



living RAIL



Vision and Roadmap for Sustainable Mobility

Rail towards 2050



About this document

LivingRAIL – Living in a Sustainable World focused on Electrified Rail

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Vision and Roadmap for Sustainable Mobility

Rail towards 2050

Joint presentation of the conclusions of the two FP7 projects

SPIDER PLUS and LivingRAIL



Women at the station in Zagreb ©Ante Klecina

1 Two Projects – One Goal

Contents and Background

This document constitutes a collaborative action of two research projects funded under the 7th framework programme of the European Commission: LivingRAIL and SPIDER PLUS. Details on the projects and their approaches are given in Chapter 2. The following sections summarise their main findings and recommendations by topic areas: “The Rail Sector” lead by SPIDER PLUS (Chapter 3) and “Spatial Concepts and Policy” contributed by LivingRAIL. The “Joint Key Messages” presented in Chapter 5 highlight the most pressing needs for action by policy, industry and the railways in a condensed form. The document concludes with short statements of experts in the field and discussants at the projects’ final conference held in Brussels, April 23rd 2015.

Both projects developed detailed and very complex railmaps and analyses. For the sake of readability these have not been taken up in this joint summary document. For further information readers are referred to the project websites www.livingrail.eu and www.spiderplus-project.eu, which contain further summaries and the full scientific reports.

Introduction

In March 2011, the European Commission adopted a comprehensive strategy (Transport 2050) for a competitive transport system aimed at increasing mobility, removing the major barriers in key areas and fuelling growth and employment.

The resulting transport White Paper “Roadmap to a Single European Transport Area – Towards a Competitive and Resource Efficient Transport System” defines ten strategic goals and benchmarks; the following four are of major significance:

- 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.
- 50+% of medium distance intercity passenger traffic shifts to rail by 2050.

- The European high-speed rail network is to be completed with a tripling of the network by 2030. A dense railway network in all Member States will be maintained.
- By 2020, the framework for a European multimodal transport information, management and payment system should be established.

In 2012, the SPIDER PLUS and LivingRAIL research projects were commissioned and funded under the 7th Framework Programme. The projects were independently commissioned to develop a passenger and freight mobility vision for 2050, encompassing seamless travel and transportation chains in which electrified rail plays a central role. The projects were undertaken in parallel over the thirty month period from December 2012 to May 2015. They are the logical response to achieving the goals as defined in the 2011 White Paper.

The proposed shift to rail is highly ambitious and in a ‘business as usual’ scenario would not be achieved. Both research projects recognised that a major transition from the status quo would be required. Drivers of change and the obstacles to change were identified. The required changes in railway supply, policy, spatial structures and user preferences were defined.

The results formed the foundations on which an achievable vision for rail could be developed, consistent with the overall goal of the 2011 White Paper. Both research projects independently developed roadmaps and action plans for achieving the vision of a European society overwhelmingly served by electrified rail.

In the latter reporting stages of the research, both projects collaborated in the sharing of results. What emerged was a significant synergy. Although varying approaches had been taken from different perspectives, the outcomes reinforced the validity of the conclusions reached.

This common report presents the methodologies and insights which have been derived from both research projects. In so doing, it provides a synopsis of the well informed judgement which can inform future strategic thinking.

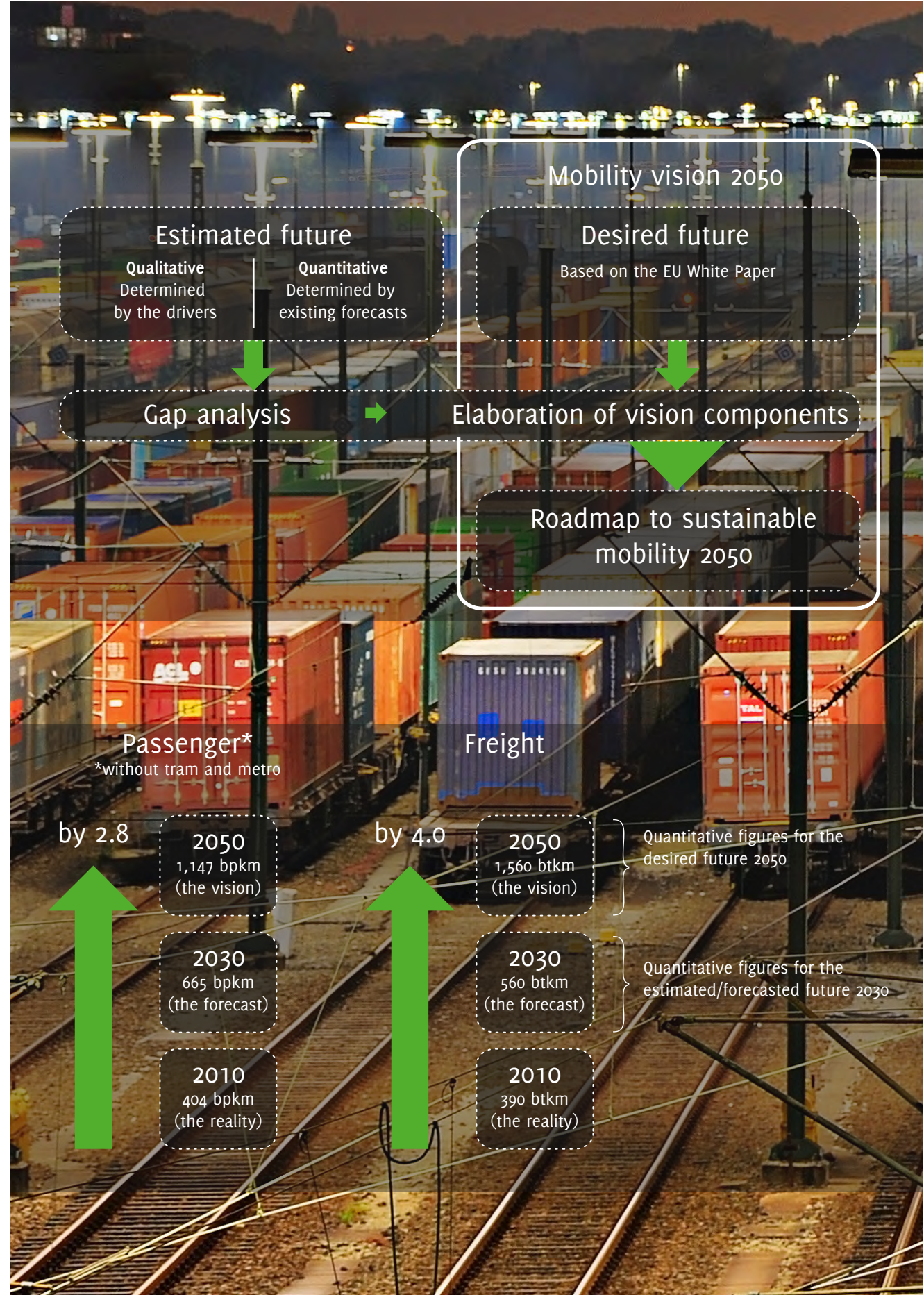


Photo: Freight terminal ©Fotolia.com / Marco2811 | Graphics: SPIDER PLUS

2 Two Approaches

SPIDER PLUS – Sustainable Plan for Integrated Development through the European Rail Network

The SPIDER PLUS gap analysis compared and contrasted the estimated future and the desired future. The estimated future is grounded in a ‘business as usual’ scenario and has two dimensions: qualitative aspects concerning drivers like urbanisation and sustainable lifestyles which shape the future; and quantitative forecasts up to 2030. The estimated future differed significantly from the desired future which was based on the EU White Paper. The gaps which were identified were addressed in the construction of the vision components and formed the backbone of the road map to sustainable mobility in 2050.

Special emphasis was given to the quantitative framework. Based on the situation in 2010, several forecasts for 2030 were analysed. Taking account of the decreasing growth rates forecast between 2030 and 2050, the European transport volume for 2050 was calculated. Together with the ambitious

SPIDER PLUS quantitative scenario for a sustainable mobility in 2050, it became clear that the current rail transport volume would have to increase substantially.

In particular, rail passenger services (excluding tram and metro) would have to increase 2.8 fold by 2050, while rail freight services would have to increase 4.0 fold by 2050; this being based on 2010.

The interdisciplinary SPIDER PLUS consortium is composed of thirteen European partners encompassing a comprehensive knowledge and experience in all sectors of rail and transport. Co-ordinated by HaCon Ingenieurgesellschaft mbH and supported by a comprehensive network of expertise (business & research) the project has elaborated a road map to sustainable mobility 2050 considering the four guiding principles below:

Full information on the project’s mission, partners and publications can be found on the SPIDER PLUS website at: <http://www.spiderplus-project.eu/>

Industrialisation <ul style="list-style-type: none">Freight services based on advanced technologies and innovative production systems.Orientation on successful models (global shipping container traffic and U.S. rail freight).Comprehensive interoperability and harmonised cooperation (Infrastructure Managers – Operators – Users).	Seamless and convenient transport <ul style="list-style-type: none">Passenger services according to their expectations (seamless, convenient travel chains and enjoyable customer experiences).Door to door integration and comprehensive realisation of co-modality for freight as well as passenger services.Holistic management of and guidance through the networks based on real-time information.
Offer driven business models <ul style="list-style-type: none">Reversion of the demand driven approach into offer driven concepts.Finalisation of the liberalisation process and full exploitation of arising potential.	Co-modality and sustainability <ul style="list-style-type: none">Reduction of GHG emissions as stated in European as well as national transport policies.Development of the rail system in order to optimise co-modality and increase sustainability.

LivingRAIL – Living in a Sustainable Europe based on Electrified Rail

The LivingRAIL research project was designed to explore the strategic measures through which transport policy, spatial planning and the rail sector can maximise the market share of electrified rail. The project outcomes are aimed at making a significant contribution to a sustainable Europe in 2050, enhancing the quality of life for all Europeans.

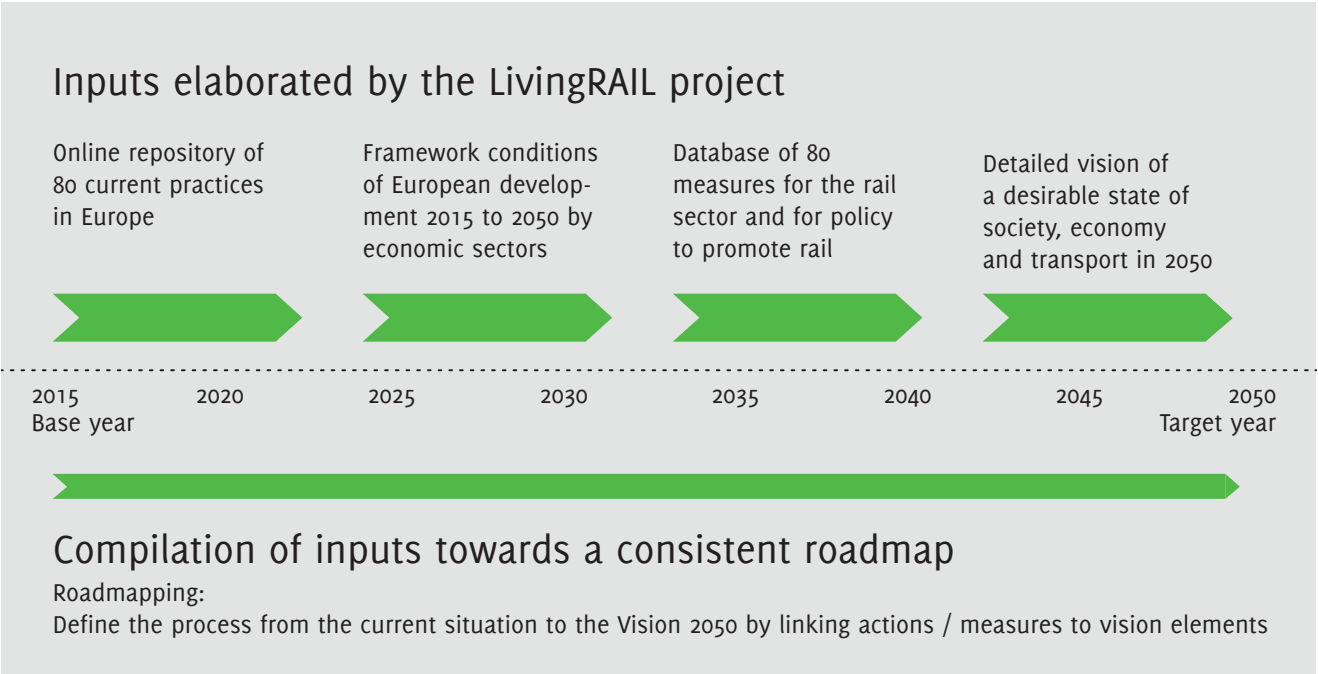
In this context, LivingRAIL developed visions of the future role of the electrified rail in 2050 in two parallel streams: ‘railway evolution’ and ‘spatial and urban policies’. They encompass not only the mobility of people and goods but also take a holistic view of the evolving demographic and economic structures; environmental challenges; energy issues; social and cultural values; living spaces; and advances in technology.

The project has utilised a sequence of analyses, from current concepts to future measures and vision statements, to identify the factors which constitute an effective planning process for the European railway and transport sectors beyond investment cost benefit analysis.

The process was based on literature review and modelling work, the analysis of framework conditions and of best practise cases in Europe, the appliance of visioning and road mapping techniques, and not least on extensive stakeholder and expert involvement. The core steps of establishing the final LivingRAIL Railmap is illustrated by the illustration at the bottom of this page.

Following the structure of the research, the project team has released six scientific reports including two special reports and an image film on potential railway futures. Besides these documents, the results of the review of current practices in and around the railway sector and the proposed interventions for future action derived from them have been made available in full detail through online repositories. All of these resources are available on the LivingRAIL website.

The LivingRAIL project is the result of collaboration between eight European research institutes, SMEs, railway alliances and industry stakeholders. The research team was supported by an Advisory Board composed of representatives from European railways, user organisations, governmental bodies and NGOs. The project was co-ordinated by the Fraunhofer Institute for Systems and Innovation Research (ISI). Full information on the project’s mission, partners and publications can be found on the LivingRAIL website at www.livingrail.eu.



3 The Rail Sector

Infrastructure

Sustainable growth and environmental friendly mobility is particularly challenging when viewed against the 2050 vision given the magnitude of the required increases in traffic volume for both passengers and freight. Therefore the action field ‘infrastructure’ is the most critical and determining consideration:

- EU network development
- Interoperability & modular design
- Predictive maintenance
- Safety & security
- Environment & sustainability
- Stations and nodes

Upgrading of the EU rail network is crucial. The mid-term focus is on the TEN-T core network, including the elimination of bottlenecks as a structural work for expanding capacity, and on the addition of new conventional and high speed lines, which will close existing infrastructure gaps. This way of proceeding is cost-effective, extracting the best benefits from investments.

Comprehensive interoperability must be ensured to enable high quality rail freight transportation in Europe and effective modal shift. The interoperability goal is key for promoting investments and precluding individual countries’ initiatives which may run contrary to the fulfilment of a single European rail area. By 2030, the TEN-T corridors must be completed. The co-modal nodes located in the traffic attraction zones for improving accessibility and last mile distribution must be in operation. The existing rail infrastructure will have the facility to accommodate 750m long trains everywhere in Europe. On the busiest corridors sustaining traffic industrialisation, the infrastructure will be capable of managing 1,500m long trains (with potential for combining trains and path sharing).

In the period between 2030 and 2050 one focus is on the comprehensive network, which, in addition to the TEN-T

corridors, provides the transport capillaries into suburban and rural areas. Urban/regional lines play an important role as connectors and feeders for long distance services. The second focus is on a significant increase of the network capacity, by innovative rail operating schemes, as well as new lines/by-passes for rail freight services. This will reduce conflicting paths with passenger traffic in the most intense urban areas where passengers have a priority.

All developments, constructions and upgradings must take into consideration both operational optimisation and cost reduction, as well noise protection which is a key factor in gaining public acceptance.

Existing plans for upgrading the long distance HSR passenger lines must be accomplished to support seamless passenger transport on a European scale while at the same time, conventional long distance services are necessary to cover more rural areas. In European cities, the integration process in the central hubs can take different paths. Station upgrading enables full functionality of all modes.

The stations have to be designed in a co-modality framework and serve as central mobility hubs, offering a variety of services, including direct interchanges with airports. Newly constructed stations extend over multiple levels integrating all mobility services with suitable accessibility. Metro and rail lines such as high speed, commuter and conventional are integrated underground to avoid conflicts with surface transportation at street level. At street level tram and bus services interchange with mobility segments such as taxis, automated shuttle transportation and bike sharing. Limited space is needed for drop-off and pick-up locations for private vehicles. It is important to allow easy walking access to the hubs for people of all ages.

The freight nodes must be located in the middle of the European traffic attraction zones, providing proper interchanges between corridors. They have to fulfil the task of traffic bundling for achieving rail freight industrialisation and be capable of offering a variety of ancillary services to the users, promoting an effective co-modality. Advanced

technologies will have been deployed to manage the planned traffic volumes. Hubs and terminals are open 24/7 to be compatible with the seaports’ production cycles and the overland interchange borders of the Union.

The European ERTMS Deployment Plan foresees installation of the ERTMS equipment to more than 25,000km of railway lines by 2020. A number of key European freight lines have also been identified for ERTMS deployment. For both, freight and passenger services the implementation of moving block operation (ETCS Level 3) where a substantial capacity increase of up to 40% versus conventional system can be expected is a long-term priority.

In combination with new rolling stock technologies predictive maintenance contributes to an efficient management of the infrastructure.

Rolling Stock

For the transition to a future oriented rolling stock park there are three key elements of main importance:

- Hybrid locomotives & train sets
- Automatic coupling, electric wire & new braking technologies
- New light weight wagon design

Locomotives with energy recuperation are state of the art. Optimised hybrid locomotives and train sets enable the provision of seamless services between electrified and non-electrified parts of the network both for freight and regional passenger services. The support of efficient last mile services will improve the competitiveness of rail freight services, especially in the intermodal industry as well as for private sidings.

A automatic coupling together with continuous electric wire, facilitate efficient shunting operations and new production schemes. Electronically controlled braking and automated brake tests are innovations which are creating step changes especially in rail freight services. Instant electronic braking reduces derailment risks and improves the general safety and security of the train operation. This is especially important for longer, heavier, commercially faster trains which will be an important pillar of future rail freight services.

Another step change will be done in wagon design with advanced lighter materials and alloys such as carbon fibres

to reduce dead weight for higher payload. Modular design for freight wagons becomes standardised.

The pace of innovation must be fast providing suitable services for increased traffic volumes. The process of speeding up the replacement of the existing park is paramount and needs therefore to be strongly supported by public funds (national and/or EU).

Even if rolling stock characteristics are different for passenger and freight wagons, lighter materials, modular design, preventive maintenance, embedded ICT, are common features.

Technology

The evolution of the rail service sector by introduction of new technologies is mandatory to be more efficient and competitive in short- to mid-term horizon, here three major key-elements are identified:

- Rolling stock design and materials
- Automation in movements/transfers
- Comprehensive ICT based management

For passenger services, new design train sets are modular, energy efficient and eco-friendly by reduced tare weight. Maintenance on demand is important for cost efficiency by optimised use of the fleet in service. Demand criteria like comfort and well-being as well as extended on-board services and reduced noise, are important elements of the improved service profile.

Design and materials for the next generation of freight wagons as well as the refitting of existing fleet is guided by a reduction of noise emissions and abrasion of the tracks. For freight the automation of all loading/unloading and controlling processes are of main importance for the reduction of increasing labour costs and acceleration of train dispatching.

In the context of the overwhelming increase required of rail based intermodal services the automation of handling of Combined Transport (CT) units in hubs and terminals is a sine qua non. Supported by the equipment of all intermodal wagons with continuous electric wire the comprehensive introduction of robotics/mechatronics in transfer, pin setting and controlling will contribute to the efficiency and capability of rail based intermodal services in competition in cost and quality to road. These functionalities performed in the nodes define the terminal profile of the future. Efficient IT-

based interactions with shippers/receivers, forwarders and road feeder services are another key efficiency driver. Future transshipment terminals concentrate on efficient transfer of CT units between trains to facilitate the integration of feeder terminals/urban logistic centre in the European intermodal network. Automated composition/shunting of train sets supports the efficiency in yards where the assembling-disassembling can be arranged for competitive operation on the long distance part of the rail transport chain.

Comprehensive ICT based management, as well as advanced e-solutions support all operations and the seamless integration of rail in overall logistic distribution and supply chains. Applications for rail are developed to control traffic volumes, increase safety of operations and improve asset utilisation. Satellite solutions such as Galileo support future advanced pan-European real time data collection and information.

Governance

Holistic Governance including all actors in their respective responsibility, is crucial for the proper development of the rail sector.

- Network governance
- Transport industrialisation
- Legal framework and policy measures

Governance ensures investment effectiveness, coordinates planning, and facilitates technological development and successful market uptake. Targeted regulation and planning ensure an European wide coordinated approach, an integrated mobility system, and the harmonising of existing and future guidelines e.g. for TEN-T realisation, European rail ports network, capacity of hubs compatible with corridors’ capacity, and the desired single EU rail space.

The role of European agencies is evolving; the governance is shifting from national to European authorities. An adequate balance in mutual relationships for a new European model for co-modal transport authorities is required.

Rail transport services need a performance upgrade through industrialisation models enabling economies of scale and have to be supported by respective governance measures. Efficiency is reached by working on all system components like trains, tracks, terminals, rolling stock & unit loads equipment, ICT and energy in a co-modal integrated perspective. The outlined elements for passengers are optimised con-

nectivity, different types of services, coupling/sharing of train modules, and high frequency services with integrated timetables. For freight services longer, commercially faster & heavier trains and the comprehensive transition to H24 T7 working cycles by all in the transport chain involved stakeholders are of high importance.

TSI (Technical Specifications for Interoperability) and IRS (International Rail Standards) are features set to harmonise technical components and operating processes. Legal framework and policy measures are fundamental to support harmonised and integrated business models enabling true EU wide market opening and efficient competition, as well as EU focused for rail system construction, renewal, upgrading and operation. Funding schemes to support the stakeholders for the required migration of the existent rail area to the desired vision for 2050 are fundamental. Simplified approval European procedures and appropriate R&D programs are main supporters of the change.

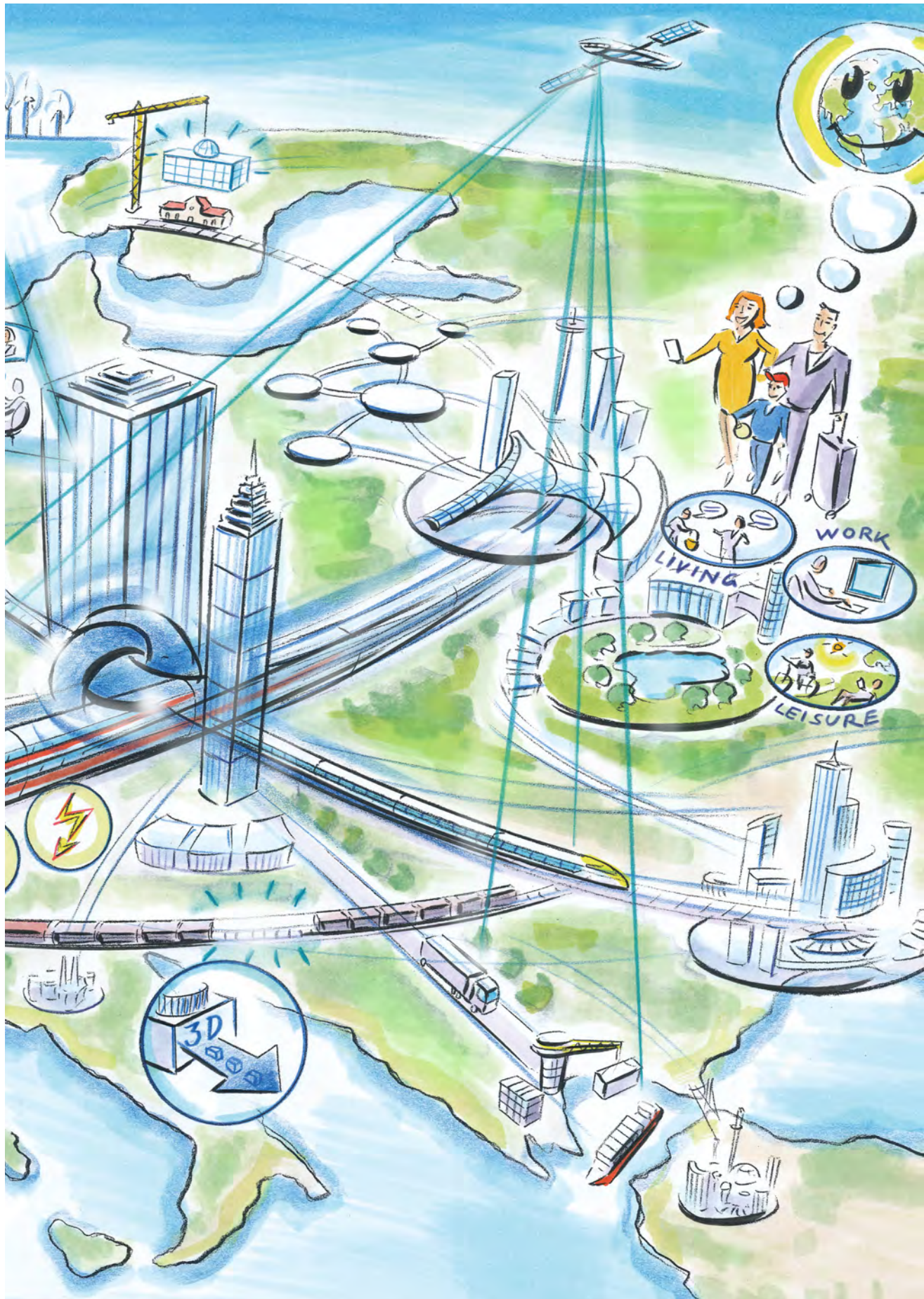
Market Uptake

Beside the technological evolution, soft elements fostering an appropriate market uptake, which is the precondition for the required evolution of the European rail system to the vision 2050.

- Collaboration and offer driven business model
- Permanent education & training

The move from the recent national monopolies to an international collaborative culture is key for reliable market uptake of new business solutions. Pioneer experiences exist in many areas: OSS (One stop shop) – single point of contact & multichannel distribution approach, logistic engineering, new offerings & collaborative logistics/warehouses, single ticketing for the whole journey. Their development requires new processes, appropriate ICT technology and upgraded/new business models, to be incorporated in a regulatory framework.

The renaissance of the rail industry relies on the abilities of the involved staff. The natural turnover of ‘old’ with ‘new’ staff facilitates the introduction of new and qualified employees in general. Measures like permanent training and education for technical/technological and commercial skills remain the only way to guarantee a high level of competences. The educational aspects are as important as the technical ones.



The LivingRAIL vision ©Heyko Stöber

4 Spatial Concepts and Policy

Shifting major shares of passenger and freight transport from road and air to rail requires not only high capacity, attractive and efficient rail services, but also an environment which supports and sustains the envisaged fundamental change in mode choice patterns. Rail based services are a high capacity and reliable backbone transport alternative, but the flexibility of the system is limited. It is thus essential to change values, living styles, settlements and industries closer to the services which rail is able to offer, in order to benefit from its environmental, economic and social advantages. The illustration indicates the direction to go into a rail-friendly future.

Norms, Values and Lifestyles

The conscious decisions of people and companies on how much and by which means to travel and to move goods certainly support mode shift policies. For the decades ahead we expect people, companies and the public sector to put a high priority on sustainability, health and inclusion in decisions across all parts of society. Flexible job arrangements and public services are reducing the need for travel and car use in particular.

The car is continuing to lose its status role, although it is still needed in sparsely populated areas. Long-distance business and holiday trips remain, but are chosen more carefully thanks to high quality ICT technologies. Creating and sustaining this shift in preferences requires the constant application and adjustment of a bundle of push and pull instruments.

- **Actively address social norms and values.** With sophisticated social campaigning techniques, role models and incentives combined with information and communication showing what is socially desired and rewarded behaviour, social consciousness can be supported towards more sustainable behaviour.
- **Stimulate green behaviour** by information, incentives and regulation. Information can contain labelling for green mobility products or rail starter packs for people entering new phases of life or company start-ups. Incentives

include urban car pricing in an elaborated form or as simple parking fees, truck tolls or the subsidisation of green products. Regulation includes parking and area access management, urban and rural building codes or emission standards and caps.

- **Green and transit friendly cities.** Cities are the start and end point of journeys. Taking the private car off peoples' minds in urban mobility can also reduce the role of the car as first choice for longer trips. Fostering walking, cycling and sharing concepts to get around in green and liveable cities thus helps rail travel by impacting peoples' mind set on travel options. The trend of greening cities has already started in many parts of Europe and thus needs to be further stimulated. A number of powerful concepts are at hand supporting PT and rail use within, from and to city areas:
- **Transit oriented development (TOD)** concepts encourage the location of large commercial facilities, employers and dense residential structures along public transport axes. The Dutch and Scandinavian ABC policies or the Hamburg Axes concept demonstrate the success of this urban and regional development concept for public transport use.
- Improving the accessibility of rail stations, large shops, employers and other traffic generators by compulsory **Transport Mobility & Accessibility Plans**. In a wider sense, sustainable urban mobility plans have become popular over the past years. These need powerful planning authorities linking the various urban and regional decision makers to develop common goals and to implement them in co-operative processes.
- **Fostering the shift of mobility** demand from car to green modes by greening cities, extending public transport networks as well as safe and comfortable cycling networks. Reduction of road space for cars, strict parking management and various forms of road charging help this shift and generate parts of the funds needed.

Sustainable and Powerful Regions

Concentrated living reduces both trip rates and distances as well as their dispersion. Concentrated flows are further in favour of collective modes of transport. On the other hand,

providing a healthy environment and a high standard of living in large agglomerations is challenging and costly. We thus propose to strengthen the position of small to medium-sized cities providing a good compromise between quality of life, cultural plurality and rail accessibility. Instruments empowering regions to enter forward looking rail friendly and sustainable developments include:

- **Strengthen the power of local communities.** Transport and sustainability solutions have to be in accordance with local priorities and cultures. The motivation of innovative investment and operations projects appears to be much higher the more freedom of decision-making is devoted to local actors. This includes the transfer of budgetary power, but also the installation of appropriate support and monitoring mechanisms.
- **Re-vitalise small and medium-sized rail stations and close missing links** in regional rail networks. Both measures are relatively cost-efficient but may decisively boost the attractiveness of rail modes.

Regional Freight Solutions

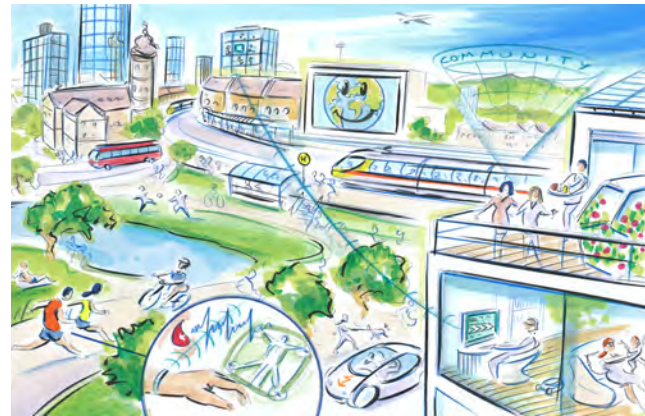
The major share of freight movements currently carried by trucks starts and ends in or around big cities or major agglomerations. Bundling these flows at the start and end point of the main haul near railway terminals promises to create new markets where railways have lost considerable business in the past. The idea of regional logistics parks is not new, but may be re-vitalised by a number of flanking measures:

- Carefully **analyse the reasons for failure or stagnation of regional and urban logistics centres** established in the past decades. Build or establish powerful connections to nearby rail freight terminals and review access policies of the adjacent city area.
- **Provide financial incentives or funding** for companies to locate in logistics parks, near railway terminals, for establishing rail industry sidings and/or directly for the use of rail.
- Foster the **containerisation and the standardisation** of shipments for easier application to rail freight.

Integrated and Open European Transport Planning

While some countries in Europe have made good progress in modernising their rail systems and in stopping or even reversing the downward trend of rail market shares, others struggle more. We find the basic ingredients for successful rail systems are unique across regions; different national

identities, economic powers and development speeds need to be respected when transferring strategies from central to peripheral regions. Moreover, prevailing inconsistent and sometimes confusing policy goals and instruments need to be reviewed in favour of clear and co-ordinated strategies.



Green, liveable and multi-modal cities ©Heyko Stöber

Concepts include:

- In the short term, a **common European vision and road-map** for the railways within an integrated mobility future towards 2050 needs to be established. This must be closely co-ordinated with member state development plans and goals.
- **Co-ordinating European and national investment plans** in particular in border regions. In the medium term national visions and assessment standards and methodologies of national planning tools should converge.
- **Actively involving the railway sector** in the establishment of regional to European transport visions and investment plans.

Foster Multi-Modality

Rail modes may serve as a high capacity and reliable backbone transport provider over medium to long distances and on high demand routes. But the flexibility of the system and its accessibility in sparsely populated areas are limited by a reliance on rather costly track infrastructures. To meet the high expectations of future passengers and freight customers, rail providers thus need to co-operate with other modes or integrate these into their core business models. This means multi-modal urban transport, airport connections and intermodal freight.

- Develop **rail stations to become intermodal hubs**. Integration of modes requires convenient transfer points, tariff integration and reliable information platforms. Support **reliable multi-modal European booking and information**

platforms. Good examples in passenger and freight transport suggest a short term realisation seems possible. Required are **universal data standards, quality targets** and liability frameworks.

- Push on high quality **rail connections to major European gateways**, i.e. international air, sea and inland ports.
- Support **regional mobility associations** linking various multi-modal service providers under a single and recognisable brand. Model cases are the current PT tariff associations of Germany and Austria.

Reforming Railways

Despite a few good examples on consequent national railway policy and market orientation of incumbents, the general picture across Europe suggests that rail carriers and policy are satisfied with small to medium-sized market niches. The railway business is complex and due to long investment cycles and often difficult funding conditions appears slow moving. Both barriers can be tackled by more demand, which in turn requires a change in business cultures and policy styles.



Spatial and urban structures ©Heyko Stöber

- **Customer orientation.** In the short run, railways are to undertake intensive market research in order to understand what potential customers value and what would mobilise mode shift behaviour. Mode choice studies suggest that besides door-to-door travel time and costs, up to 50% of decisions are influenced by soft factors.
- **Binding performance targets** in passenger and freight transport over entire trip chains should be defined by the railway, their governing institutions and customers and supported by customer advisory boards. National policy, which frequently governs railway undertakings, is to set performance based incentives valuing customer satisfaction and service quality over shareholder interests. These could include quality based infrastructure subsidies.

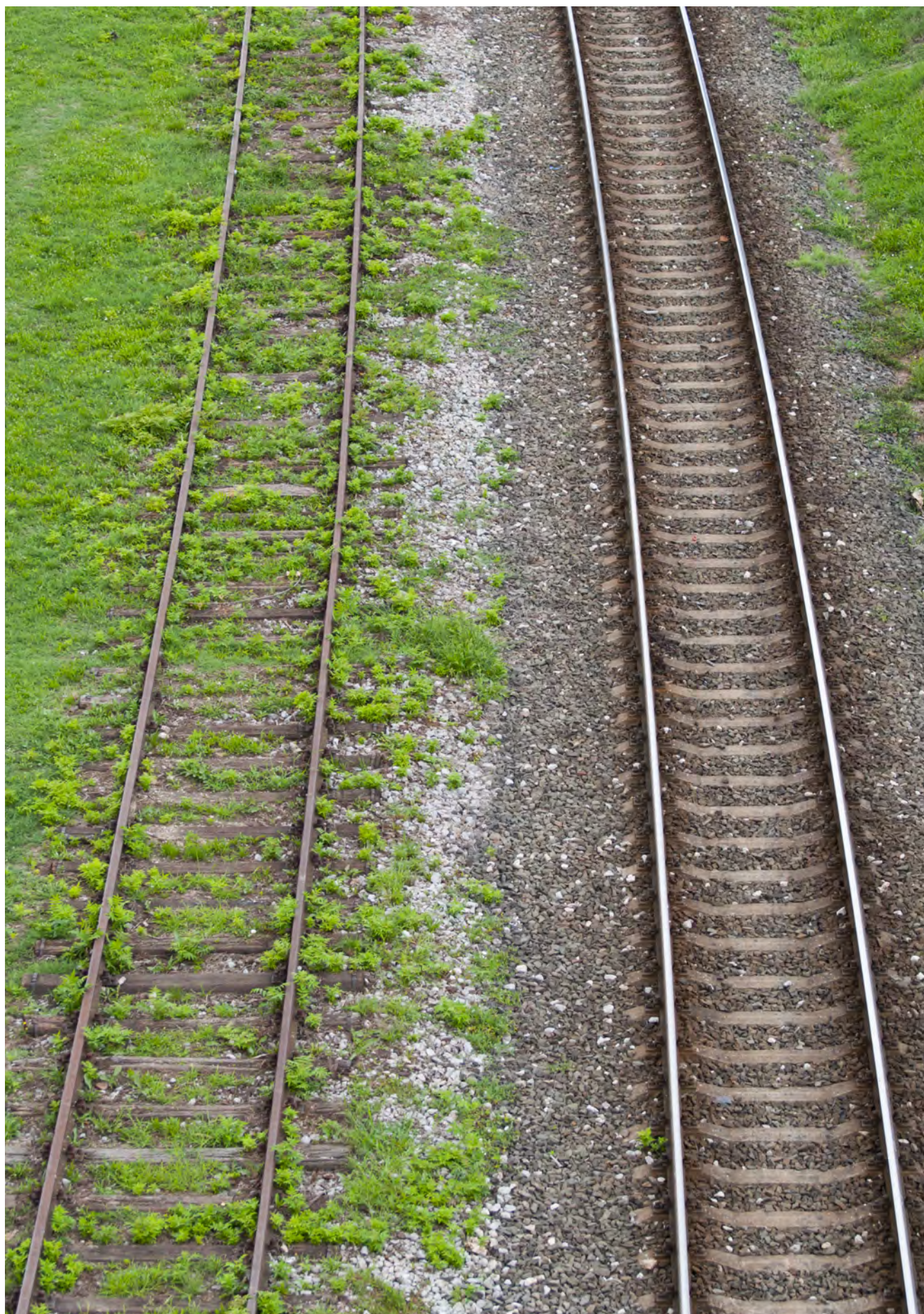
Funding the Mobility Shift

In the medium to long term revenues from a massive shift of passenger and freight demand to rail will easily outweigh the investment and running costs as has been the case in the pre-car era. In the initial phase of a pro rail scenario, funds will nevertheless be scarce. Innovative funding solutions including private capital as well as the achievement of a fair level playing field of all modes of transport will help the shift by taking pressure from public households.



Vision for the rail system ©Heyko Stöber

- **Through fair taxation and pricing** on cars, buses, trucks and flights, tax inefficiencies can be removed and additional funds can be created to finance high quality transport infrastructures. However, studies suggest that with moderate charge levels direct mode shift effects from pricing remain modest.
- **Install multi-modal and cross-regional funds.** Experiences from Switzerland and France indicate positive receptivity for sustainable and forward-looking transport solutions when shifting from a single mode to a multi-modal view on transport funding. As for pricing, fairness and transparency in fund allocation plus an open communication on the benefits of funding rail from road revenues appears important.
- Involve **private investments** in the funding of high capacity infrastructures. This might be for dedicated freight lines on high volume corridors in the form of concessions or PPPs.
- Expand **public service obligations** to all regions where a profitable rail system cannot be established. In the long term, rising rail and PT demand will clearly improve the profitability of carriers. But initial investments and in some regions long-term support is needed.



5 Joint Key Messages – "It's Time to Act"

Both projects conclude that most measures need to be maintained over a long period of time. Thus, the challenge of reaching a much higher mode share for rail is not only concerned with finding the right sequence of actions, but even more with developing actions in parallel. Moreover, joint action by policy, rail sector, industry and user organisations is needed rather than isolated measures by single actors.

For details on the complex roadmaps the reports of SPIDER PLUS and LivingRAIL are recommended. In the following the common key messages are introduced with reference to leading actors and time lines.

For **policy and public administrations** rail-friendly policy is of vital importance. This includes transnational planning and decision processes, suitable regulations and appropriate funding. Main steps are to be taken by 2020.

- Agree on a common vision for rail by including all relevant actors, policy levels from EU to member states and regions, infrastructure managers and service providers, industries and user associations.
- Decisive policy action across sectors (transport, energy, urban and regional development, finance), countries and regions is needed to set clear conditions for investment decisions.
- Standardise railway regulations European-wide to fit 21st century conditions and support the introduction of new rail technologies. The role of ERA in this respect should be strengthened compared to national interests.
- Provide sufficient funds for the first phase of the required European railway system evolution. Only in the later phases the increased revenues will create a self-sustaining investment framework.

Infrastructure managers play a key role in a high mode shift scenario. Activities range from short term capacity management to advanced train control systems and the upgrading of existing lines in the medium term to investments in new capacity in the longer run.

- Complete the national high speed networks to make a European system and optimise long distance intercity networks.
- Realise high capacity freight corridors suitable for longer and heavier trains including subsequent connections to freight nodes.
- Remove gaps and bottlenecks especially at borders, improve quality and availability and complete regional networks where necessary.
- Push forward the implementation of an advanced single European train control system (e.g. ECTS Level 3). Focus on international main lines in the short run, but install on all networks in the medium run for full effectiveness.

The **railway industry** has to undertake R&D to modernise the sector by improving efficiency. Affordable solutions which allow migration from existing systems are badly needed in the short run.

- Replace outdated equipment (especially in freight services) with state of the art technologies for more efficient rail operations to European standards.
- Introduce a comprehensive IT-based management of the railways in the short run. This includes automation of train operation, shunting and freight handling processes and terminal operations as well as multi-modal passenger information services.

The strengthening of the positive perceptions of rail in society is a key task for all stakeholders. This includes quickly solving the railways' noise problem (especially in the freight sector). The improvement of the railway system allows to put electrified rail in the centre of co-modality. Better promotion of these services together with attractive service offers speed up the shift to rail.

Rail investments will pay off in the long term. Required additional annual network and rolling stock investments, maintenance and operation costs may range between 25 and 50 billion euros until 2030. Towards 2050, however, projected additional income from passenger and freight customers can be expected to be two to three times higher.

6 Statements of Selected Sector Experts

Michael Cramer, Green MEP, Chairman of the Transport Committee in the European Parliament

Let's put rail at the heart of our mobility strategy: No other means of transport is more climate-friendly or safer. Trains offer affordable mobility, need little space, and can be run with 100% renewable energy. The EU's role is to finally ensure fair competition across all modes and to boost the sector through targeted investments and harmonisation.

Dr. Josef Doppelbauer, European Railway Agency

Rail transport is environmentally friendly, energy efficient, and safe. The European Railway Agency concretely contributes to improving the competitive position of the railway sector by enhancing the interoperability level and by developing a common approach to safety on the European railway system. Regulation, research and innovation need to collaborate in creating the railway system of the future.

Dr. Christopher Irwin, European Passengers' Federation

The EU's targets for shifting passenger and freight to more sustainable modes imply a multi-fold increase in rail's share. That can't be achieved by diktat: rail must make itself the mode of choice, understanding customers' needs and striving to maximise user satisfaction. This will help sustain the political will, enabling investment necessary to ensure the sufficiency of the system.

Prof. Marc Ivaldi, Université de Toulouse

I have a dream. The European rail manager has completed an interoperable and dedicated rail network managed by technologies using global cellular connectivity. Five alliances of logistic operators- approved by the DG Competition- are competing on cargo services between the main hubs of Europe. The European Rail Agency devotes all its efforts to regulate the "last mile" freight concessions. Overall, 35% of goods are transported by train.

Dr. Libor Lochman, Community of European Railway and Infrastructure Companies

The shift towards energy-efficient modes like rail is clearly inevitable in the coming decades in order to lower Europe's dependence on imported fossil fuel, decrease the environmental impact of transport and relieve road congestion. Rail, as it takes over medium-distance traffic, will therefore become an even greater contributor to the European economy in 2050.

Ralf Charley Schultze, International Union for Road-Rail combined Transport

The use of intermodal loading units (containers, swap-bodies, semi-trailers) is the key to achieving the desired shifting of freight from road to sustainable modes, mainly electric rail. Combined Transport offers the most efficient transshipment solutions to connect modes, opening the door to the desired energy efficiency gains, as well as pollution and congestion reductions.

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