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CORRIDORS, HUBS AND SYNCHROMODALITY

Research & Innovation Roadmap

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Executive summary

The ambition of this Roadmap is the achievement of EU wide co-modal transport services within a well synchronized, smart and seamless network, supported by corridors and hubs, providing optimal support to supply chains. It involves a step change from the current system, towards the ultimate vision of the Physical Internet, by synchronizing intermodal services between modes and with shippers (referred to as Synchromodality), aligning equipment and services on corridors and hubs and integrating these into networks.

So far, network integration has been focused on interconnectivity and interoperability of transport processes and equipment. Integration has been achieved only partially at the TEN-T core network level, without alignment of hubs and corridors specifically for freight transport. There is a poor match between requirements of door-to-door freight services within Europe and the supporting pan-European infrastructure. In addition, important dynamic qualities of the transport system such as flexibility, resilience and responsiveness are still underdeveloped. Thirdly, integration has not been achieved in the vertical sense, aligning transport services with supply chain requirements of manufacturers, distributors and the wholesale sector. Freight services are, therefore, insufficiently customer-oriented to serve increasingly diverse client's needs.

This Roadmap aims to contribute to the definition of research and innovation challenges to design and set-up a European core freight network of "smart" hubs and corridors, supporting the emerging needs of the transport industries to serve supply chains. These challenges complement the research and innovation items defined by other technology platforms including ERTRAC, ERRAC, WATERBORNE with whom we collaborate and have contributed to this roadmap. Information and communication technology, inter-firm collaboration, process re-engineering and innovative business models are important enablers of this seamless, European co-modal system.

The innovation *Roadmap for Corridors, Hubs and Synchromodality* provides pathways towards improvements in the integrated European freight service network. The concerned stakeholders are at the supply chain level (e.g. manufacturers), at the transport service level (e.g. transport operators) and at the infrastructure network level (e.g. public road authorities). As our overall goal is to arrive at an integrated system, the direction of innovations is the improvement of the linkages between these levels. The Roadmap will make optimal use of the latest developments in enabling technologies in the field of e.g. ICT (software), equipment (hardware) and governance (orgware) to achieve this coupling. This conceptual model behind the Roadmap is pictured in figure S-1.

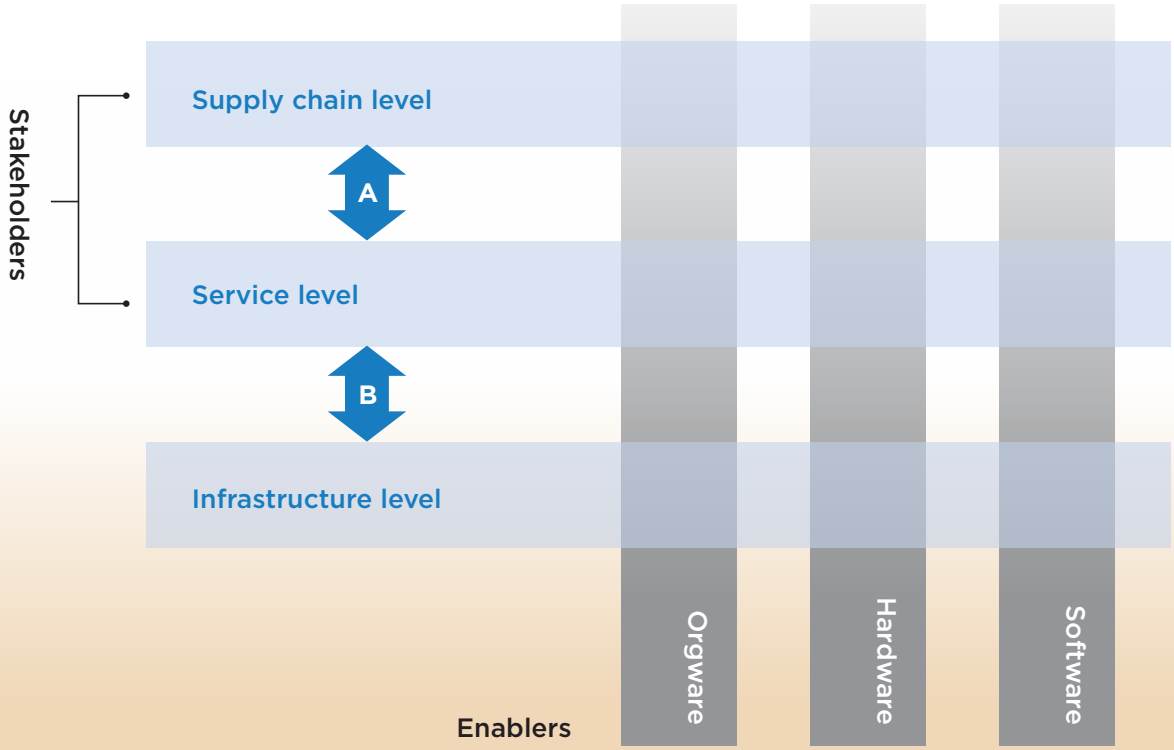
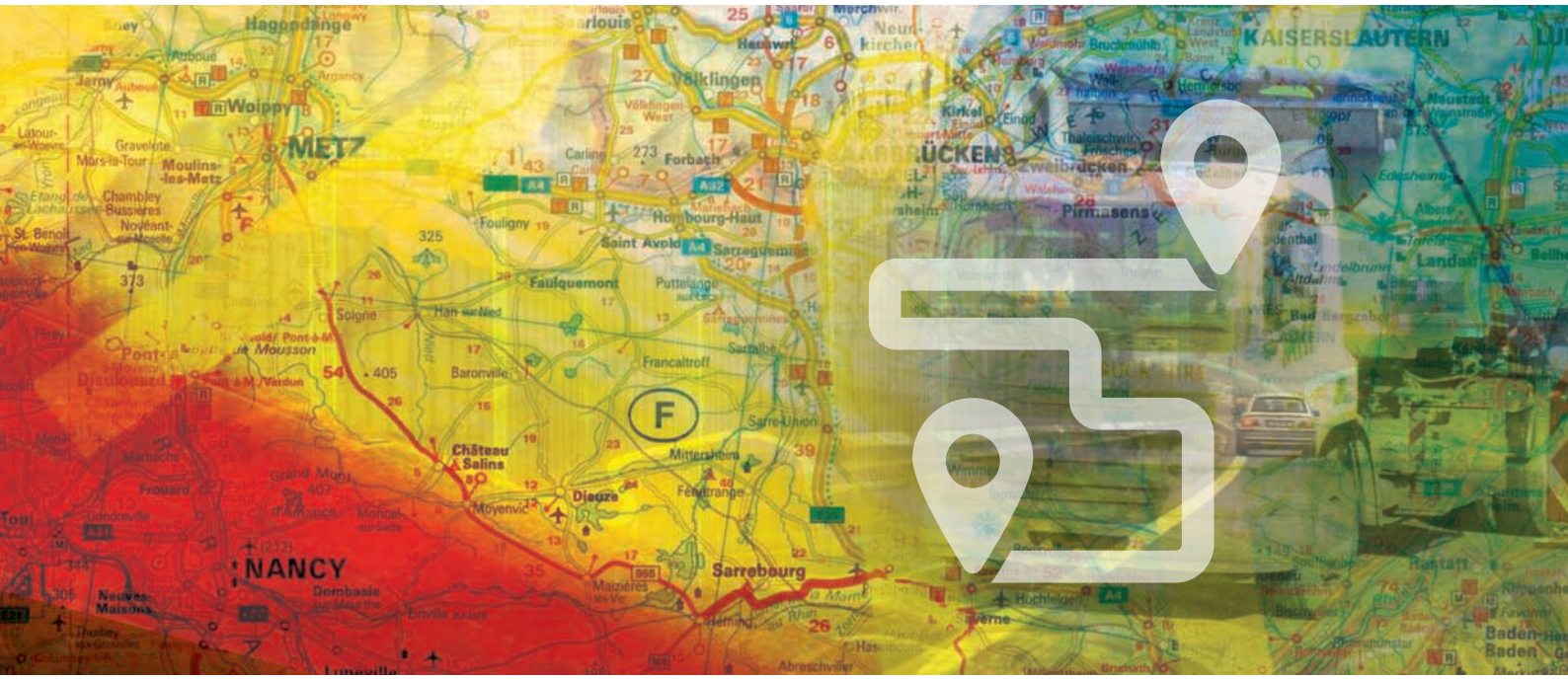


Figure S-1: **Stakeholders levels and enablers**



The Roadmap

In order to arrive at a connected system, integration must be achieved between the horizontal layers. We arrive at two main areas of innovation, with each 3 underlying pathway topics. These are:

A. Integration of transport services and supply chains

1. Understanding the demand for the synchromodal freight transport system
2. Optimize alignment between supply chains and transport services
3. New roles for hubs in the supply chain

B. Integration of transport services and infrastructures

4. An integrative freight network strategy
5. Transport chain design and operation for Synchromodality
6. Deploying ICT as integrating technology

Table S-2 explains the main subjects that fall within these areas. Each pathway supports the integration of two layers of operation. We have identified the main innovations that need to be realised, the market responsible for their adoption and the expected impact of this innovation. Table S-3 pictures the main stages in the Roadmap through R&D, products, market uptake and impact. Roadmap implementation actions and projects are expected to make an extensive use of pilots and proof of concepts and business cases, clearly defining the operational framework assumptions of all new solutions.

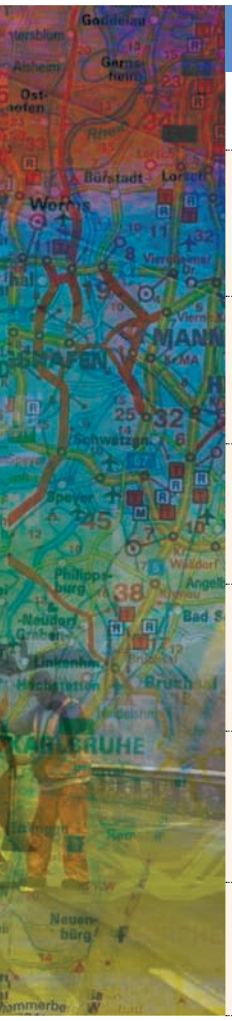


Table S-2. Roadmap pathways

PATHWAY	MAIN INNOVATIONS	USING MARKET	EXPECTED IMPACT
1. Understanding the demand for synchromodal transport	Detailed demand mapping and forecasting tools. Big data used for demand prediction.	Transport service providers, SME networks.	Load based, a-modal planning and booking possible due to demand intel.
2. Optimize alignment supply chains and synchromodal / multimodal services	Tactics for transport service and supply chain alignment (e.g. hybrid networks). Mind shift.	Supply chain managers, Logistics managers, Regulators.	Tightly coupled production/ distribution/ transport systems.
3. New roles for hubs in the supply chain	New value added business models. Hubs taking role in supply chains for e.g. postponed manufacturing.	Real estate, cluster managers, transport service providers, port authorities, Regulators.	Healthy and stable clusters, networks of clusters. Specialisation of hubs in TEN-T.
4. An integrative freight network strategy	European core freight network and access networks, multimodal network management, freight ITS.	Network managers, corridor managers, hub managers.	Connected and sustainable Pan- European freight TEN-T infrastructure.
5. Transport chain design and operation for Synchromodality	Seamless and transparent freight service networks in Europe (gateway networks, hub/spoke, plus service levels.	Transport service providers, hub operators.	Increased diversity and resilience of transport services, more Intermodality.
6. Deploying ICT as integrating technology	Extended freight ITS towards Integrated and automated planning, booking, operation.	ICT sector, Transport service providers.	Automated and responsive synchromodal transport services.

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RESEARCH THEMES

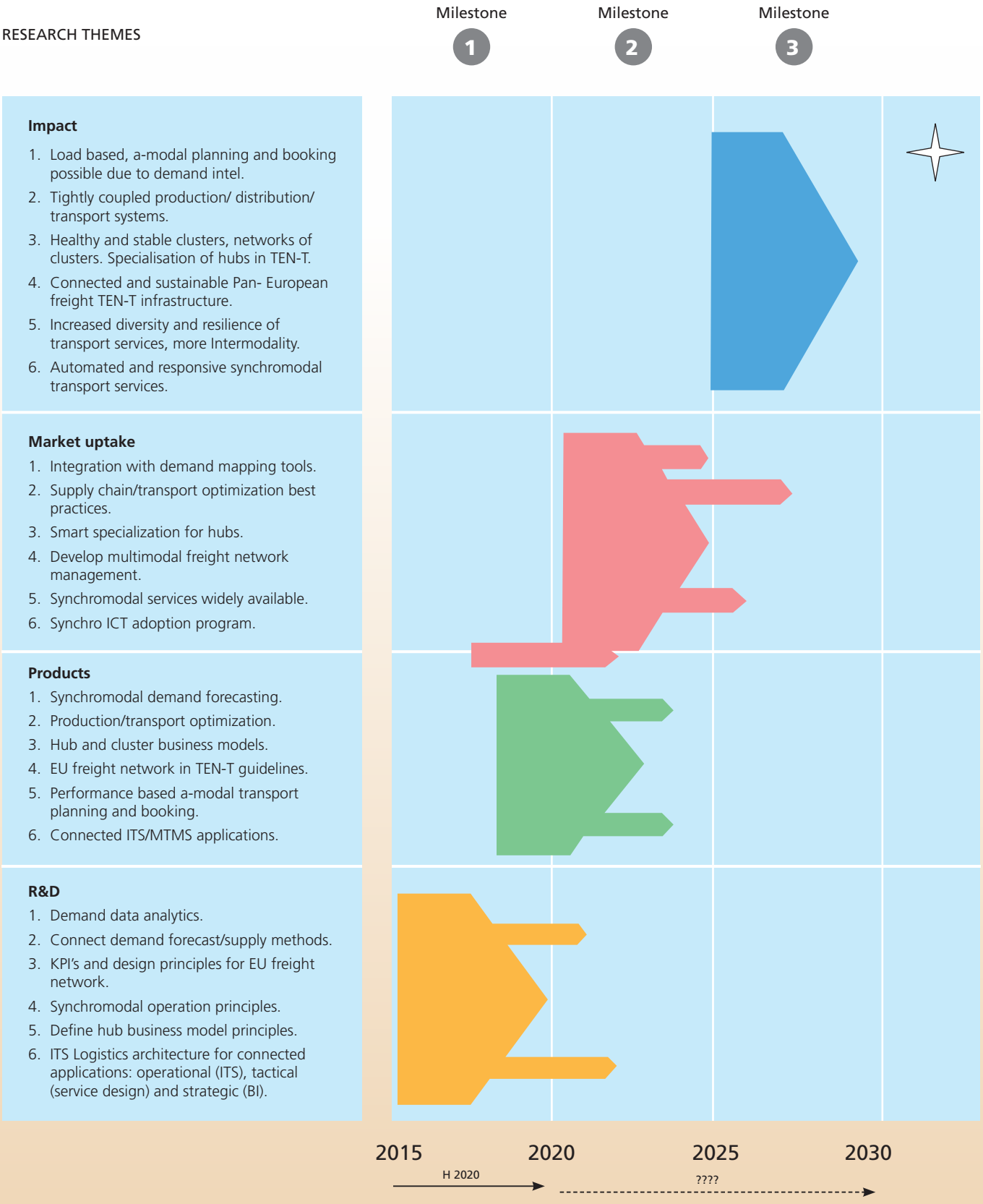

Table S-3: **Summary of research themes by stage in the Roadmap**

The 6 Pathways

1. Understanding the demand for synchromodal transport.
2. Optimize alignment between supply chains and synchromodal/multimodal services.
3. New roles for hubs in the supply chain.
4. An integrative freight network strategy.
5. Transport chain design and operation for Synchromodality.
6. Deploying ICT as integrating technology.

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Table of contents

Table of figures


KAISERSLAUTERN
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1

INTRODUCTION

The European Technology Platform ALICE, Alliance for Logistics Innovation through Collaboration in Europe, was launched on June 11, 2013, and received official recognition from the EC in July 2013[1]. ALICE has been set-up to develop a comprehensive strategy for research, innovation and market deployment of logistics and supply chain management innovation in Europe with the mission: "to contribute to a 30% improvement of end to end logistics performance by 2030".

One of the key elements identified by ALICE as the Vision to achieve this improvement is The Physical Internet (PI) Concept. PI is pursuing an open global logistic system founded on physical, digital, and operational interconnectivity, through encapsulation, interfaces and protocols design, aiming to move, store, realize, supply and use physical objects throughout the world in a manner that is economically, environmentally and socially efficient and sustainable.

ALICE has identified five different areas that need to be specifically analysed and addressed in terms of future research and innovation needs to achieve its mission.

These areas are:

- Sustainable, Safe and Secure Supply Chains
- Corridors, Hubs and Synchromodality
- Information Systems for Interconnected Logistics
- Global Supply Network Coordination and Collaboration
- Urban Logistics

Five different Working Groups have been launched, one in each of these areas to further analyse and define research and innovation strategies, Roadmaps and priorities agreed by all stakeholders to finally achieve the ALICE Vision and Mission.

While ALICE is a European Platform all efforts should be made to open up the scope of every project to International Collaboration. Moreover, projects addressing research areas identified in this Roadmap should comply with the following characteristics that can be considered as best

1. STRATEGY FOR EUROPEAN TECHNOLOGY PLATFORMS: ETP 2020. SWD (2013) 272 final. Brussels, 12.7.2013

practices coming from the experience in international collaborative projects:

- Clear definition of the operational framework assumptions of all new solutions.
- Extensive use of Pilots and Proof of Concepts.
- Sharing of information and project results to clearly map advances in Roadmap implementation and new gaps identified. This process should be supported by ALICE.

This document describes the research Roadmap in the field of ***Corridors, Hubs and Synchromodality***.

The ambition of this Roadmap is the achievement of EU wide synchromodal services for a smart and seamless network, based on corridors and hubs, together facilitating efficient and effective supply chains. It involves a step change from the current system towards the ultimate vision of the Physical Internet, by synchronizing services and equipment on corridors and hubs and integrating these into networks. So far, network integration has been focused on static attributes of services and equipment (interconnectivity and interoperability), instead of dynamic attributes: as a result of this perspective, typical dynamic properties of the system such as resilience and responsiveness are not developed. Moreover, integration has been achieved only partially at the TEN-T core network level, without alignment of hubs and corridors specifically for freight transport. There is a poor match between requirements of pan-European, door-to-door freight services and the supporting infrastructure. Thirdly, integration has not been achieved in the vertical sense, aligning transport services with supply chain requirements of manufacturers, distributors and the wholesale sectors. Freight services are, therefore, insufficiently customer-oriented to serve increasingly diverse client's needs.

Box: Intermodality, Co-modality, Synchromodality

The European vision of Co-modality is aimed at creating strong framework conditions for each mode of transport in its own right and, where possible, in co-operation with other modes. Intermodality is the form of transport where this co-operation materializes by the use of more than one mode within the transport chain. Synchromodality builds on these two and concerns a very strong alignment at the operational level between transport services of different modes, with the aim to best serve supply chain needs.

Synchromodality, or synchronized intermodality, can be defined as the service which, through informed and flexible planning, booking and management, allows to make mode and routing decisions at the individual shipment level, as late as possible in the transport planning process including the trip itself. Although this might seem overly complex, its implementation has become realistic due to the rapid development of information systems in transport and logistics.

Positive experiences with synchronized intermodal services exist in port-hinterland container transport, in proprietary transport chains of integrators and in the hybrid (dual-mode) supply chains of certain shippers. Still, in most cases, the choice of mode and route is either fixed long time ahead, or is not made with consideration of all the latest options. Networks of modes are still decoupled at intermodal terminals, be it physically, financially or administratively, and synchronization between modal operations is limited or absent.

As a step towards the vision of the Physical Internet, the technologies and logistic approaches behind Synchromodality need to spread more widely to other segments of freight transport. As in the Physical Internet, synchromodality combines individual private networks into one supernetwork and allows combinations of services of different providers. The result of this increased flexibility is that the best possible mode is used at all times, given the logistics requirements and the prevailing network conditions. As such, Synchromodality creates more efficient transport services that are more responsive to customer needs and more resilient to changing external conditions.

The Roadmap will contribute to identify and define research and innovation challenges to design and set-up a **European core freight network of "smart" hubs and corridors** bearing the emerging needs of the transport industries to serve supply chains. Collaboration, process reengineering and business models are important areas of intervention needed to pursue a seamless, European synchromodal system.

Experts from all important stakeholders group involved in "Corridors, Hubs and Synchromodality" operations and research activities have contributed to this work[2].

2. See the list of members of the core group and additional experts consulted at the end of the document

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1.1

Expected impacts of research and innovation activities in Corridors, Hubs and Synchromodality

In order to define what research is needed in the area of Corridors, Hubs and Synchromodality it is important to decide which impacts are expected from innitiatives and projects. In this section, an extensive list of expected impacts from the implementation of the strategy for research and innovation proposed by ALICE is included. These expected impacts cover all ALICE areas including Corridors, Hubs and Synchromodality. The areas of intervention defined afterwards in this document and the research innitiatives arising on those topics do not need to contribute to all of the listed impacts but at least positive to some of them and neutral to the rest.

ALICE mission is "to contribute to a 30% improvement of end to end logistics performance by 2030". This improvement needs to be translated into the People, Profit and Planet perspectives therefore the impacts expected are divided into these three categories.

Further work needs to be done in order to define proper measurements units and indicators to properly define to what extend the expected impacts listed below will contribute to the 30% improvement of end to end logistics performance and accordingly define guiding objectives for these indicators in the medium and long term.

The impacts have been divided in primary and secondary impacts. While primary impacts are the ultimate expected impacts, the secondary impacts will have a positive influence in the primary one. For example, energy c onsumption is a primary impact while increasing load factors of vehicles is a secondary impact which positively influence energy consumption as well as other indicators such as emissions reduction.

These expected impacts are related to logistics performance dimensions. All actions undertaken under the ALICE umbrella should improve one or several of them without scarifying the others.

Table 1.1. Summary of the expected impact of research and innovation activities on Corridors, Hubs and Synchromodality

	PRIMARY IMPACTS	SECONDARY IMPACTS
People	+ Customer satisfaction. + Products availability. + Secure societies.	+ Load factors: weight and cube fill of vehicles. + Volume flexibility (Time to +/- capacity). + % Synchromodal. + Asset utilization. + Supply Chain Visibility. + Reliability of transport schedules. + Perfect order fulfilment. + Transport routes optimization (reducing distance). + Transport actors using automatic data exchange. + Cargo and logistics units integrated in the automatic data exchange. + Upside / Downside Supply Chain Adaptability and Flexibility. + Decoupling logistics intensity from GDP. - Empty Kilometres. - Waiting time in terminals. - Risk factor reduction. - End-to-end transportation time. - Transport distance to reach the market. - Lead times.
Planet	- Energy consumption (kWh Logistics/GDP). + Renewable energy sources share. - CO_2 Emissions (kg CO_2/tkm).	
Profit	+ Return on assets and working capital. - Cargo lost to theft or damage. - Total supply chain costs.	

The overall goal of the Roadmap "Corridors, Hubs & Synchromodality" is to support the realisation of efficient and effective supply chains at Pan-European level also exploiting the Physical Internet potentialities and integrating them in the freight supply chain. It is also important to consider the indicators that can be used to measure and monitor progress, and to set targets that are to be achieved according to the EC Agenda. Both indicators and targets specific for this Roadmap will be further discussed and developed within the work of Working Group 2.

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1.2

Background

Current status of the European freight transport system

The knowledge of the current status of the freight transport system fixes the starting condition for the Roadmap. Freight customer needs evolve constantly changing their priorities. Reliability is assumed as the most perceived-value that customers seek for from the purchase of a transport service and the most relevant indicator when developing a transport service. It is critical that cargo is delivered efficiently, on time and intact. Comprehensive and accurate logistics information is necessary to enable to find out about problems sooner and adjust plans proactively, minimising the impact of deviations or other exceptions and maximising commercial opportunities. **Approaches that reduce uncertainties and raise efficiency need to be developed**.

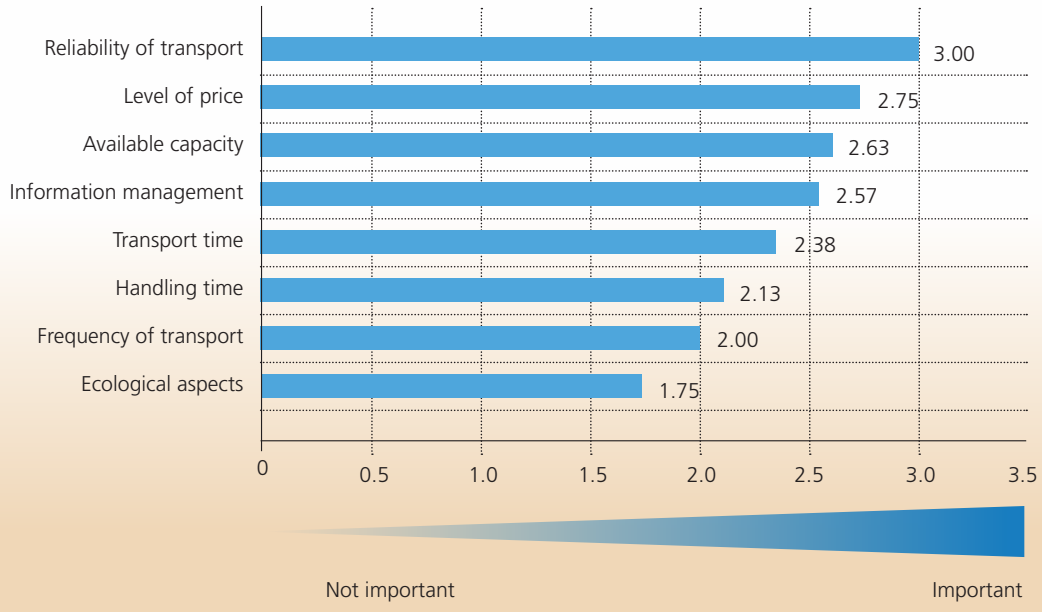


Figure 1.1: **Freight customer requirements (CER, 2011)**

Freight transport across Europe relies on both short and long distance modes. Keeping in mind the desire of the EC to shift freight from road to alternative modes of transport on long distances, it is necessary not only to recognize the actual shippers' demands above, and the skewed geographic distribution of transport flows, where most of the volume is on short distances (only 11% of tons moved is above 300 km in year 2030, not much different from now; ACEA, 2011). Still, 56% of transport performance (tonkm, which correlates directly with costs, revenues, energy use and emissions) will take place on long distances, thereby suggesting a strong potential impact on freight KPI's from even a modest modal shift in tonnes.

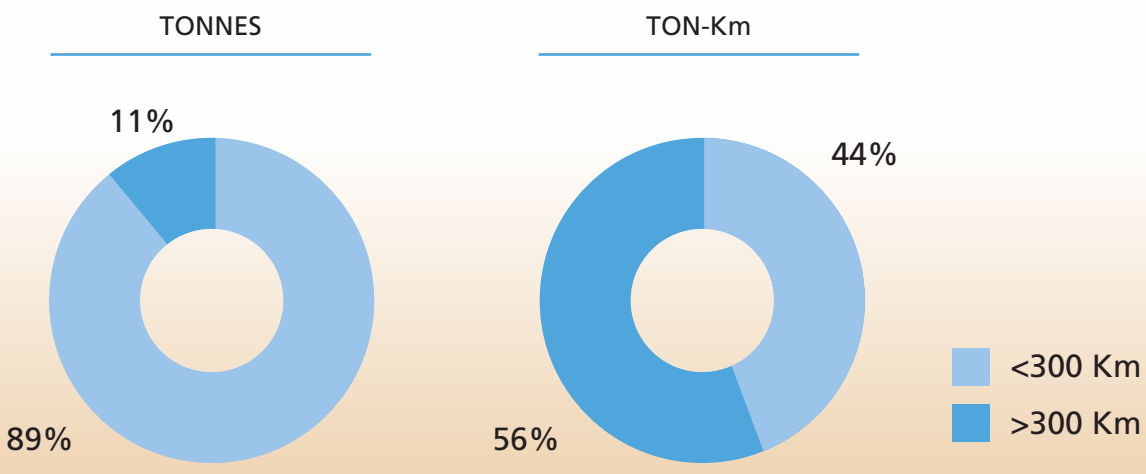
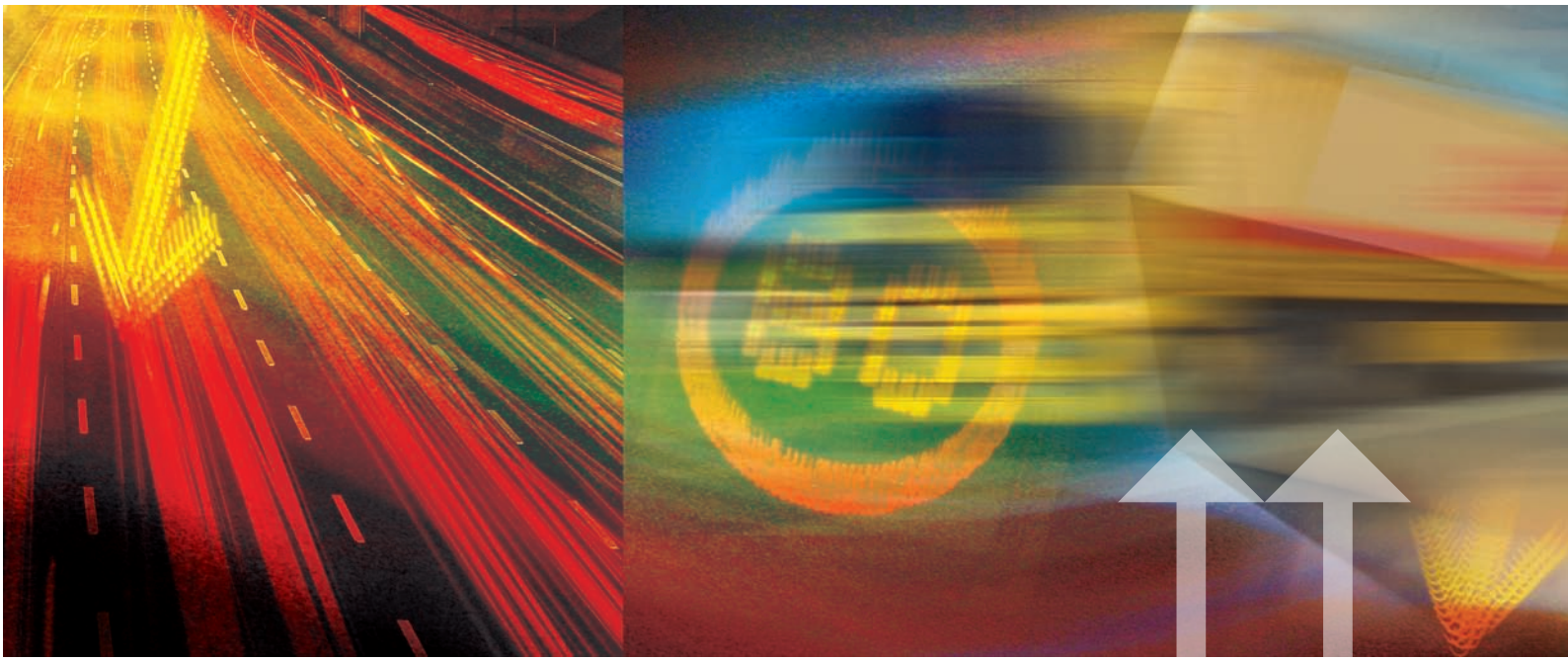


Figure 1.2: **Spatial distribution of transport flows for road transport (2030; ACEA, 2011)**

Development of the TEN-T (as the core network of strategic European infrastructure, intermodal terminal networks including seaports and inland terminals, international hubs, etc.), includes improvements such as addressing gaps, and removing bottlenecks that hamper the smooth functioning of the internal market and overcoming technical barriers. It seeks to strengthen transport chains for freight and is technology neutral to allow, future developments to be taken into account.



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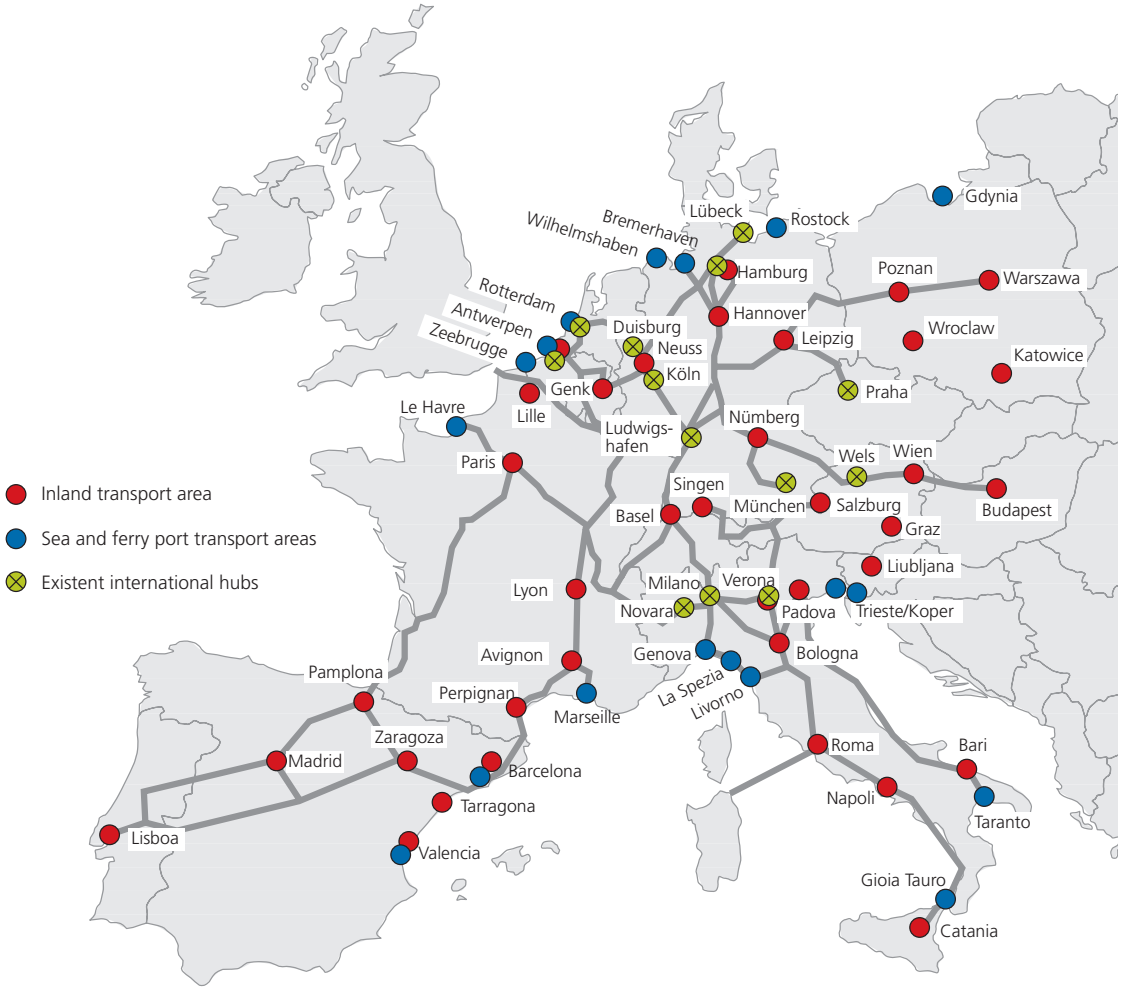


Seamless transport is not easy to achieve. The European transport and logistics sector is one of the key business sectors in Europe, performing billions of operations by millions of companies and people every day. Assuring the integration of these operations across national borders is a cornerstone of EU policy and a basis for the competitiveness of the economy. The absence of common processes, a common language and common standards for interoperability is a key obstacle to achieving integration. Moreover, any supporting technology to be applied should be highly reliable, accessible, low cost and as generic as possible. Interactions between stakeholders must be easily established at a cost affordable to all. Supply chains need to be more efficient by providing state-of-the-art visibility and collaboration capabilities. Above and beyond the proper design of infrastructures and services, the operational control of the execution of transport processes should be optimised through, for example, improved **synchronisation**.

European policy context

"Europe needs efficient, integrated transport alternatives that are both environment-friendly and user-friendly", said Jacques Barrot, former Commission Vice-President with special responsibility for transport. "The integration of these modes of transport into efficient logistic chains is essential in order to reconcile the economic efficiency and long-term development of transport".

On the basis of the findings of a wide-ranging consultation started in 2006, the Logistics Action Plan proposed measures aimed at making freight transport in the EU more efficient and sustainable, while reducing costs and saving both time and energy. The Action Plan aimed to improve the flow of information accompanying the physical transport of goods, simplify administrative procedures, improve the competence and attractiveness of the logistics sector, and encourage high-quality services. It also advocated innovation in long-distance transport concentred in "green corridors".

A series of initiatives and projects aimed at making freight transport in the EU more efficient and sustainable have been adopted. The package of measures consisted of proposals concerning logistics, a rail network giving priority to freight, and European ports and maritime transport. The simultaneous adoption of all these measures gave a strong signal demonstrating the close links between logistics and the various modes of transport. The common objective of these initiatives was to promote innovative infrastructure technologies and practices, develop means of transport, improve freight management, facilitate the construction of freight transport chains, simplify administrative procedures and enhance quality throughout the logistics chain. The European Commission promoted maritime transport, which remains the mode that is, if used wisely, the most energy-efficient and environment-friendly in terms of greenhouse gas emissions especially thanks to the IMO directives imposing the use of greener fuels and other measures. Given the steady increase in the efficiency of road transport, rail transport also needed to become more competitive.

The Commission proposed new initiatives with a view to create a European freight-oriented network in which the service was to be more reliable and more efficient.

Status of EU R&D

In order to meet the above mentioned challenges a number of research projects have been financed by the European Commission that have contributed to improvements in the freight transport system. Co-modality has become operational and has been defined including development of benchmarking and KPI concepts and solutions for establishing performance measurement mechanisms for co-modal logistics chains (relevant projects include: BELOGIC, EIRAC, KOMODA and SynchromodalIT). A harmonized understanding of information flows was created including, amongst others, improved security of supply chain through visibility, development of e-freight solutions, development of information architecture allowing existing systems and new applications to efficiently co-operate. A number of projects focused on these developments including iCargo, CONTAIN, CASSANDRA, e-Freight, EURIDICE, FREIGHTWISE, INTEGRITY, SOCOOL@EU, COMCIS and DISCwise. Reduction of energy consumption and CO2 emissions linked to multimodal transport including improvement of horizontal collaboration, development of Green Corridors has been achieved in LOG4GREEN, SUPERGREEN, ECOMOVE, CO3 projects.

Among others, the results proved the need for a better integration of freight activities with the focus on chains driven by manufactures and not by the infrastructure.

Links with Shift2Rail

The Shift2Rail Joint Undertaking (S2R) will in a substantial degree address freight issues and solutions. It will help rail to act within the important market and revenue potentials on European transport markets and, in particular, contribute to the EU and Member States' policy objective of making more use of more energy-efficient transport modes in order to reduce greenhouse gas emissions and improve the overall environmental performance of the European transport system.

Shortcomings on the freight transport markets, e.g. the lack of reliability and punctuality of rail freight services is a source of dissatisfaction among customers causing potential customers to consider rail as incapable of meeting their logistical needs. Therefore, the rail sector must prepare for a rapid and substantial evolution. It will have to think differently about its value propositions, continuously developing and improving products and services that evoke extreme responses, uncover missed costumer segments, look to, check and adopt services developed in other sectors that can be a source of inspiration. This will require rail transport stakeholders to question long established principles and practices and to develop more sustainable and promising market opportunities by thinking faster, by thinking differently, by thinking partnerships and open collaboration and, above all, by thinking bold.

The cooperation with actors from other modes will be a key for S2R in order to apply innovations form other sectors also in the railway domain and to develop high quality and seamless mobility solutions. This requires liaising with relevant stakeholders, most definitely including the logistics industry.

The cost competitiveness and the reliability of freight services need to be considerably improved if the sector is to meet the ambitious objectives that were set in the Transport White Paper in terms of developing rail freight.

The challenge is two-fold:

- To acquire a new service-oriented profile for rail freight services based on excellence in on-time delivery at competitive prices, interweaving its operations with other transport modes, addressing the needs of the clientele among others by incorporating innovative value-added services.
- To increase productivity, by addressing current operational and system weaknesses and limitations, including interoperability issues, and finding cost-effective solutions to these problems, including optimisation of existing infrastructure and fostering technology transfer from other sectors into rail freight.

Taking into account the fierce competition with road transport, it is important that future rail freight solutions are developed to optimise the handling and set up time at marshalling yards and in terminals and an overall increase of speed and efficiency for rail freight operations. The two major areas in the Roadmap, *"Innovative supply-chain design and Integrated Synchromodal Services and Hubs"* and *"Network Integration for a resilient supply-chain"*, will provide innovation to S2R, in several technology readiness levels. Members and partners of S2R will be active in the development of these two areas. The liaison between ALICE and IP5 (Innovation Programme 5: *Technologies for Sustainable & Attractive European Freight*) in S2R will follow and support the linking and cooperation; this process will find coherent and consistent cross-fertilization between TD5 (Technology Demonstrator "The Novel Terminal, hubs, sidings and marshalling yards") of IP5 in S2R and WG2 "Corridors, Hubs and Synchromodality" of Alice.

Forces driving innovation needs

In the coming decade, a number of trends driving the need for innovations in hubs, corridors and Synchromodality will be seen. These changes come from outside the freight sector, by pressure from our natural environment (e.g. energy transition), and from technology push (e.g. ICT) or driven by the clients of logistics services (e.g. mass-customization).

Such trends have been identified by the ALICE WG2 involved experts as follows.

- Transport and supply chain processes are converging into well **aligned systems**. Whereas in the past transport could be seen separately from manufacturing and distribution, now this is no longer the case. Developments such as re-shoring of production, 3D printing, e-commerce and cross chain control may have a profound effect on the demand for transport.
- **Greening of supply chains** will go beyond efficiency improvement, to achieve the long term GHG emission reduction objectives. New solutions will be needed to achieve sustainable transport, such as innovative propulsion technologies and the influencing of consumer behaviour through information or pricing.
- The use of logistics data and ICT solutions will accelerate, including the development of applications for **dynamic transport management**, freight travel information, cargo and capacity management, Synchromodality and security related implementations. At the same time, the divide in capabilities between large firms and SME's, as well as a lack of harmonization may create unwanted lock-ins or hamper progress.
- **Globalization** is pushing Europe to develop a position and a clear network strategy in the development of the main connectors to other world regions, including Central Europe, the Middle East, Africa, Asia and the US.
- **Socio-demographic changes** are attributable to a greying society, urbanization, migration and mass-individualization. These will change the demand for transport, reduce the ability to operate labour-intensive systems, and increase public pressure on land development.

Each of these developments bears different, interrelated challenges. Anyway, a common denominator among them is the **increasing pressure for the deployment of innovative solutions for responsive, customized and sustainable freight transport service throughout Europe**.

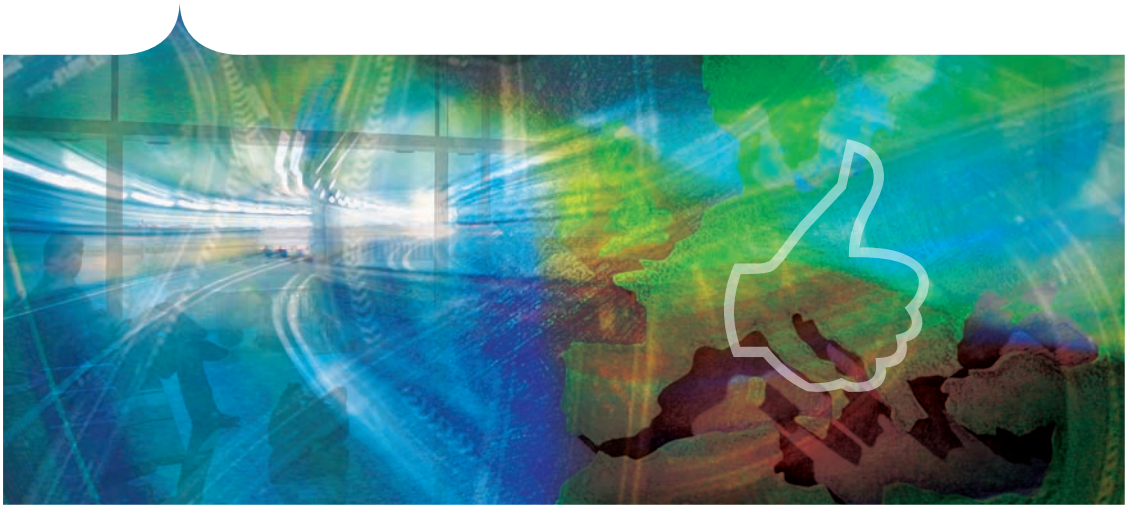
The consolidation of goods volumes is essential in order to promote modal shift and increase the share of combined transport in Europe. Consolidating loads creates the volume needed to sustain regular new services and regular services will in turn attract higher cargo volumes. When frequent and reliable connections between larger and smaller transport hubs are in place, the modalities of rail, short sea shipping and inland waterway transport will have an improved chance of competing with road-only transport options. However, modal shift actions require more than just physical connections. The European focus has recently changed from Intermodality, to Co-modality, to the latest concept of Synchromodality, where all transport options are offered alongside one another at transport hubs and selected according to destination, required turnaround time and sustainability concerns.

There is a need for further improving the efficiency of the transport chain with a special focus on hinterland connections. This is viewed in the light of a forecast increase in freight volumes together with high transhipment costs when cargo shifts from one carrier to another.

There is a need for integrated data transfer from seaport (terminal) to hinterland, thus enabling better and faster interconnectivity when selecting a hinterland transport mode.

Today's technological achievements enable new and more efficient information systems, which can assist transport organisations and ensure higher efficiency in the form of greater detail of user and travel information for both companies and the people performing the actual transport function. In this sense the focus is on "Smart Solutions" which should cover the topics such as: Information and Communication Technologies, E-Freight, Telematics' Applications, E-Customs, Tracking and Tracing and Satellite Communication.

More policy attention towards research is still needed. The business sector considers research to be one of the most important topics for the future. Despite the good intentions, there still seems to be a gap between the results achieved through research and development projects and what the business sector experiences in its day-to-day operations. Concepts developed in research projects are often not taken to the next level. Competition and confidentiality issues seem to play a role here. Better communication and dissemination of research results on a wider scale is desirable. Knowledge exchange or coordination of research efforts could be improved, leading to the suggestion that an overarching maritime research network or a dedicated maritime/transport/logistic think-tank should be created.



1.3

Scope and main approach of the Roadmap

The current European economic circumstances, the still existing globalization trends and the transformations that are in place have a strong impact on the goods mobility patterns, generating an unprecedented pressure on the existing international, national, regional, and local transport systems and infrastructures. Therefore, new solutions and guidance to the freight system development are needed, also considering the present and future needs in terms of sustainable transportation in an evolving environment. Different aspects characterize the main issues related to sustainable freight mobility: they encompass the use of integrated resources and transport modes, the planning of new transport infrastructures and the improvement of the existing ones by defining their territorial role in the wider EU Corridors' context.

Well-integrated, synchronized operational processes and environmentally friendly co-modal transport networks all depend **on efficient and synergized hubs**. Efficiency and sustainability are further enhanced throughout the network if cooperation between hubs and other relevant stakeholders enables re-orchestration of functions in the network and along the whole supply-chain, especially in case of congestion or other factors decrease the system stability and regularity.

The innovation Roadmap for Corridors, Hubs and Synchromodality provides pathways towards improvements in the integrated European freight service network. The concerned stakeholders are at the supply chain level, at the transport service level and at the infrastructure network level. With the overall aim to arrive at an integrated system, the innovations concern the coupling of these levels. The Roadmap will make optimal use of the latest developments in enabling technologies in the field of e.g. ICT (software), equipment (hardware) and governance (orgware) to achieve this coupling.

Stakeholders (Horizontal layers)

The stakeholders will benefit from innovations are at 3 levels:

- **Supply chain level:** Networks from the goods producing and trading sectors of industry towards the consumer, i.e. shippers and receivers of goods
- **Service level:** Transport service providers, per mode of transport, but also for intermodal transport and forwarding services.
- **Infrastructure level:** Network providers including hubs and corridor managers.

The innovation tasks lie in between these layers, as integration activities.

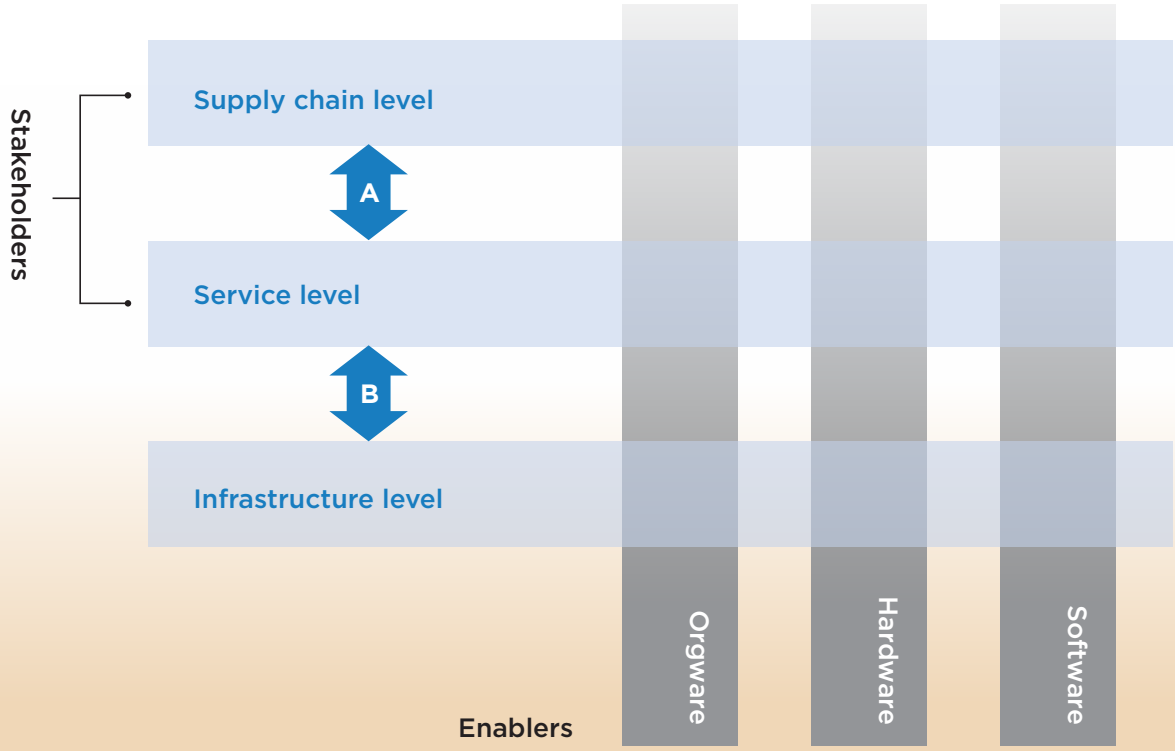


Figure 1.3: **Stakeholders levels and enablers**

A closer link between the transport system and industrial supply chains needs to be organized, for two reasons. Firstly, the European transport sector should keep up with the quickly evolving needs of transport client sectors (e.g. near-shoring of high tech, biofuels markets, 3D printing), to support the competitiveness of Europe's industry and to be able to satisfy mass-individualization in consumer needs. Secondly, transport sustainability measures need support and leadership of all supply chain actors, in order to avoid suboptimal environmental measures in the transport system.

The synchronization of operations of different modes of transport requires availability of information about services of different modes, the possibility to integrate and modify these services in a dynamic manner, and information exchange to allow operational execution of dynamic planning and booking systems. Collaboration between actors is essential, to create synchronized services and to cope with future pressures on efficiency, flexibility and sustainability: this collaboration requires a fit between operational processes of horizontal and vertical business partners.

Synchromodal services require an integrative network strategy for multimodal freight transport within Europe. Network integration involves a close fit of corridors and hubs into a holistic EU freight network. Hubs need to be nominated, equipped and connected by corridors in a consistent way, from TEN-T level to last-mile level, in order to allow services to achieve the economies of scale and the integration scope of multimodal networks. Pan-European approaches for performance management of freight corridors need to be put in place. Information systems brought forward by independent ITS applications need to be harmonized.

Enablers (Vertical layers)

While the horizontal layers mark the desired progress in the transport service network, the rate and direction of progress also depends on general, sector-neutral, developments in social and technological systems. These can be called the **"enabling innovations"**.

- **Business Models innovation and governance/Orgware** – Best collaborative practices and approaches for fast deployment of innovations.
- **ICT deployment of innovative technologies/Software** – Operational practices and standards for data, messages, software / digital divide
- **New technology/Hardware** – Modularized solutions, transport equipment, ICT devices

An important barrier for innovation is the lack of promising business cases for new technologies. Business cases can evolve from the conventional ones by allowing further differentiation in services towards identification of new market segments, inclusion of environmental impacts (internalization), capturing the value of information about transport service execution and the inclusion of added value services (e.g. storage, postponed manufacturing, return logistics, financial services). **New co-operation schemes** around international corridors, hubs and logistics clusters already show that governance innovation is essential.

The pace, at which ICT technology is permeating the transport world is unprecedented. Deployment of these technologies within Europe is, however, still hampered by widely differing operational practices and standards. Smart regulations, working approaches and living labs need to be developed to support diffusion of innovations, internationally and between large firms and SME's. Specific attention needs to be given to create awareness of new technologies, to empower SME's and to harmonize technology with global developments.

With the idea of the Physical Internet as long term vision, it can be expected that technologies moving towards strong **modularity, connectivity and self-organization** will appear. This includes information devices, flexible and modularized transport equipment, sensor/actuation systems, automated driving and transhipment systems, etcetera.

Areas of innovation

In order to arrive at an inter-connected and synchronized system, integration must be achieved between the 3 horizontal layers (see arrows A and B in figure 1.3):

A. the supply chain layer and the services layers
B. the services layer and the physical network layer

Such connections define specific areas of innovation which concept will be further developed in Chapter 2 of this Roadmap.

1.4

Complementarities with other ALICE Roadmaps

In Figure 1.4 the interdependencies of the Roadmaps to achieve the whole ALICE vision are included:

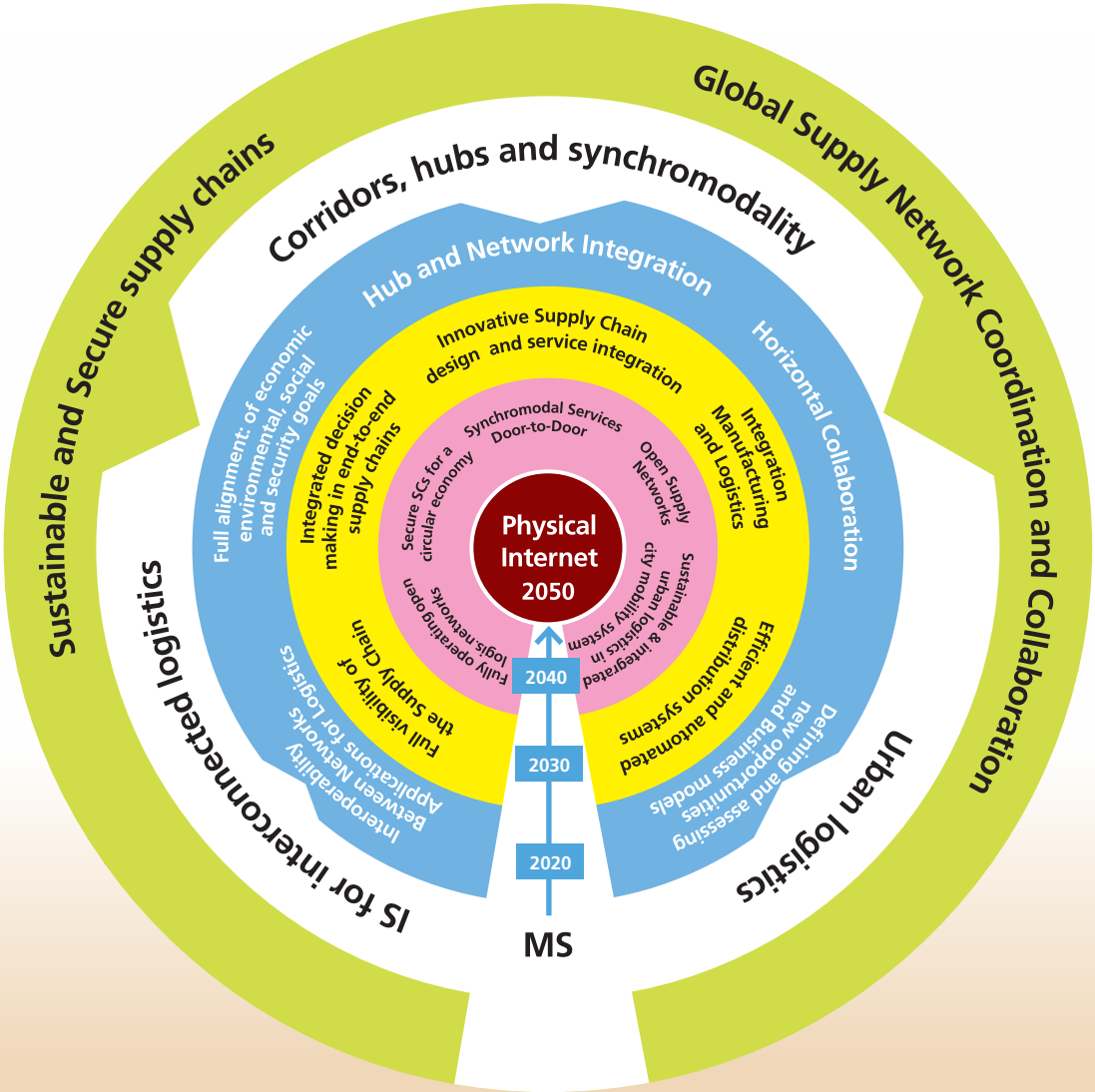


Figure 1.4: **Interrelation between Roadmaps**

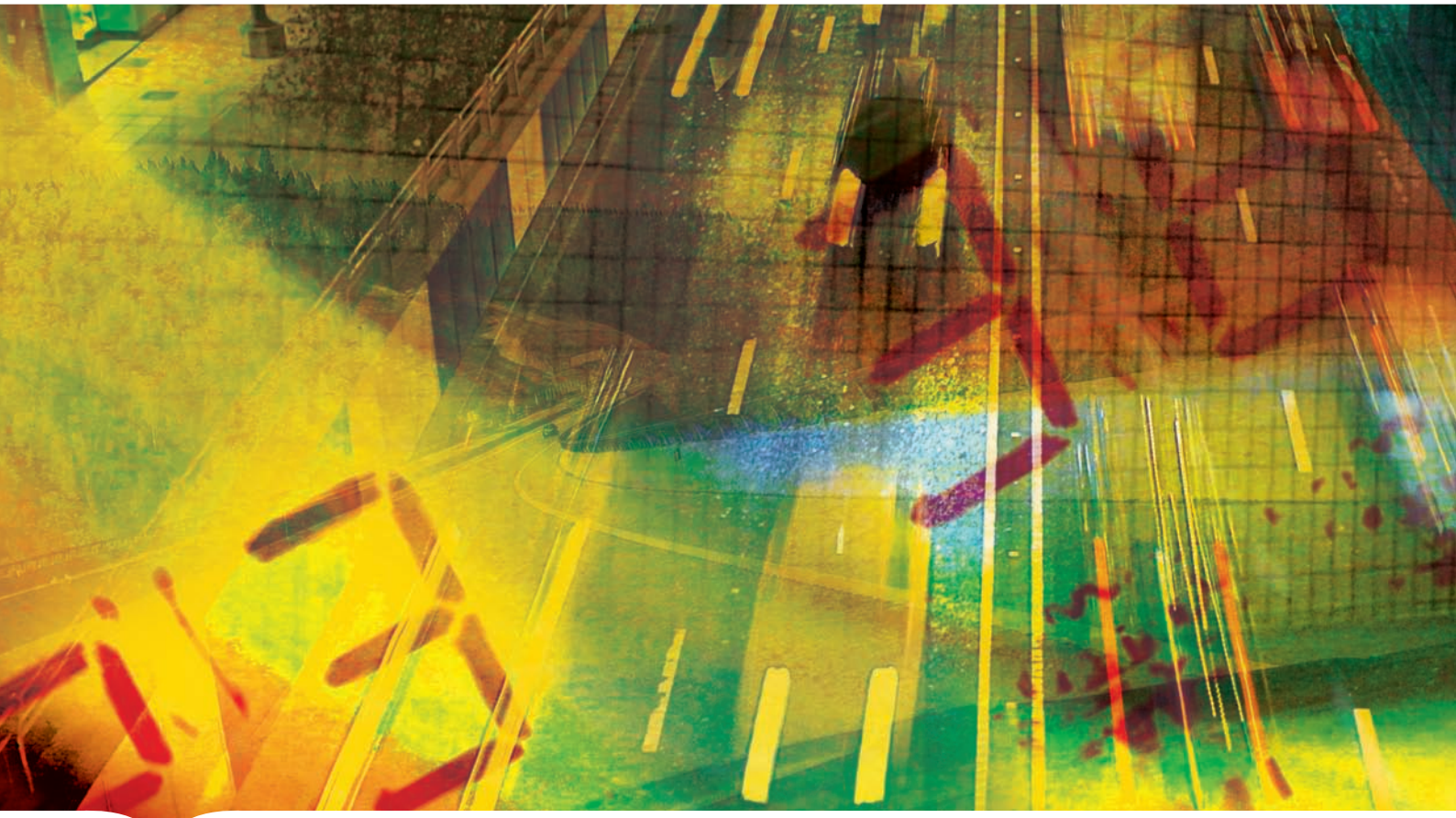
Specifically, the following links and complementarities with the other ALICE Roadmaps are:

- **Roadmap on Sustainable Safe and Secure Supply Chains**. Synchromodality concerns a very strong alignment at the operational level between transport services of different modes, with the aim to best serve supply chain needs meeting economic sustainability as well as social and economical considerations that are of particular focus of Sustainable, Safe and Secure Supply chains Roadmap.

- **Roadmap on Information Systems for Interconnected Logistics**. Information systems are key enablers for Synchromodality, therefore the implementation of this Roadmap will rely on the availability of ICT and other technologies supporting the Physical Internet concept. Information System for Interconnected Logistics Roadmap emphasis is laid on the smart analysis and management of event information from the Internet-of-Things; the aim is the development of advanced tools and systems which enable users to master the flood of information from big data by means IT-tools and systems for intelligent planning and control. Specifically, information management (Data matching, Standards, Security, Protection of Confidentiality rights etc.) is addressed in Information Systems for Interconnected Logistics Roadmap.

- **Global Supply Network Coordination and Collaboration**. Corridors and hubs may be important nucleation points for horizontal collaboration. They concentrate big volumes and therefore, big synergies could be found to increase operations efficiency. This topic is interconnected between Roadmaps.

- **Roadmap on Urban Freight**. While Corridors Hubs and Synchromodality Roadmap is focused on long distance transport the Roadmap on Urban Freight focusses on the Urban Environment. Integration and connection between the long distance transport and the last mile delivery, which is the major interconnection, is addressed in this Roadmap as it includes hubs within the scope.



2

CHALLENGES AND THEMES

Starting from the analysis of the current EU freight transport system status and the identification of the enablers, it is possible to distinguish between two major areas for the Roadmap. These include:

1. Innovative Supply-Chain Design based on Integrated Synchromodal Services.
2. Hub and Network Integration for a resilient supply-chain.

Each of these areas has major streams of innovation, which originate from R&D, through deployment of innovations and market uptake towards expected impact. Here, below the individual innovations that jointly constitute the outlined pathways are described together with the way in which these build up from R&D to impact (Figure 2.1).

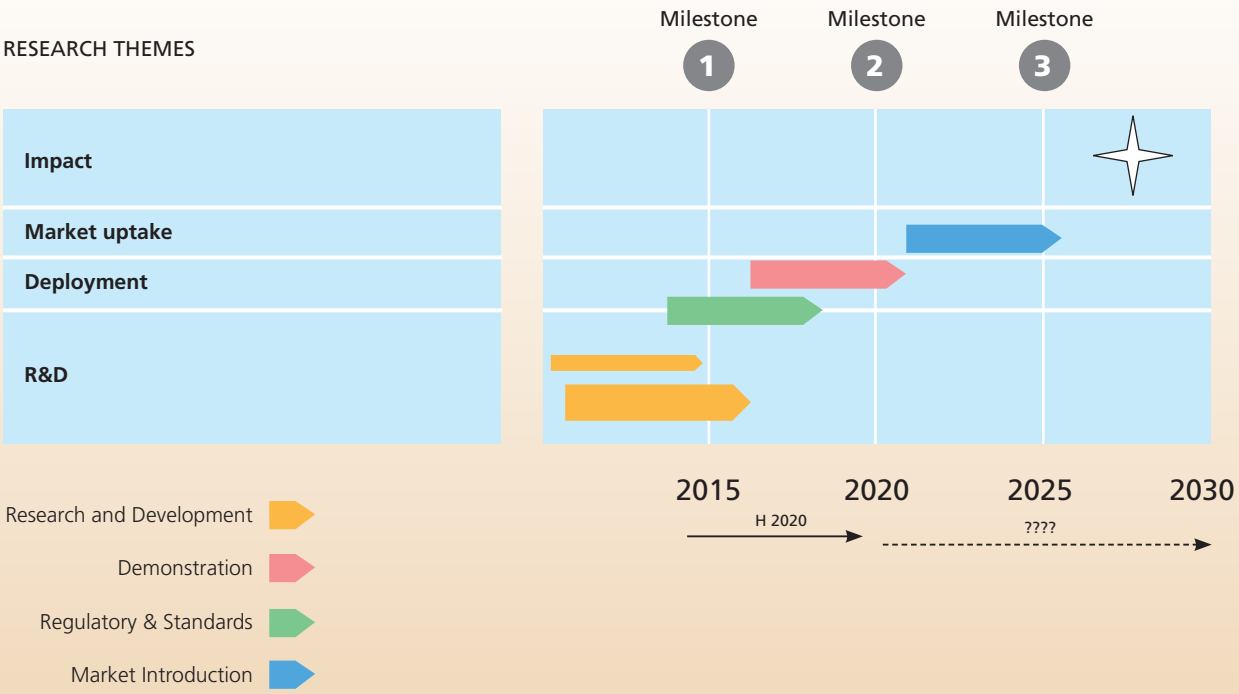


Figure 2.1: **Roadmap format (abstract)**

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2.1

Innovative Supply-Chain Design based on Integrated Synchromodal Services

The novel approaches to supply chain design will concentrate on fostering synchro-modal operations by the following targets:

- **Improving specialization** (per production process, warehousing, storage, transport) and focusing on the specific quality of transport services (next to costs) that are needed to support production and consumption processes. For this, a deeper understanding of the needs of users of the transport system – the shipper – is needed in terms of their logistics processes at individual item level.
- **Strengthening digital and physical flows** (systems' interoperability and operations standardis ation) between shippers and carriers, working towards optimal total service/cost solutions. Transport services and distribution chain functions have to be optimized and standardized at the supply chain level, otherwise the systemic effect would be wasted.
- **Defining novel governance and business models**, with market oriented dynamics able to equilibrate supply and demand and then make more efficient supply chains at global level. This will allow hubs to exploit their business models, i.e. to develop trade and manufacturing functions from physical transport support to value added logistics services. Eventually, clusters will be better embedded in local economies.

Three streams of work, or pathways can be recognized in this part of the Roadmap:

Pathway 1 Understanding the demand for synchromodal freight transport

Dynamic (predictive and responsive) mapping of commodity chains and their requirements using operational data. More efficient use of hubs for different types of products and its requirements (e.g. frozen, non-frozen) is needed. Differentiation of industrial sectors needs to be taken into account. To develop hubs appropriately multi-customer multi-supplier value chain mapping is needed including availability of qualitative and quantitative data.

Pathway 2 Optimize alignment between supply chains and transport services

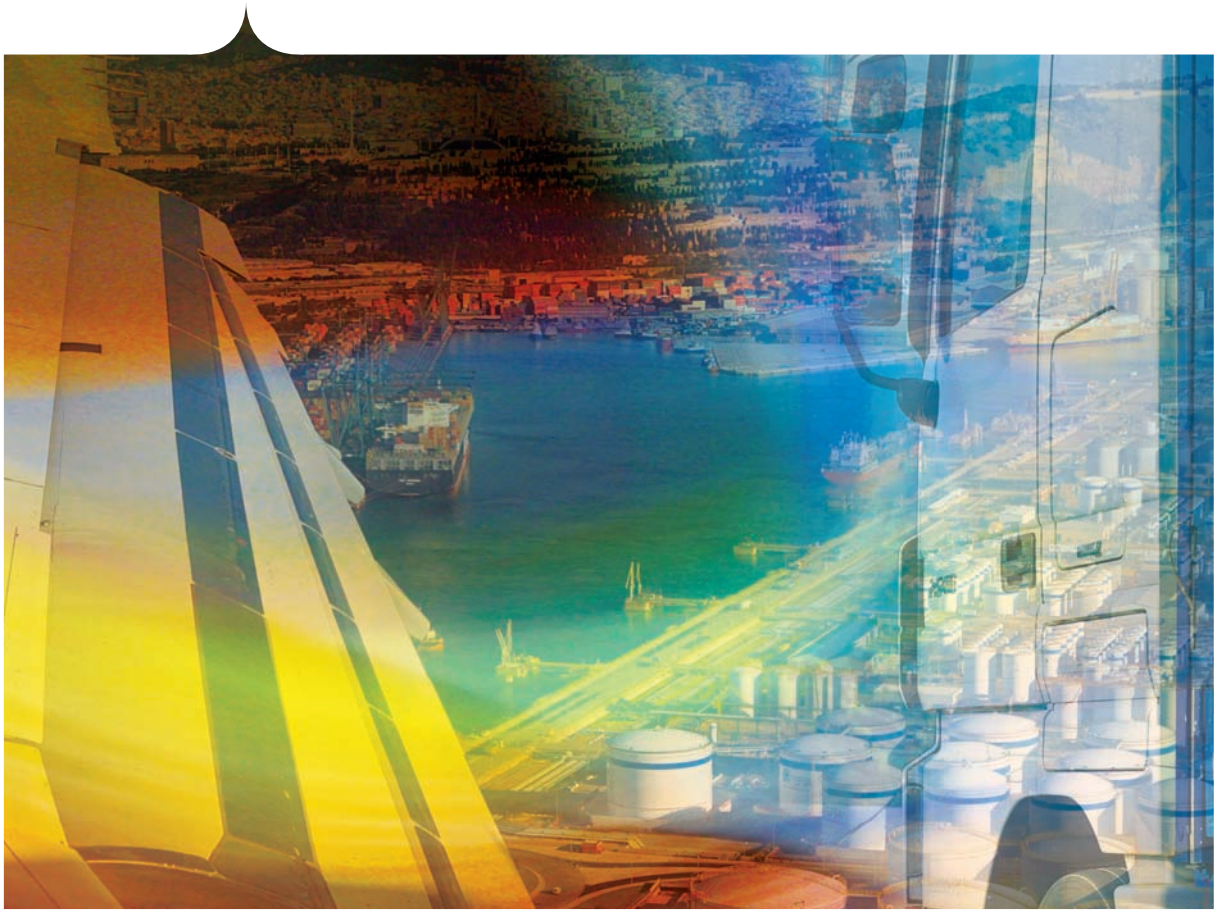
Innovative strategies to align transport service design and global supply chains:

- synchronization of transport and production schedules,
- hybrid channels for parallel distribution,
- re-organisation of planning (interactive),
- booking processes (a-modal) and bundling internally and externally (collaboration).

Pathway 3 New roles for hubs in the supply chain

Identification of new roles and business models for hubs in the supply chain. Extended hubs acting as freight forwarders, able to specialize physical operations in cargo (de)consolidation, negotiate transport services, balance the traffic in its proximity network, manage exceptions, create community added value will be developed. The role of clusters should be identified, including clusters of different players, clusters of hubs. Important innovations include solutions for collaborative cluster business models made possible through reliable and fast exchange of information.

PATHWAY	INNOVATIONS?	FOR WHOM?	IMPACT?
1. Understanding the demand for synchromodal transport	Detailed demand mapping and forecasting tools. Big data used for demand prediction.	Transport service providers, SME networks.	Load based, amodal planning and booking possible due to demand intel.
2. Optimize alignment supply chains and synchromodal / multimodal services	Tactics for transport service and supply chain alignment (e.g. hybrid networks). Mind shift.	Supply chain managers, Logistics managers, Regulators.	Tightly coupled production/ distribution/ transport systems.
3. New roles for hubs in the supply chain	New value added business models. Hubs taking role in supply chains for e.g. postponed manufacturing.	Real estate, cluster managers, transport service providers, port authorities, Regulators.	Healthy and stable clusters, networks of clusters. Specialisation of hubs in TEN-T.



2.2

Hubs and Network Integration for a resilient supply-chain

Novel hubs have to support the need to rethink Supply Chains in order to remain agile without assuming that main features passes just over the maximization of efficiency and reduction of operating costs. They drive innovation by transforming their traditional supplier of nodal service into integrated value chains. Hubs have to operate as more than isolated collections of resources, equipment, and functions, each independently pursuing its own activities and goals.

Integration of hubs and corridors at strategic level (freight TEN-T), tactical level (pan-European service profiles) and operational level (network sense and respond approaches) has also to be considered. Standard protocols and operations per layer and self-regulated dynamics for improving specialization, reliability, scalability can enable collaboration and integration. The new TEN-T guidelines and the CEF will support the realization of a EU freight network, connecting the TEN-T corridors for different modes at strategic hub locations.

Then, it can be deduced that Collaboration and Network Integration are two major patterns of the new role of the hubs. This approach is strongly supported by the "Physical Internet" core concepts:

- physical and digital encapsulation: the former by modular and standardized rules and processes, the latter by reproducing the Internet ISO/OSI layers in shipment transaction;
- standardized vertical transactions among close layers;
- horizontal transactions only among homologue layers.

Specific streams for research, development and implementation in the Roadmap can be organized as follows:

Pathway 4 An integrative freight network strategy

Positions of nodes and freight facilities vis-á-vis passenger transport investments will need to be clarified. Within the context of the TEN-T, the position of freight transport has to be articulated. Investments in maintenance and hub development, needed for a healthy pan-European freight network, need to be systematically identified. Besides the sea ports, the network should include inland logistics hubs. With a view towards robust and flexible services, the network vision behind the co-modal concept needs to be developed in more detail, aiming at synchronization of modes. In addition, landside gateways to Eastern Europe, China and the Middle East need to be developed. Innovations include new frameworks for network design, methodologies for investment decision making including involvement of local authorities.

Pathway 5 Transport chain design and operation for Synchromodality

Tools and data are needed for the design of synchronized services, execution of multimodal routings and for multimodal network management. The focus has to be on optimized efficiency, responsiveness and customizability. R&D work is also needed to test to what extent the redundancy and agility of services required for Synchromodality (and for the higher concept of the Physical Internet) would be more effective and efficient than a vertically integrated and pre-planned transport plan, based on the current predict & prepare static philosophy.

Pathway 6 Support to ICT as integrating technology

Support to ICT systems at EU network level as facilitator of the process of integration with multidimensional approach (social, trade, service provision, capacity, legal). Interoperability among IT systems of the various transport chain actors has to be ensured by best practices for standardized communication throughout Europe. Applications to manage the various stages of freight transport have to be developed with user-friendly interfaces. Web based systems have to be developed to facilitate the accessibility to the freight transport, from both the stakeholder and the customer sides, to allow well-synchronized functioning of all the system components.

PATHWAY	INNOVATIONS?	FOR WHOM?	IMPACT?
4. An integrative freight network strategy	European core freight network and access networks, multimodal network management, freight ITS.	Network managers, corridor managers, hub managers.	Connected and sustainable Pan- European freight TEN-T infrastructure.
5. Transport chain design and operation for Synchromodality	Seamless and transparent freight service networks in Europe (gateway networks, hub/spoke, plus service levels). Aligned with modular loading and vehicle technology.	Transport service providers, hub operators. Vehicle and equipment manufacturers.	Increased diversity and resilience of transport services, more Intermodality.
6. Deploy ICT as integrating technology	Extended freight ITS towards Integrated and automated planning, booking, operation.	ICT sector, Transport service providers.	Automated and responsive synchromodal transport services.

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2.3

Milestones

PATHWAY	OVERLL INNOVATION	MILESTONES
1. Understanding the demand for synchromodal transport	Detailed demand mapping and forecasting tools. Big data used for demand prediction.	Demand data analytics. Synchromodal demand forecasting. Integration with demand mapping tools.
2. Optimize alignment supply chains and synchromodal / multimodal services	Approaches for transport service and supply chain alignment (e.g. hybrid networks). Mind shift.	Connect demand forecast/supply methods. Production/transport optimization. Supply chain/transport optimization best practices.
3. New roles for hubs in the supply chain	New value added business models. Hubs taking role in supply chains for e.g. postponed manufacturing.	Define hub business model principles. Hub and cluster business models. Smart specialization for hubs.
4. An integrative freight network strategy	European core freight network and access networks , multimodal network management, freight ITS.	KPI's and design principles for EU freight network. EU freight network design, TEN-T guidelines. Develop multimodal freight network management.
5. Transport chain design and operation for Synchromodality	Seamless and transparent freight service networks in Europe (gateway networks, hub/spoke, plus service levels). Aligned with modular loading and vehicle technology.	Synchromodal operation principles and technologies. Performance based a-modal transport planning and booking. Modular transport technolgy. Synchromodal services widely available.
6. Deploying ICT as integrating technology	Extended freight ITS towards Integrated and automated planning, booking, operation.	ITS Logistics architecture for connected applications: operational (ITS), tactical (service design) and strategic (BI / business intelligence). Deploy connected ITS / MTMS (multimodal TMS) applications. Synchro ICT adoption program.

Legend for colours: Orange: R&D / Green: Products / Red: Markets

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Annex 1

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Annex 2

Overview of relevant projects and initiatives

ACRONYM	FULL TITLE	DESCRIPTION	DURATION	WEBSITE
BELOGIC	Benchmarking Logistics for Co-modality.	Development of benchmarking and KPI concepts and solutions for establishing performance measurement mechanisms for co-modal logistics chains.	September 2008-February 2011	http://www.be-logic.info/
BESTFACT	Best Practice Factory for Freight Transport.	Aims to develop, disseminate and enhance the utilisation of Best Practices in 3 clusters: Urban freight transport, Green Logistics and Co-modality, and eFreight.	January 2012-December 2015	http://www.bestfact.net
CASSANDRA	Common Assessment and analysis of risk in global supply chains.	It aimed to improve security of supply chain through visibility including: 1/ technically bridging the gaps between visibility solutions and community systems in supply chains, 2/ facilitating the adoption of modern tools for integrating risk management, 3/ providing platform to discuss and adopt a common risk-based approach for business and government supervision.		http://www.cassandra-project.eu/
CHILL-ON	Enhancing safety at every step on the food supply chain.	The project aimed to improve quality, safety, transparency and traceability of the chilled/frozen supply chain by developing cost-effective technologies, devices and approaches for continous monitoring and recording of the relevant data and processing the data for information management throughout the entire supply chain.	July 2006-December 2010	http://www.chill-on.com/
C-LIEGE	Clean last mile transport and logistics management.	C-LIEGE will promote cleaner and energy efficient freight movements in urban areas. A novel set of integrated solutions and "push-and-pull" demand-oriented measures will be tested and shared in Roadmaps for the implementation in European cities.	June 2011-November 2013	www.c-liege.eu

ACRONYM	FULL TITLE	DESCRIPTION	DURATION	WEBSITE
COFRET	Carbon footprint of freight transport.	COFRET's main objective is to develop and test a methodology and framework for the accurate calculation of carbon emissions in the context of supply chains. COFRET provides for a methodology to calculate and monitor carbon emissions based on their component CO2-emissions and if applicable further GHG gases such as CH4 and N2O as well as so- called F-gases deriving from cooling processes.	June 2011-November 2013	http://www.cofret-project.eu/
Co-Gistics	C-ITS for urban freight.	CO-GISTICS will deploy cooperative ITS services for logistics. CO-GISTICS will deploy 5 services: • Intelligent parking and delivery areas. • Multimodal cargo CO2 emission estimation and monitoring. • Priority and Speed advice. • Eco-drive support.	January 2014-December 2017	http ://www.cogistics.eu
COMCIS	Collaborative Information Services for Container Management.	COMCIS aimed to explore the possibilities and commercial viability of employing situational awareness tools to solve problems of data fragmentation, delay and inconsistency throughout the global supply chain. The project used the Common Framework supporting interoperability between ICT systems in logistics.	September 2011-August 2013	http://www.comcis.eu/
CONTAIN	Container Security Advanced Information Networking.	CONTAIN is aimed at specifying and demonstrating a European Shipping Containers Surveillance system in a global context which will encompass regulatory, policy and standardisation recommendations, new business models and advanced container security management capabilities.	October 2011-March 2015	http://www.containproject.com/
CO3	Collaboration Concepts for Co-modality.	The CO3 project mission is to encourage a breakthrough in the competitiveness and sustainability of European Logistics by stimulating horizontal collaboration between shippers. The project's main objectives are to: 1) develop a legal and operational framework and remove managerial barriers for horizontal collaboration, 2) facilitate, launch, and coordinate test cases, 3) organize workshops and seminars to disseminate and educate market operators, 4) create Mental Shift towards Collaboration in the Supply Chain.		http://www.co3-project.eu/
CVIS	Co-operative vehicle-infrastructure Systems.	Innovative technology solution for vehicle communication and cooperation with roadside infrastructure and other vehicles.	February 2006-January 2010	http://www.cvisproject.org

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ACRONYM	FULL TITLE	DESCRIPTION	DURATION	WEBSITE
DiSCwise	Digital Supply Chains for European SMEs based on the Freightwise Framework.	Aims to improve the competitiveness of the transport & logistics sector in Europe, through the smart use of ICT. It seeks to improve the supply chain management in the sector and get stakeholders more connected, in particular smaller sized enterprises, by assisting their integration into efficient co-modal supply chains. Supports the European Union's Freight Transport Logistics Action Plan.	January 2010 - February 2012	http://www.discwise.eu/
ECOHUBS	Environmentally COherent measures and interventions to debottleneck HUBS of the multimodal network favoured by seamless flow of goods.	EcoHubs provides models and capabilities for cooperation and communication between multimodal terminal network stakeholders, amplifying, thus, their joint capabilities. It also establishes Common Value Added Services which, combined with existing services, facilitate end-to-end co-modal, low-CO2 transport solutions that maximise utilisation of terminal and logistics resources and transform multimodal terminals into Green Hubs.	November 2012 - April 2015	http://www.ecohubs.eu/
ECOMOVE	Cooperative and Mobility and Services for Energy Efficiency.	eCoMove will develop core technologies and applications based on vehicle-to-vehicle and vehicle-to-infrastructure communication or so called "cooperative systems", where vehicle eco-relevant data can be shared real time with other vehicles and traffic controllers as a basis for fuel-efficient driving support and traffic management.	April 2010 - March 2013	http://www.ecomove-project.eu/
ECOSTARS		ECOSTARS is setting different fleet schemes that will rate vehicles and operating practices using star rating criteria, to recognise levels of environmental and energy savings performance. Operators will then receive tailor-made support to ensure the fleet is running as efficiently and economically as possible, to help them progress to higher ratings within the scheme.	June 2011- May 2014	http://www.ecostars-europe.eu/en/
E-FREIGHT	European e-Freight capabilities for Co-modal transport.	An e-Freight platform supporting the design, development, deployment and maintenance of e-Freight Solutions which have been validated in business cases and pilots involving representatives from all relevant stakeholders in surface transport including large and small businesses and authorities. e-Freight deals with Framework, Single transport Document and Single Window.	January 2010- June 2013	http://www.efreightproject.eu/
EIRAC and EIRAC II	European Intermodal Research Advisory Council.	EIRAC developed a joint research strategy through a new and common vision for innovation and change, which consequently turned into a Strategic Intermodal Research Agenda, and the relevant Implementation Plan.	June 2008 - February 2011	http://www.ecoweb.info/2883_eirac-20082010

ACRONYM	FULL TITLE	DESCRIPTION	DURATION	WEBSITE
EURIDICE	European inter-disciplinary research on intelligent cargo for efficient, safe and environment-friendly logistics.	Create concepts, technological solutions and business models to establish an information services platform centered on the context of individual cargo items.	January 2008-December 2010	http://www.euridice-project.eu
FIDEUS	Freight Innovative Delivery of Goods in European Urban Space.	Optimization of vehicle load capacity by improving transhipment operations and integrating delivery operation with city traffic management and control.	May 2005-April 2008	http://www.transport-research.info/web/projects/project_details.cfm?ID=20318
FREIGHTVISION		Vision and Action Plans for European Freight Transport until 2050 : a long-term vision and robust and adaptive action plans for sustainable long-distance freight transport in the EU.	September 2008-February 2010	http://www.freightvision.eu/
FREIGHTWISE	Management Framework for Intelligent Intermodal Transport.	Support modal shift of cargo flows from road to intermodal transport.	October 2006-April 2010	http://www.freightwise.info
GOODROUTE	Dangerous Goods Transportation Routing, Monitoring and Enforcement.	GOOD ROUTE aims to develop a cooperative system for dangerous goods vehicles through route monitoring, re-routing (in case of need) enforcement and driver support, based upon dynamic, real time data, in order to minimise the Societal Risks related to their movements, whereas still generating the most cost efficient solution for all actors involved in their logistic chain.	January 2006-December 2008	http://www.goodroute-eu.org/pages/page.php?mm=1&lnk=start.php
HAVEIT	Highly Automated Vehicles for Intelligent Transport.	The project aimed at the improvement of road safety, energy efficiency and comfort through the development of a virtual co-system, which will support the driver of different vehicles, including trucks.	February 2008-June 2011	http://www.haveit-eu.org/displayITM1.asp?ITMID=6&LANG=EN
HEAVY ROUTE	Intelligent Route Guidelines of Heavy Vehicles.	Link road infrastructure via electronic mapping.	September 2006-June 2009	http://heavyroute.fehrl.org
iCARGO	Intelligent Cargo in Efficient and Sustainable Global Logistics Operations.	iCargo will build an open affordable information architecture that allows real world objects, existing systems, and new applications to efficiently co-operate, enabling more cost effective and lower-CO2 logistics through improved synchronisation and load factors across all transport modes.	November 2011-April 2015	http://www.euridice-project.eu

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ACRONYM	FULL TITLE	DESCRIPTION	DURATION	WEBSITE
IMCIS	Research for a Sustainable Intermodal Freight Container.	This project studied the processes and products allowing improvement in competitiveness, being respectful with the environment, addressing the need to favor the Intermodality in freight transport.		
INTEGRITY	Intermodal Door to door Container Supply Chain Visibility.	Aims at creating supply chain visibility by providing a basis for securing intermodal container chains ("security tracing") on a door-to-door basis by evaluating information from various types of sensors, portals and other information sources, partially pre-processed by intelligent algorithms.	June 2008-October 2011	http://www.integrity-supplychain.eu
KOMODA	Co-modality - towards optimised integrated chains in freight transport logistics.	The main KOMODA's objective was to produce a Roadmap, with associated action plans, to nurture an integrated e-Logistics platform by and between modes of freight transport across Europe.	January 2008-December 2009	http://www.transport-research.info/web/projects/project_details.cfm?ID=36907
LOGICON	Lean Secure and Reliable Logistics Connectivity for SME's.	The project aims to develop SIMPLE and PRAGMATIC targeted solutions for data exchange in trade and logistics for SMEs that support digitisation of document exchange reducing the number of errors and increasing the timeliness of information. It aims at setting up, testing and facilitating the adoption of low-cost, low-barrier Data Connectivity Solutions.	September 2013-August 2015	www.logicon-project.eu
LOGINN	Logistics Innovation Uptake.	Aims at co-ordinating and supporting RTD projects in the logistics area to improve their capabilities to bridge the gap between pilot implementation and marketable solutions. To achieve this goal LOGINN will set up a collaborative platform (the Virtual Arena) to allow the main stakeholders of the logistics domain (industry, SMEs, public authorities, investors and research organizations) to work together on promoting innovative transport logistics solutions aiming at increasing efficiency and with a particular focus on intermodal transport.	November 2011-April 2015	http://www.loginn-project.eu/
LOG4GREEN	Logistics for Green.	Logistics clusters of six regions - Carinthia (Austria), Ruhr Area (Germany), Wallonia (Belgium), Normandy (France), Istanbul (Turkey), and Odessa (Ukraine) perform joint analyses of the respective logistic sectors in order to develop regional strategies and a Joint Action Plan.	December 2011-December 2014	http://www.log4green.eu/index.php/project-info

ACRONYM	FULL TITLE	DESCRIPTION	DURATION	WEBSITE
MARATHON	Make Rail The Hope for protecting Nature.	It aims at extracting the maximum productivity from the existing rail infrastructure for producing efficiency, reducing operating costs and attracting new traffic to rail. The fast implementation of technologies and business solutions capable of delivering operational and visible cost effective results, is a fundamental improvement.	April 2011-March 2014	http://www.marathon-project.eu/
PROMIT	Promote Innovative Intermodal Freight Transport.	Intermodal freight transport technologies and procedures.	March 2006-February 2009	http://www.promit-project.net
RISING	River Information Systems for Transport & Logistics.	The overall objective is identifying, integrating and further developing information services such as River Information Services (RIS) in order to efficiently support Inland Waterway Transport (IWT) and logistics operations.	February 2009-January 2012	http://www.rising.eu/web/guest/home
Secure SCM	Secure Supply Chain Management.	It aimed to develop secure multi-party computation protocols, preserving supply chain management. A randomized model for benefit sharing in secure collaborative lot size planning was introduced as well as a tool for automatic analysis of data sharing risks in supply chains.		http://www.securescm.org/
SMARTFREIGHT	Smart freight transport in urban areas.	The main aim of SMARTFREIGHT is therefore to specify, implement and evaluate Information and Communication Technology (ICT) solutions that integrate urban traffic management systems with the management of freight and logistics in urban areas.	January 2008-June 2010	www.smartfreight.info
SMARTSET	Sustainable Market driven Terminal Solutions for Efficient freight Transport.	SMARTSET is structured around three core aspects for creating successful and attractive terminals: Market based business models, energy efficient vehicles, Incentives and regulations.	June 2013-?	http://smartset-project.eu/
SOCOOL@EU	Sustainable organisation between cluster of optimised logistics @ Europe.	The project aims to create an open European platform of excellence in the area of supply chain management and logistics in connection with hubs and gateways.	January 2012-December 2014	http://www.socool-logistics.eu/

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SPIDERPLUS	Sustainable Plan for Integrated Development through the European Rail network – Projecting Logistics & mobility for Urban Spatial design evolution.	SPIDER PLUS objective is to provide a new 2050 mobility VISION through a Strategic Design & Plan and a Road Map delivering Sustainable Solutions by then. The productivity of the available resources supported by ICT and other technologies is maximized by the combination of infrastructural nodes with spatial and urban planning integrating the missing links for sustainable mobility and city logistics. Synchro-Mobility and Seamless liquid mobility are the 2050 SPIDER PLUS final goals.	December 2012 - May 2015	http://spiderplus-project.eu/
STRAIGHTSOL	Strategies and measures for smarter urban freight solutions.	Develop an impact assessment framework for measures applied to urban-interurban freight transport interfaces. Part of the European Green Cars Initiative. Pilots related to ITS supply chain/last mile, loading/unloading policies, night deliveries, mobile depot.	September 2011-August 2014	http://www.straightsol.eu
SUPERGREEN	Supporting EU's Freight Transport Logistics Action Plan on Green Corridors Issues.	The purpose of SuperGreen was to promote the development of European freight logistics in an environmentally friendly manner. Environmental facors play an increasing role in all transport modes, and holistic approaches are needed to identify 'win-win' solutions. SuperGreen will evaluate a series of 'green corridors' covering some representative regios and main transport routes throughout Europe.	January 2010-January 2013	http://www.supergreenproject.eu/project.html
TIGER DEMO	Transit via Innovative Gateway concepts solving European - intermodal Rail needs.	The goal was to adopt a realistic strategy for improving the use of freight trains when the new infrastructure investments will be completed delivering the needed capacity. These goals can be achieved by removing the conflict on the same rail tracks between freight and passengers, by developing corridors oriented to freight and extracting the best productivity from each available modality or from the combination of them.	April 2011-September 2013	http://www.tigerdemo-project.eu/
SWIFTLY Green	Sweden-Italy Freight Transport and Logistics Green Corridor.	SWIFTLY Green is a European project aiming to develop a toolbox for green corridors. The toolbox will consist of guidelines, tools and recommendations for greening of logistics and transport. It will be based on best practice and transferable results from a thorough mapping and analysis of previous and on-going projects.		http://www.swiftlygreen.eu/en

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