to reach the White Paper goal over the long-term. Some of these concern the competitiveness of road freight. Due to the higher energy intensity of road freight compared to rail or waterborne freight, the former is more sensitive to increased energy prices. In the reference scenario used (EC, 2013) the oil price increases to \$140 (€118) per barrel in 2050. There is, however, a considerable uncertainty associated with this projection. The availability and cost of unconventional oil in 2050 will constitute a key factor, as will the willingness among politicians around the world to tolerate such fuels, which often have much worse climate impacts than conventional oil. Environmental changes such as a warming climate might also see new freight routes open up that have implications for long-distance freight transport in Europe. For example shorter transportation distances between Europe and Asia through opening of the North-West passage for sea transport.

Wages are another important component of road freight costs. Roughly speaking road freight costs (excluding terminal handling) are distributed rather evenly across three parts; wages, fuel and vehicle costs. At present there is a clear trend in road freight towards an increasing share of drivers from Member States with comparatively low wages. The significance of this trend is illustrated by the fact that a Polish driver on average costs €6,000 annually, while an average German driver costs €26,000. This means that it would take more than a tripling of the oil price (i.e. around \$300 (€260) per barrel) to neutralise the cost of a shift from a German to a Polish driver. From this it may be concluded that the pace at which wages in different parts of the EU converge (or a similar effect achieved by other means) will be of key importance for the competitiveness of rail and waterborne in relation to road freight.

A related factor is how the disparities regarding wages develop globally. A rapid increase in wages in countries like China may to some extent imply a relocation of some earlier outsourced

production to Europe or North America (The Economist, 2013). Increasing automation may also support such a development. Another possible effect could be a transfer of 'cheap labour production' to regions like Africa. How wage differences develop is uncertain but potentially important for how the demand for freight transport develops.

Changed consumption and investment patterns are obviously important for the development of freight demand and the possibility to reach the White Paper goal in the long-term. E-commerce is increasing rapidly and will impose challenges relating to the possibilities of bundling goods in order to achieve efficient rail or waterborne transport. The future development of the present tendencies towards a sharing economy is also significant. If strengthened, it may decrease the need for consumer goods like cars, boats, sports equipment etc. in favour of collective use of shared items. It would then also somewhat decrease the need for parking and road space, which in turn would decrease the need for transport of steel, concrete and asphalt. The ageing and stagnating population in the EU may also have an effect in this direction, since the need for adding housing and transport infrastructure may diminish.

The ageing population will also mean there will (*ceteris paribus*) be less available public budgets for infrastructure investments as financial resources will need to be redistributed to reflect the new and changing societal needs. A key challenge will then be to re-allocate funding from road to investments in rail and waterborne to ensure that the modal shifts required take place, and that there is sufficient funding for these modes to bear their added responsibilities effectively.

There are substantial uncertainties regarding both the total demand and the structure of the demand for freight transport in 2050. This poses problems since the inertia in planning and building transport infrastructure is high. Typically it takes 8-20 years from the moment a road or railway link is decided upon until it is taken into service. Finding the balance between new infrastructure and maintaining the current system can be difficult.

Moreover, awareness raising at the European level takes time and due to the current focus on freight corridors, it will be a long time before there is any tangible measure of success that can be identified, as the scale of the operations, the number of actors involved in freight movements along these makes monitoring a very complex undertaking. Therefore planning now and in the very near future needs to be taking account of the changes that need to, and that will occur in the next 35 years. Financial support and concrete but flexible legislation at the European level would help to level the playing field between modes and help to establish a more long-term stable policy framework to support the coming changes, but solutions and willingness to change must come from the industry too in the long-term.

6 Long-term perspectives for HSR in Europe

In order to achieve a long-term modal shift of most medium distance travel towards rail, there are numerous key elements that need to be addressed simultaneously. On one side, there is a need to densify and optimise the existing HSR (and conventional rail) infrastructure by increasing capacities on congested railway hubs, improving accessibility and intermodality in the main HSR stations, and increasing competitiveness of on-board travel time. As identified in the TRANSFORUM HSR roadmap, this should be prioritised to 2030 and maintained to 2050.

There is a general and on-going trend of scarcity of public funds for large scale infrastructure development throughout Europe's Member States that puts pressure on every capital-intensive project (as there are high opportunity costs and high risk on return on investments); coupled with some moderately successful high-speed lines that question the necessity of an "all-HSR" railway network (such as the controversies around HS2, Eastern Europe projects and Spanish experiences of closing down lines). In order to have a vibrant, balanced system by 2050, it is important to implement incremental innovations across the overall transport system, HSR inclusive, in order to increase capacity and quality of services. This would enable high demand corridors to have been identified and prioritised to ensure that by 2050 most European-structuring projects will be developed or developing.

It is also important to try and align the global HSR strategy with what is happening over the long-term in Europe. Moving towards 2050, if not already considered by 2030, a reconsideration of how HSR projects are costed would be beneficial. Currently, industries and investors tend to put a strong focus on lifecycle costs which might not be completely taken into account in most financing schemes. This means that risk management has to be handled considering the entire lifespan of an infrastructure and as a result may increase the total costs (due to the consideration of full lifetime costs instead of one-time costs). Such consideration is also important as PPP is a growing practice when building a new infrastructure, and the state as the guarantor of risk, should take into account the private sector requirements in terms of long-term funding schemes in order to identify which corridor or which PPP framework can minimise its risk and maximise its profits.

Addressing lifecycle and construction CO₂ emissions of HSR is also a key theme that will continue to be important over the longer term. As HSR is often promoted as a sustainable alternative for road and air travel, more comprehensive and accurate CO₂ measurements and comparisons are required. As opposed to the pure financial costs, CO₂ emissions are currently poorly calculated on an indirect assessment of construction process and energy sources. Not only do these elements need to be better considered, but the source of the energy powering the lines, the capacity of the train as well as the distance it travels all need to be considered in order to really appreciate the level of HSR CO₂ emissions.

The development and utilisation of methods that enable these considerations to be taken into account in the understanding the cumulative effect of CO² emissions must be prioritised.

Whilst there will always be a role for politics in the development and maintenance of the HSR network, it is the railway authorities that need to be strategising and managing the long-term organisation of the network. The European Commission could take a role in recommending which particular lines need to be extended from a European perspective, based on transparent financial, economic and social criteria over the long-term. This would most probably focus on missing cross-border links.

7 Long-term perspectives for MIMP in Europe

As the MIMP goal was related to establishing a framework for the integration of information, management and ticketing/payment for transport across Europe to 2020, this outlook does not extend beyond 2030-5. Over this time horizon the three different systems (information, management and ticketing/payment) can be expected to grow together. At the moment we are still looking, by and large, at three distinct systems. In some cases we may see more functions offered by one platform, but these very often deal with only one mode of transport and/or one specific operator. Already, numerous solutions exist all over Europe, very often on a regional or city level.

The biggest stumbling blocks, which need to be addressed by 2030-5, are still interoperability between (and often within) modes, and between different operators and across borders. And the biggest driving forces on the other hand, will continue to be the developments in areas such as social networking, mobile computing, open data initiatives, a new culture for sharing, to name but a few. These elements will continue to put more and more pressure on the established operators to offer accessible services. Added pressure will come from the fact that nowadays many of these services are free and new services must offer clear added advantages in order to be able to charge for them. Even then, there will always be a certain share of people who would rather accept lower quality services than pay for improved ones. 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 or otherwise there is a risk that any new systems will have a very low impact on travel behaviour.

In the end it should be 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, that language is in no way an issue across the European network), that they obtain all the services they require ideally through a single platform, which is reliable, easy to use and trustworthy. At the same time transactions costs must be kept to a minimum in order ensure continuous usage. What and who is behind this, how all these systems are integrated should be of no direct concern. Whether it is one integrated system, or a number of different systems linked together through interfaces should, in the end, make not 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 interests of travellers, operators and service providers alike.

Indeed, ensuring that standards relating to issues such as passenger rights are fit for purpose are of great importance for the future development of the field. Whilst it is true that technologies are

spreading fast and may continue to do so, it is also important that regulations and standards keep this pace as well, optimally even showing the way to go.

There is also a need for long-term investment (despite fast-changing developments) to ensure the stability and endurance of the system. Finally, whilst a single system is preferable, the nature of European cities and regions should be taken into account as much as possible now and in the future. The diversity of economic situations and development in Europe needs to be considered, as does the varying needs for (different sorts of) information in different areas, the levels of car ownership and mobile technologies, education and income, which may all be precursors and inhibitors to uptake and utilisation of an integrated MIMP system in the long-term across Europe.

8 Policy recommendations

Whilst specific recommendations have been offered throughout the 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 European 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 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.

- Vision is important and there is a need for the European Commission to provide long-term perspective, financial support and concrete, but flexible legislation in order to deliver against the White Paper goals and to withstand the shocks and uncertainty that the transport system as a whole will have to endure before 2050 and beyond;
- The European Commission should establish a framework supporting/encouraging long-term investment in the goal areas to foster a sustainable, vibrant transport network;
- There is a need to address the mismatch between short-term political cycles and long-term goals/issues. This is an endemic problem with all political decision-making and needs to be address across all levels;
- A basic planning consideration that could be applied across all levels of government and across a multitude of different industries is to think more strategically about how short-term distinct projects fit together as part of a whole and with the longer term future;
- The need to decarbonise the transport infrastructure, and the whole economy is increasingly being seen as an imperative. Therefore, it is a priority for the European Commission, all Member States and European businesses to mainstream and ‘be aggressive’ with low carbon. There is a need for a different reflection of current reality, where fossil fuels are actively removed from our economic activity and alternatives are provided and utilised;
- In addition, there is a need for much more money to be allocated towards coping with change and to building resilience into the system;
- Much more attention needs to be focused across all administrative areas on the fact that the European population is ageing;

- Addressing the inequality that is inherent, but seldom addressed, in mobility would improve the quality of the transport network and society immeasurably. Such inequalities exist across Member States, between regions and in cities, between urban and rural areas, between modes of transport and routes, between different strata of society and are issues that warrant much greater attention in the long-term.
- There is an underlying need, not to curb mobility, but to curb the *need* for mobility, which can strategically support all four White Paper goals over the long-term. This requires the rethinking of urban form, production and consumption systems, the role of HSR in favour of other medium- and long-distance modes, and the role of technology in both facilitating and supplanting the need for travel.

9 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 developments 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 actions and measures that will have the largest impacts, individually as well as in synergy with each other would be a good place to start. Setting compelling and ambitious visions based on evidence and science is one key starting point. Such vision should be based on principles of sustainability and consider the environmental, economic and social limits that we want (and need to) strive for in the future. Decarbonisation of transport is one such clear vision: it is a proviso of any sustainable transport future. Equity, as in providing equitable access and mobility opportunity to all social groups, may be one of the more fundamental social goals behind any such future transport system.

Setting such visions can have the effect of catalysing leadership towards common goals as well as providing a way to ‘backcast’ and help to answer with greater clarity the central question in TRANSFORuM of “Who needs to do what by when” over the long-term. It can also help to break away from the BAU-based trends and determine the steps required to reach such visions, their synergy, whether actions and measures contribute to the desired change, and finally (importantly), whether ‘we are on track’ to meet the goals.

The best recipe for resilience to unknown future trends is also 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. The stakeholders in TRANSFORuM have been confident that we have the tools to avoid such risk; we just need to implement them.

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Further Questions?

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