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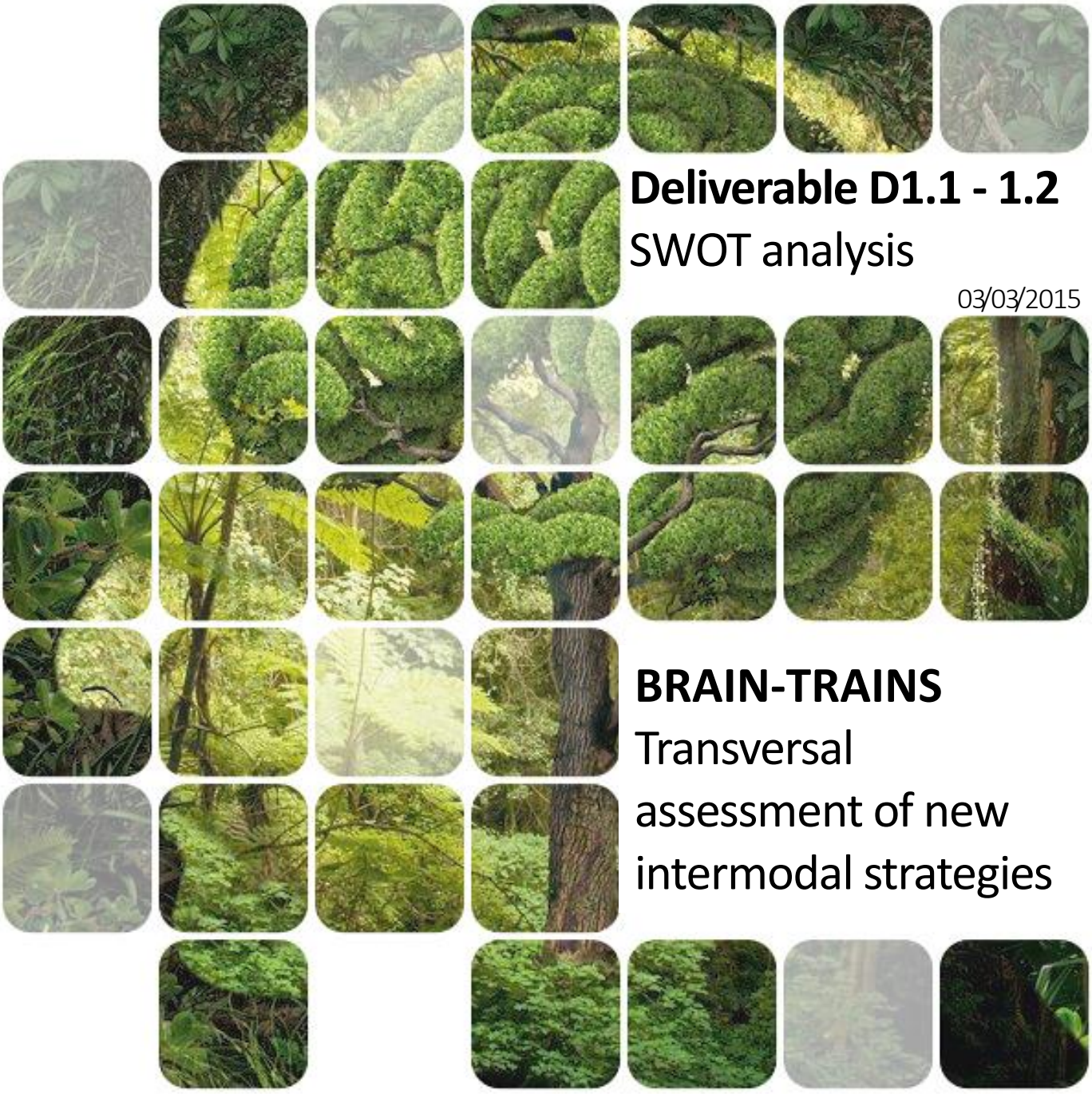
BELGIAN RESEARCH ACTION THROUGH INTERDISCIPLINARY NETWORKS



Deliverable D1.1 - 1.2

SWOT analysis

03/03/2015

BRAIN-TRAINS

Transversal assessment of new intermodal strategies

CONTENTS

TABLE OF ABBREVIATIONS

3PL	Third Party Logistics
CEE	Central and Eastern Europe
CEF	Connecting Europe Facility
CCTT	Coordinating Council on Trans-Siberian Transportation
DG	Directorate-General
ECMM	Executive Commission of the Ministers of Mobility
EIRF	European Intermodal Route Finder
ERTMS	European Railway Traffic Management System
ETCS	European Train Control System
FDI	Foreign Direct Investment
FOD M&V	Federal Public Service of Transport and Mobility
GCI	Global Competitiveness Index
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographic Information System
IL	Intermodal Links
IPA	Instrument for Pre-accession Assistance
IT	Information Technology
ITS	Intelligent Transportation System
IWW	Inland Waterways
LCA	Life-Cycle Assessment
LPI	Logistics Performance Indicator
MNCs	Multinational Corporations
NMBS/SNCB	National Belgian Railway Company
OR	Operations Research
PKM	Passenger-kilometre(s)
PPH	Pre- and Post-Haulage
PPP	Purchasing Power Parity
R&D	Research & Development
RFC	Rail Freight Corridor
RIS	River Information Services
RRT	Rail-Road Terminals
SMEs	Small and Medium Enterprises
SWOT	Strength-Weakness-Opportunities-Threats
TCO	Total Cost of Ownership
TEN-T	Trans-European Transport Networks
TEU	Twenty-foot Equivalent Unit
TKM	Tonne-kilometre(s)

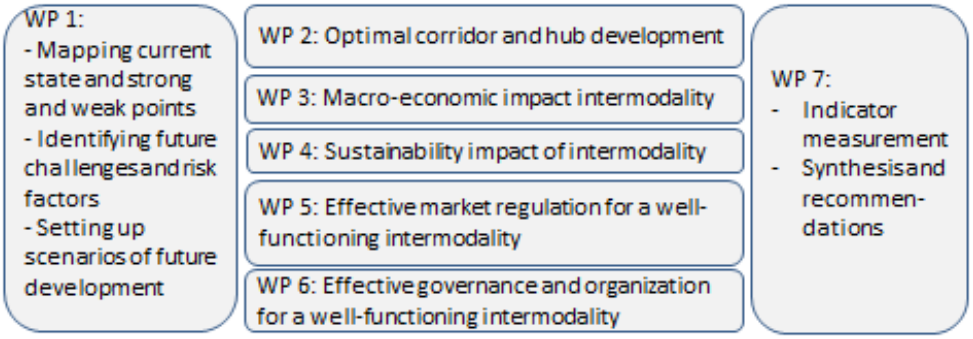
INTRODUCTION

The BRAIN-TRAINS project deals with the possible development of rail freight intermodality in Belgium. The main goal of the project is to develop a blue print establishing the detailed criteria and conditions for developing an innovative intermodal network in and through Belgium, as part of the Trans-European Transport Network and related to different market, society and policy-making challenges. The project will develop an operational framework in which effective intermodal transport can be successfully established in Belgium, with attention to beneficial participation and commitment of all different stakeholders.

This analysis will be built around five different main topics:

- The optimal corridor and hub-development.
- What is the role of costs in transportation mode competitiveness?
- What are the SWOT-elements of intermodal railroad transport competitiveness related to road transport?
- The macro-economic impact of intermodality.
- The sustainability impact of intermodality.
- Effective market regulation for a well-functioning intermodality.
- And effective governance and organization for a well-functioning intermodality.

FIGURE 1: STRUCTURE OF THE BRAIN-TRAINS PROJECT



SOURCE: BRAIN-TRAINS (2014)

This document will first focus on a transversal research of the role and influences of rail transport in Belgium, building a profound SWOT analysis of the current situation. This is shown as work package 1 in the figure above. As the sector of rail transport is changing more than ever, the different trends and barriers will be analysed. The strengths-weaknesses analysis, as well as the opportunities-threats analysis, will be concentrated on the same five main topics. Two sub-topics will be elaborated on for corridor and hub-development, resulting into seven chapters in total. For each chapter a general SWOT table is given at the start, after which a more detailed study follows about the separate elements. These sections are the result of a study of existing literature and published studies, as well as different interviews with the consultation group (Appendix).

In the next phase, this SWOT analysis will lead to several scenarios, from which each of the five mentioned fields of interest will define a specific methodology to perform the necessary calculations and obtain the desired outcomes. These results will be integrated and analysed, in order to indicate an optimal scenario for rail transport development in Belgium.

DELIVERABLE 1.1 - 1.2 A: Optimal corridor and hub development

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Operations Research (OR) is being described as the science of optimizing processes through analytical methods to help make better decisions. Intermodal transport, with its underlying planning and modelling complexity, provides OR with interesting study areas and challenging research questions. With the increasing interest in intermodal transport, a considerable number of analytical publications have recently appeared. These studies address planning issues in intermodal transport from the OR point of view, noting a significant growth acceleration during the last decade.

The common method to classify planning problems in intermodal transport is conducted based on the problem's decision horizon. From this perspective, three levels are classically identified:

- **Strategic:** where decisions impact a very long term (10-12 years).
- **Tactical:** where decisions impact a time period of months/weeks.
- **Operational:** where it involves day-to-day or real-time decisions.

In addition to acknowledging the above classification, studies have been also categorized based on the type of operator:

- **Drayage operators:** they plan and schedule the truck trips between the terminals, and the shippers/receivers.
- **Terminal operators:** they handle the transhipment operations between the different involved transport modes.
- **Network operators:** they are responsible of the infrastructure planning, network configuration, load units distribution and services pricing strategies.
- **Intermodal operators:** they are mostly considered as the users of the intermodal infrastructure and are concerned with routing and repositioning problems.

The combination of the two classifications yields twelve different categories of planning problems. Although, some problems can be relevant for more than one decision maker, or for the same decision maker at different time horizons, it has been found that the number of studies concerning issues that require decisions from more than one operator and/or more time horizons is very limited.

Based on the available literature in this scope, in what follows, we attempt to develop a SWOT analysis of intermodal transport in general, and rail freight in specific, from the OR point of view, and cover the different characteristics of this transport scheme that can be of a negative and/or a positive impact in what concerns OR planning issues. (Table 1)

TABLE 1: SWOT – OPTIMAL CORRIDOR AND HUB DEVELOPMENT

Strengths	***Weaknesses***
1. Economic and societal advantages introduced by the concept of "freight consolidation" 2. A high potential for applying standardization measures offering several benefits to businesses aiming to achieve greater economies of scale 3. More sustainability and less negative environmental influences	1. The relatively high drayage operations costs 2. The additional complexity to ensure the multi-actor chain coordination 3. The additional complexity in selecting adequate pricing strategies, as well as subsidies policies 4. Possible reliability and efficiency-related drawbacks on the network
Opportunities	***Threats***
1. The Geographic Information Systems (GIS) technology advantages in the networks design 2. The significant interest and effort in studying "new-generation terminals" 3. The recent progress in Intelligent Transportation Systems (ITS) 4. The societal advantages introduced by the recent application of the concept of "City Logistics" 5. Standardization of the network operators resulting into better network reliability	1. Interoperability barriers 2. The commodities' nature 3. Ongoing complications to the development of decision support models for intermodal transport 4. The still missing vital answers to transhipment and terminal operations 5. Asynchronous implementation of EU standards by EU Member States

SOURCE: CHAPTER SUMMARY (OWN CREATION)

1. STRENGTHS

1.1 Economic and societal advantages introduced by the concept of "freight consolidation"

A design of an intermodal transport network should take into consideration to maximize the network's utilization, which introduces a core design concept, namely *"freight consolidation".* It simply denotes that, instead of designating direct customized shipment for every cargo, small flows are merged, moved to a single point (consolidation centre) and "*bundled*" into larger flows. In addition to making intermodal transport feasible for flows that are too small to justify individual shipments, the so-called concept of *"complex bundling"* introduces a number of other economic and societal advantages as well (Kreutzberger, 2003 and TERMINET, 2000) such as:

- A possibility for an increase in economies of scale through higher load factor of transport/load units.
- A higher transport frequency.
- Service area enlargement through serving a larger number of destinations from each begin terminal.
- A possibility of reducing the drayage length and of equalizing terminal peak and valley performance requirements.

An even more increased profitability can be further achieved by applying adequate terminal allocation methodology. The choice of the optimal terminal locations is made according to the choice of which objectives to optimize. A review of the studies concerned with terminal location problems can be found in Macharis & Bontekoning (2004) and Bontekoning et al. (2004).

Stakeholders: carriers

1.2 A high potential for applying standardization measures, offering several benefits to businesses aiming to achieve greater economies of scale

The nature of intermodal transport makes way for numerous potentials to apply standardization measures on many levels. We can distinguish between two main categories of standardization in intermodal transport: standardization of load units and of information systems (in terms of global tracking systems and common communication platforms). The European Commission and U.S. Department of Transportation (1998) named several potential advantages especially concerning the first category. Among which, we can mention the following:

- Reducing the cost of transfer facilities.
- Decreasing the need to maintain large stocks of duplicative equipment.
- Enhancing the ability to communicate and interchange business in larger organizational or physical networks.

Stakeholders: carriers

1.3 More sustainability and less negative environmental influences

Despite the common educated conviction about the ecological advantages of intermodal over all-road transport, there have been some ongoing debates over the subject, of which we can mention the following (the first two were reported by Kreutzberger et al., 2003):

- Due to the results of a study conducted for the International Road Community (IRU) and Bundesverband Gűterkraftverkehr Logistik und Entsorgung (IFEU and SGKV, 2002), suggesting that combined road/rail transport require in some cases more primary energy, the IRU has started to recommend transport policies that no longer encourage intermodal transport. The study has refuted the common insight considering combined transport as a more environment-friendly means of transportation.
- Another study conducted by Transport en Logistiek Nederland (TLN) argued that PPH, and the increasing speeds and low loading degrees can lead to higher emissions of CO_2, NOx and SO_2 in intermodal transport than in all-road transport in many situations. The study, consequently, advocates longer trucks over modal shift. However, the international union of railways (UIC), in cooperation with other official parties, have recently conducted a study to establish an all-aspect comparison between rail freight and mega-trucks. They concluded that using mega-trucks on the long-term would produce negative consequences that outweigh any wider benefits (UIC et al., 2014). This conclusion can, nevertheless, be argued to be biased to the railway sector considering the authors' affiliation.
- Despite many social inconveniences of mega-trucks in general, Eco combi (Gigaliner) trucks in specific may have ecological benefits over rail freight due to their significantly small CO_2 emissions and large size that can lead to a lesser number of used trucks and less congestion.

Kreutzberger et al. (2003) have given an overview of the studies and papers concerned with the external effects of both intermodal and unimodal transport, as well as the most important questions that were raised about the subject. They have reached the conclusion that it is safe to assume that, regardless of the types of commodities, intermodal transport is indeed more environmentally preferred than unimodal road transport in most cases. This conclusion is solid enough when considering only energy use and CO_2 emissions, and it is even more justified when local emissions, accidents, congestion and noise are brought into the picture.

One might think, in conclusion, that the internalization of the external costs would yield a modal choice in favour of intermodal transport, which would eventually increase its market share and improve its competitiveness. However, this does not necessarily hold. This is basically because the influential criterion here is not "*the height of external costs*" as much as it is "*the coverage of external costs by the balance of taxes, charges and subsidies*" (Kreutzberger et al., 2003). It does not matter if the external costs of all-road transport are significantly higher than those of intermodal transport, as long as the external costs to be considered are only those which are not already covered by taxes/charges. Kreutzberger et al. (2003) has reviewed the European research project RECORDIT (2001) which has analysed the internal and external costs of intermodal freight transport, the cost coverage and the coverage by prices for three European relations. A conclusion had been reached that, despite the fact that the cost coverage is higher for all-road transport, the prices of all-road transport are far below the expected social costs (the total sum of internal and external costs). This implies that, if cost coverage is the central criterion, internalization would not significantly improve the competitiveness of intermodal transport. Kreutzberger et al. (2003) suggests that this could be compensated by the control of other operational rules (like driving times).

Stakeholders: government

2. WEAKNESSES

2.1 The relatively high drayage operations costs

The cause of the interest in drayage operations is wrapped up in their relatively high cost contribution with respect to the total origin-to-destination expenses, between 25% and 40% as reported by Macharis and Bontekoning (2004), which is seen to seriously affect the profitability and competitiveness of intermodal transport, possibly resulting in its market limitation.

These high costs can be attributed to a number of other associated operations, besides the relatively short travelled distances by trucks between terminals and shippers/receivers in comparison to the main rail or barge haul. In contrast to the simple pick-up and delivery operations in road transport, drayage operations have some other distinct features and alternative organizational procedures to be carried out that can be summed up in the following major issues (Macharis and Bontekoning, 2004):

- The arrangement of an empty container/trailer for the shipper, and the subsequent transportation of the full container/trailer to the terminal.
- The pick-up of the empty container either at the terminal, at an empty depot or at a receiver.
- The distribution of a full container/trailer from the terminal to a receiver, and allocating appropriate time for it.
- The collection of the empty container/trailer and its transportation back to the terminal, an empty depot or a shipper.
- Scheduling of the truck trips subject to many constraints such as: the customer's pre-defined pick-up and delivery times (time windows), road travel times and realistic limits on the length of the working day.

Stakeholders**:** carriers and drayage operators

2.2 The additional complexity to ensure the multi-actor chain coordination

There is a multitude of actors involved in a typical intermodal transport chain, greatly adding to the complexity of ensuring synchronized and seamless operations to the shippers.

The general problem, as put by Bontekoning et al. (2004), is "*to gear all activities in the chain to one another, provide timely information and communicate the right things at the right time*". In addition to the day-to-day management of transport activities, there are involved longer-term choices related to standardization procedures, to integrate tracking information along the chain and the use of available information technologies.

Stakeholders**:** intermodal operators

2.3 The additional complexity in selecting adequate pricing strategies

A major stirring factor that affects the intermodal transport competitiveness and the modal choice decision is the "*determination of the right tariff for intermodal transport services*", known as "*pricing strategy*" (Bontekoning et al., 2004). Pricing strategy decisions are mainly based on the tariff/pricing strategy implemented by several actors in the intermodal transport chain (intermodal agents, railroad, terminal and drayage managers). According to Macharis and Bontekoning (2004), the tariff determination process demands an accurate real costs estimation, which can be regarded as a complex process in itself, as well as a clear insight of the market situation.

This complexity is also particularly true when devising subsidies policies. Since a subsidy plan cannot be regarded as a permanent/long-term solution, a proper reasoning is much needed to strike the balance between competitiveness and profitability, as well as to specify their respective definitions in tangible terms.

Stakeholders**:** government and network operators

2.4 Possible reliability and efficiency-related drawbacks on the network

Applying the consolidation methodologies, which are considered as core concepts when designing intermodal networks, may result, in contrast to their original intentions, in negative effects on the network, such as: the risk to reduce the door-to-door reliability due to the money and time cost, caused by the additional handling at intermediate nodes, and the larger transport distances caused by the routes' detours for most transport services, compared to direct terminal services with no intermediate bundling operations, increasing in turn the total time and costs.

Also, as a result of the current fragmented standardization, the network operators may be doomed to offer limited back-up options, in case of fall back.

Stakeholders**:** carriers

3. OPPORTUNITIES

3.1 The Geographic Information Systems (GIS) technology advantages in the network design

The GIS technology has introduced new opportunities to model large and complex intermodal networks, as well as develop virtual networks, where all successive operations in a multi-modal transport scenario are broken down, in such a way as to simulate different parameter values by the software and optimize the involved costs through different settings.

Thanks to the location analysis features of the GIS, new strides in the decision support systems have been achieved. Some prominent examples of which in the literature could be Macharis et al. (2011) and Zhang et al. (2013).

Stakeholders**:** OR researchers

3.2 The significant interest and effort in studying "new-generation terminals"

The implementation of "*new-generation terminals*" is expected to substantially enhance the cost-quality ratio of the node operations and significantly contribute to a more efficient intermodal transport chain. As described by Bontekoning and Kreutzberger (1999), "*new-generation terminals*" are highly automated and robotized, and characterized by "*intelligent, compact layouts and synergetic operations for transhipment, storage and internal transport*", which render them more capable of executing the complex operations required by innovative networks. Many research works found interest in studying the feasibility of "*new-generation terminals*" and evaluating their advantages and performance in specific case studies.

However, it is not believed that terminals' automation is a sufficient measure on its own. On the one hand, inflexibility concerns are acknowledged, as well as the need to handle them through increased commitment and well integrated information systems. On the other hand, if not well studied, automation might impose a threat of competing and incompatible technologies.

Stakeholders**:** carriers and terminal operators

3.3 The recent progress in Intelligent Transportation Systems (ITS)

Intelligent Transportation Systems (ITS) come to offer great opportunities for multi-actor chain coordination. They can provide better management, control and use of resources, and hence, more efficient flow of freight information along the chain, more responsive and flexible services, smoother modal transfers and an altogether higher transport system performance.

As an application, information technology (IT) related initiatives have been taken; the European Railway Traffic Management System (ERTMS) for the rail transport sector in the EU and the River Information Services (RIS) in European countries with inland waterways.

Stakeholders**:** carriers and intermodal operators

3.4 The societal advantages introduced by the recent application of the concept of "City Logistics"

The concept of "*City Logistics*" denotes the process of optimizing the urban logistics activities by private companies while considering the social, environmental, economic and energy impact. It involves all kinds of urban freight activities, with a view to reduce the vehicle kilometres and number of trucks used, and to increase the vehicles productivity in general. This can take place close to urban centres. The wide implementation of these concepts can provide an efficient solution to a number of urban freight transport issues such as traffic congestion and enhancing the quality of life.

Similar examples currently operate in Germany and Switzerland, as well as across the Atlantic. Better insights on the subject are available through Zografos & Recker (2003).

Stakeholders**:** carriers and government

3.5 Standardization of the network operators resulting into better network reliability

There are many promising results associated to applying more homogenous standards for the network operators, in what concerns the achievement of a better network reliability. A great benefit would be the ability to create multiple fall back corridors, serving as back-up solutions. In today's logistics chains in Europe, a blockage on a main line could result in blocking a serious amount of trains, and potentially a complete halt of a certain traffic direction. However, in a future optimal corridors scenario, affected products may be directed through alternative corridors/routes, given the fact that the same staff and equipment can still be used.

Stakeholders**:** network operators

4. THREATS

4.1 Interoperability barriers

The intention to ensure efficient intermodal operations through implementing procedures towards more standardization can be faced with several limiting factors in the EU:

- Physical infrastructure limitations (such as fixed tunnel heights and widths, and bridges in case of the inland waterways), hinder the extent of possible dimension changes.
- The current existence of a wide range of load units types and sizes renders the process to reach an agreement on standards problematic.
- Effective standardization and resulting costs savings would not become perceivable, unless all actors take part in the agreements, which can be threatened by their possible conflicting interests.
- The trans-regional language barriers, especially among the network operators, impose a true limitation to labour flexibility, mobility and communication.

Considering the railway transport system separately, a number of additional interoperability-limiting issues can further be noted:

- The existing variation in gauges.
- Changes in direction of running.
- Train lengths variation among the EU countries.
- The usage of different signalling and power systems.

Stakeholders: government

4.2 The commodities nature

The nature of products/commodities is a major factor that is still under-investigated in hub location modelling (since transportation systems have generally been configured as hub-and-spoke networks). Planning delivery of time-sensitive or hazardous products, which are likely in multi-commodity freight transportation, can tremendously affect the network design.

Stakeholders: carriers and terminal operators

4.3 Ongoing complications to the development of decision support models for intermodal transport

A number of issues are still considered as complications in the face of further developing intermodal decision support models, such as (Caris et al., 2013):

- The limited data accessibility/availability on freight flows for some actors and the threat of private data disclosure represent a restriction to the decision models refinement. This is basically triggered by the need to exchange more data in intermodal transport in comparison to unimodal transport.

- The need to enhance the systems' computational features in order to cope with real-life intermodal problem sizes and provide real-time decision support.
- The need to consider decision support systems from more than one actor's perspective. Many solutions can be stuck in sub-optimality due to the narrow problem views.

Stakeholders**:** OR researchers

4.4 The still missing vital answers to transhipment and terminal operations

There are still a number of external issues that can significantly affect transhipment-related and terminal operations, and that still demand further investigation, such as:

- The impact of arrival and departure dynamic and synchronized schedules on terminal layout and operations strategy.
- The impact of standardization on terminal costs and performances.
- The effect of the multi-actor chain co-ordination on the number of objectives a terminal must meet and their possible arising conflicts.

Stakeholders**:** OR researchers

4.5 Asynchronous implementation of EU standards by EU member states

The conflicting interests of the EU member states, as well as the lack of vision homogeneity may in turn lead to an asynchronous implementation of EU standards, as far as the transport sector is concerned (point 4.1). Such disparity automatically leads to less optimal corridors, which would consequently result into higher costs.

Stakeholders**:** government, shippers and carriers

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DELIVERABLE 1.1 - 1.2 B: What is the role of costs in transportation mode competitiveness?

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1. Operational, external and full costs

Transportation costs are divided into two main categories: operational (or internal, or private) and external costs. The first category relates to the costs that an economic agent has to support in order to perform his activities. The fuel, driver or insurance costs are examples of operational costs. External costs are side effects of transport. They represent costs to the society which, without any policy intervention, are not born by the transportation companies (Maibach et al., 2008). Different categories of external costs are identified such as global warming, air pollution, soil pollution, water pollution, noise, accidents and congestion. The sum of the operational and external costs corresponds to the total or social cost of transport (Pigou, 1920).

2. Transportation mode competitiveness

Transportation costs directly influence the competitiveness of transportation modes. The latter can be compared, in terms of efficiency, by determining their breakeven distance, i.e. the distance at which one mode becomes as competitive as another one.

Based on operational and external average costs functions of Janic (2007, 2008), Mostert and Limbourg (2014) highlight the importance of drayage operations external costs in terms of freight transport competitiveness between road and intermodal rail transport. The analysis compares the evolution of the breakeven distance between road and railroad transport, for operational and full (i.e. operational and external) costs consideration.

Results show that, in the case of small pre- and post-haulage (PPH) and with the internalization of external costs, intermodal rail transport becomes more rapidly competitive in terms of distance, than when only internal costs are taken into account. On the other hand, for longer PPH distances, external costs internalization leads to lower competitiveness of intermodal transport, i.e. to a higher breakeven distance than when only internal costs are considered. External costs of drayage operations are thus crucial elements to take into account when dealing with intermodal rail competitiveness.

The wide range of results obtained in the analysis also suggests that the use of average external costs in transport competitiveness evaluation is not the most suitable solution. The focus on marginal costs or the use of the externality itself seems to be more appropriate for truly representing the environmental or societal impact of transport.

Further research topics on freight transport and environmental effects clearly have to consider the decisions related to the location of intermodal terminals. Indeed, depending on the commercial density of their surrounding areas, the location of the terminal determines the level of consolidation and thus the load factor. Furthermore, terminal locations also define the PPH distances of the companies that they disserve. These factors have been identified as competitiveness attributes for intermodal transport full costs. Location decision problems have thus to integrate environmental issues. Within the SWOT analysis, only strengths and weaknesses will be addressed (Table 1).

TABLE 1: SW(OT) – WHAT IS THE ROLE OF COSTS IN TRANSPORTATION MODE COMPETITIVENESS?

Strengths	***Weaknesses***
1. Takes into account externalities. Full costs consideration	1. Difficulty to measure the damage. Risk of underestimating total cost
2. Easy to compute (top-down)	2. Uncertainty due to the evaluation methods
3. Allows for precise scenarios generation (bottom-up)	3. Does not reflect the potential differences in a system (top-down)
4. All externalities are translated into a common unit. Allows for better comparison	4. Difficult to translate into policy measures (bottom-up)

SOURCE: CHAPTER SUMMARY (OWN CREATION)

1. STRENGTHS

The main advantage related to the different methodologies used for determining external costs is that they are tools developed to explicitly integrate the externalities generated by transport. Indeed pollution or noise generated during the transport of goods from one place to another produces some nuisance that is not directly taken into account by the transport operator. Nevertheless, these effects have to be capitalized as costs, in order to reflect the real impact of transport. The different methodologies developed for identifying external costs and for valuating them thus present the strength of determining the range of importance of externalities. The real full cost of transport is then obtained, which leads to a fair evaluation of its impact (Pigou 1920).

Two types of external costs can be evaluated: marginal and average costs. Marginal costs are identified thanks to a bottom-up strategy while average costs are determined thanks to a top-down approach. For the bottom-up strategy, the analysis is based on the evaluation of the external effects of a particular element and how it negatively affects its environment. This methodology has the advantage of allowing for a lot of precise simulations. On the contrary, the top-down approach consists of evaluating the external effects of a wider system, for example a country or a sector. The total externalities are then divided by a cost unit, in order to obtain the external effects of specific items. This approach has the advantage of being simpler than the bottom-up methodology.

Finally, external effects are very difficult to compare directly because they can affect a lot of different elements (e.g. quality of life, environment, health) with different kinds of impacts. The development of the external cost methodologies allows translating all of these effects in a very well-known common unit, which is money. It becomes thus easier to compare these effects among themselves.

2. WEAKNESSES

Even if the objective of the European Union is to take into account external costs in transportation pricing policies (European Commission, 2008), they remain difficult to evaluate and to monetize.

Indeed, it is very difficult to measure physically the damage, because the scope of the externality is not totally known, the effect is uncertain and it can vary a lot from one individual to another. Finally externalities happen with different time horizons. Moreover, for the majority of externalities, there are no markets on which those externalities can be exchanged at a commercial value (Nayes and Arnold, 2010).

When there is no market price, different methods can be used for determining the value of external costs: damage cost (Bickel et al., 2005, 2006, Schmid et al., 2001), avoidance cost (Bickel et al., 2005, Schmid et al., 2001) or opportunity (or willingness-to-pay) cost method (Bickel et al., 2005, 2006, OECD, 2005, Ortúzar et al., 2000, Schmid et al., 2001). The damage cost method consists of determining the real damages provoked by the external costs. The avoidance cost method is based on scenarios and tries to determine which costs are generated for avoiding a specific amount of externalities in the future. Finally, the opportunity cost method determines the external cost value as the price that should be paid to an economic agent, who suffers from the externalities, in order to accept to support the external effect. All these methods are characterized by a lot of uncertainty and difficulties to evaluate the scope. Depending on the hypotheses that are formulated from the different scenarios' perspective, results can vary in a very large range.

The top-down approach leads to average and thus less precise values than the bottom-up approach. This method does not reflect the particularity of a specific situation. For instance, under this methodology, there will be no distinction between the kilometres travelled on hilly or flat terrains. On the other hand, since the bottom-up approach focuses on very specific cases, it might be difficult to translate the obtained results into policy measures (Van Essen et al., 2007).

DELIVERABLE 1.1 - 1.2 C: SWOT of intermodal railroad transport competitiveness related to road transport – full costs consideration (transportation companies perspective)

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As already highlighted in the previous part of this deliverable, the competitiveness of intermodal transport in relation to road is considerably influenced by the costs of both modes of transport. The best-known costs are the ones directly borne by the transport operators, i.e. the operational costs. However, according to the European political willingness, the costs generated by transport operators but supported by other economic actors, i.e. the external costs, have also to be taken into account. Several categories of factors play a role on these operational and external costs, with a positive or negative impact for the promotion and the development of intermodal transport. An overview of the different internal and external elements affecting costs of intermodal transport is provided in the following SWOT analysis. The focus in on the transportation companies perspective.

TABLE 1: SWOT – INTERMODAL RAILROAD TRANSPORT COMPETITIVENESS RELATED TO ROAD TRANSPORT – FULL COSTS CONSIDERATION (TRANSPORTATION COMPANIES PERSPECTIVE)

Strengths	***Weaknesses***
1. Large capacities and higher payload of containers 2. Reduced operational and external costs of intermodal transport on long distances	1. Longer travel time and delay – Opportunity cost 2. Higher costs for the "truck" part are assumed since less kilometres are performed in denser areas 3. Flexibility issues 4. Long lead time before operating a new service
Opportunities	***Threats***
1. Longer and heavier trains 2. Smaller PPH distances for increasing its competitiveness 3. Consolidation of flows 4. Shift of the infrastructure cost to the user 5. Homogenization and standardization of rail infrastructure and intermodal transport units 6. Development of rail infrastructure	1. Non-coordination of all the actors 2. No consolidation of flows 3. Not enough intermodal terminals 4. Too many intermodal terminals 5. Removal of current state subsidies

SOURCE: CHAPTER SUMMARY (OWN CREATION)

1. STRENGTHS

1.1 Large capacities and higher payload of containers

Rail transport allows moving large quantities of freight. In addition, the payload of containers transported by trains can be higher than the payload of containers transported by trucks. Intermodal transport using rail therefore benefits from the advantages of mass transportation and can thus generate economies of scale, which leads to reduced operational and external costs per unit transported (Rodrigue et al., 2006).

1.2 Reduced operational and external costs of intermodal transport on long distances

The operational and external costs reductions by intermodal transport are achieved for long distances of the main travel by rail. Indeed, intermodal transport is a combination of several modes. In addition to the long-haul travel by rail, additional costs have to be supported, such as pre-and post-haulage by road or transhipment at the intermodal terminal. The main travel by train must therefore be long enough for counterbalancing the additional costs due to the transhipment and pre-and post-haulage of goods by truck. However, the specific distance at which rail transport becomes more competitive than road transport differs according to the authors.

Grosso (2011) states that "*according to experiences and common practice in transport, the minimum rail distance that allows a shift from road to rail is around 500-600 km*". These important distances can be lowered to 250-300 km for routes from/to ports, where the high flows of goods compensate for the cost (Bacelli, 2001). Rail transport can also become more competitive in case of subsidies given by public authorities. Facanha and Horvath (2007) assume that trucks dominate the transport on short and medium distances of less than 500 miles. For Janic (2007), when only operational costs are considered, intermodal transportation by rail in Europe becomes interesting (compared to only-road) for door-to-door distances bigger than 900 km. However, when the external costs are taken into account, then the breakeven distance increases and reaches 1050 km. The volume of demand for such long distances is already low which means that if external costs are internalized for pricing, it might lead to an even greater reduction of the demand (higher price) and thus it would not help in achieving higher market shares for intermodal transport. This point of view is the one defended by Janic (2007), even though other studies provide totally different results. Janic (2008) uses the same kind of model as the one developed in 2007 but differentiates rail transportation between Conventional Intermodal Freight Trains (CIFTs) and Long Intermodal Freight Trains (LIFTs). The author concludes that by using LIFTs instead of CIFTs, the breakeven distance between intermodal transport and road transport, when full costs are considered, shortens from about 1000 km to 700 km.

In Macharis et al. (2008), some other breakeven points are also cited. Van Duin (2003) assumes a breakeven distance of 200-400 kilometres for rail compared to road. In Belgium, smaller distances are necessary for rail to become competitive. Indeed, the train becomes less expensive than road for distances higher than 90 kilometres (Macharis, 2000). Finally, a study of Vrenken et al. (2005) shows that intermodal transport on distances of 600 kilometres or more are viable, whereas services performed on 100 km distances are rarely competitive.

2. WEAKNESSES

2.1 Longer travel time and delay – Opportunity cost

Intermodal rail transport implies the transhipment of goods at the intermodal terminals. These operations require additional time, which makes this transportation mode slower than road transport. Moreover, transportation by rail is characterized by longer travel times since trains often achieve their trips based on predetermined schedules. In business, time is money. The opportunity cost for transportation companies can thus increase the total cost of railroad transport compared to road transport.

2.2 Higher costs for the "truck" part are assumed since less kilometres are performed in denser areas

In addition, intermodal railroad transport implies the use of the truck for the PPH between the origin/destination nodes and the terminals. Since these travels are performed in dense areas and on short distances, the unit cost is higher than in situations where the truck is used for the door-to-door travel. The same holds for externalities. Indeed, dense areas are assumed to be more congested than highways, on which the long-haul travel by truck is performed. This means that more congestion and emissions can be expected on short-haul trips, which leads to higher external costs for the PPH travels. If the kilometres travelled using rail are not important enough for compensating the truck (operational and external) costs on the PPH trips, intermodal transport can suffer an important weakness in terms of costs.

2.3 Flexibility issues

Intermodal transport may also present some problems of flexibility. Indeed train drivers are related to local lines and changing the line, for instance because of capacity issues, is difficult to perform, since the driver knowledge does not always allow for it. Language barriers are also an important problem that affects the optimal management and execution of the operations on the network. The priority of passengers' trains on the network, and thus the related schedules planning requirements, also affects flexibility improvements on the network. All of these flexibility issues highlight the importance of optimizing the management of the locomotives' operations with compliance to the market demand. Inflexibility on the network hampers the transportation of goods and thus reduces the efficiency of intermodal systems.

2.4 Long lead time before operating a new service

Finally, the difficulties and long lead time related to the start of a new service or route are also threatening the viability of railroad transport. Indeed, in order to respect all the rules in application, it requires on average 18 months for launching a new rail service. This excessive lead time can clearly disadvantage intermodal rail transport, compared to road and intermodal inland waterway transport. This problem can be improved, for instance by a cross-border slot system, where pre-defined rail paths can be ordered. However, it is still very difficult to manage in the current conditions, since rail transport is mainly organized nationally. The market variability makes this long lead time even more difficult to support, since the routes and slots required can vary between the time of request and effective attribution of the slot.

3. OPPORTUNITIES

3.1 Longer and heavier trains

The ability of intermodal transport to handle large capacities is leading to economies of scale. This strength can be reinforced by the opportunity to use longer and heavier trains for moving goods. Indeed, longer and heavier trains mean decreased unit costs and emissions. The advantage of using such trains has been confirmed by Janic (2008). The author concludes that the use of these longer trains allows intermodal transport to become more rapidly competitive compared to road, in terms of breakeven distance.

3.2 Smaller PPH distances for increasing its competitiveness

Intermodal railroad transport can take advantage of shorter PPH distances for increasing its costs competitiveness. Indeed, reduced PPH means better utilization of the cost advantage provided by rail transport and thus, increased competitiveness of railroad compared to road transport.

3.3 Consolidation of flows

Intermodal transport can also benefit from potential consolidation of flows, which leads to higher load factors of the train and thus to a better repartition of the costs between each unit transported. The rail unit cost decreases, which improves the attractiveness of railroad transport, in comparison with door-to-door transport.

3.4 Shift of the infrastructure cost to the user

There is currently a political consent to shift the costs of the infrastructure to the user. Imposing taxes on motorways is one example of the willingness to ensure that the user supports the costs that he generates. In this perspective, future road taxes, which would penalize transport by truck, can also indirectly benefit to intermodal rail transport from the costs competitiveness perspective. Taxes on trucks mean higher costs for road transport and thus relatively lower costs for intermodal transport (at the condition that the PPH are not too long). Road taxes already exist in different countries and some examples are the Eurovignette or the Heavy Goods Vehicles (HGV) toll system in Germany and Switzerland. In Belgium, in 2016, trucks will be charged for each kilometre performed on motorways.

3.5 Homogenization and standardization of rail infrastructure and intermodal transport units

Another opportunity for railroad transport is the homogenization and standardization of rail infrastructure and intermodal transport units. Indeed rail transport in Europe suffers from some interoperability problems such as different gauges sizes, different sizes of the rail structures (e.g. heights and widths of tunnels along the network), and different electrification and signalling systems. Around 20 different signalling systems are used on European rails. The development of intermodal transport led inevitably to the conclusion that some coherence among those signalling systems was required, for safety, easiness, reliability but also economic purposes. A common signalling system allows a reduction of time losses due to locomotive change at the different borders, which also clearly saves money. In this framework, the European Rail Traffic Management System (ERTMS, 2014) project, undertaken by Europe for standardizing the signalling system, represents an important opportunity in terms of cost competitiveness for intermodal rail transport. Currently, according to the actors of the sector (Buyse et al., 2014), only 20% of the truck trailers are compatible for being transported on a train. 80% of the trailers on the market cannot thus be transferred in an easy way from truck to train. This issue can be considered as a threat for intermodal transport since it can lead to higher costs of transhipment and thus to a reduced attractiveness of intermodal transport in relation to road. However, this threat can also be identified as an opportunity in the sense that standardizing these transport units will allow for reduced costs and externalities, and thus better competitiveness.

3.6 Development of rail infrastructure

Initiatives taken by public authorities for developing the rail networks are also potential opportunities for reducing intermodal costs. The European TEN-T program is one of the best examples of the willingness of network expansion (European Commission, 2014). The objective is to lead to better connections and thus to reduced travel times and costs.

4. THREATS

4.1 Non-coordination of all the actors

Intermodal transport by rail often requires the interaction of different actors all along the transport chain. These actors (network operators, drayage operators, terminal operators, intermodal operators, policy makers, port authorities, etc.) have to coordinate themselves in order to ensure smooth flows of the goods transported (Caris et al., 2013). In case of reduced or non-cooperation between the different stakeholders, intermodal transport time can increase, which leads to higher related costs. The non-coordination of the actors can happen at different levels: technical, informational (for instance lack of a transportation document) or financial.

4.2 No consolidation of flows

As already explained here above, the transportation by intermodal transport using rail is specifically efficient when flows are consolidated. However, if this bundling is not possible, the high infrastructure costs have to be borne by the few units loaded on the train, which is a potential threat in terms of cost efficiency.

4.3 Not enough intermodal terminals

The risk of not disposing of sufficient intermodal terminals may also bring difficulties to intermodal transport. Indeed not enough terminals means longer PPH and thus implies intermodal competitiveness only on longer distances. Indeed the costs disadvantages provoked by longer PPH distances thus require longer travels by rail for being compensated.

4.4 Too many intermodal terminals

The total number of terminals in a specific area should be adapted to the flows that these terminals can capture. Indeed, if there are too many terminals, in comparison to the flows that are really transported, it might affect the intermodal competitiveness. Indeed, if the total capacity of all the terminals of a specific market area exceeds the flows that are really transported in this zone, the effects of flow consolidation are reduced, as well as the benefits due to economies of scale, in terms of costs. This situation is referred to as “self-cannibalization” of the terminals. Under this scenario, it can happen that flows on trains are too low and that the total infrastructure costs cannot be shared in the most efficient way.

4.5 Removal of current state subsidies

The possible withdrawal of subsidies from public authorities can also represent a threat for intermodal rail transport, in terms of its costs competitiveness with road. Indeed, at the launch of some connections and for some corridors, subsidies are vital for intermodal transport to remain economically viable. This encouragement for a limited period of time can be required to start new services. During this specific time, when intermodal transport cannot be competitive by itself, public interventions are required for stimulating its development. In case of withdrawal of these subsidies, it may happen that it becomes too costly to transport flows using these channels, so that intermodal transport is abandoned to the profit of door-to-door road transport.

In 2014, the federal government still supports intermodal transport by providing subsidies to intermodal operators (Federal Public Service of Mobility and Transport, 2014) but nothing guarantees that this help will last in the future. The current subsidization system is the prolongation of the subsidy policy developed by the federal government between 2009 and 2012. A budget of 100,000 € was destined to the promotion of rail combined transport inside Belgium and between port areas in Belgium, and to the support of new regular business activities with international regions. The amount of subsidies is known in advance and is gradually decreasing over the years. The subsidization is done in two parts: a fixed subsidy per transhipment of an intermodal transport item and a variable subsidy per transport item, which depends on the distance travelled. A minimum distance between origin and destination nodes has to be travelled in order to benefit from the subsidies. The precise rules of attribution are detailed in a Royal Order of the 15 July 2009 (Moniteur Belge, 2009).

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DELIVERABLE 1.1 - 1.2 D: Macroeconomic influence of freight transportation by rail

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The SWOT-analysis of the Department of Transport and Regional Economics at the University of Antwerp concerns the macroeconomic influences of rail and intermodal transport. The strengths lay in both the direct and indirect influences on the economy through GDP, job opportunities, synergies between the sectors and an increased attractiveness of the region due to a better modal split and transportation efficiency.

The weaknesses focus on the insufficient network capacity and possible delays due to increased traffic and a lack of flexibility. The aim of this research is to expose an undesirable shifting of the transportation demand from other sustainable modes such as inland navigation, which is considered to be a negative effect.

With respect to the opportunities, some predictions and trends can cause an increased demand of the rail and intermodal transport. One of the important predictions for example is the increased trade and transport with Eastern-Europe. Another trend concerns the increased attention to the European freight corridors.

Threats consist of uncertainty in terms of availability of the budgets for the new infrastructure. In case of European subsidies the decision making is of a certain importance for the obtaining of the required means. In conclusion some attention is given to several possible negative trends on the employment in the rail sector.

TABLE 1: SWOT – MACROECONOMIC INFLUENCE OF FREIGHT TRANSPORTATION BY RAIL

Strengths	***Weaknesses***
1. Influence of increased/improved mobility infrastructure on the GDP 2. Better modal split – better allocation of space on the crucial transportation ways 3. Synergies with other sectors – manufacturing and construction industries and job creation 4. Job creation in the rail sector	1. Insufficient capacity of the existing network – missing links 2. Shifting the transportation from other sustainable transportation modes such as inland navigation or other existing route of a sustainable transportation mode 3. Increase in traffic and lack of flexibility can bring delays and network failures
Opportunities	***Threats***
1. Reduced external costs 2. The percentage of the European GDP in the area surrounding Belgium. Prediction of the traffic in the future: starting in the area of Belgium towards Germany/Poland and Switzerland/Italy 3. Connecting the European corridors and creating a high speed Trans-European East-West transport network and linking the national railways to the TEN-T corridors 4. Increase in GDP has a positive influence on the demand of mobility 5. Intermodal platforms and multimodal hubs can mean an uplifting for rail transport 6. R&D investment (technology) has a positive effect on rail	1. Investments, required for the renewal of infrastructure, in times of severe public savings are uncertain 2. European funds and subsidies are a financing possibility; the decision-making through a European fund/subsidy office can create a certain threat for a specific project or area development 3. Increase in passenger rail traffic can take away the capacity from freight transport by rail 4. Shortage of capable personnel and aging of existing personnel 5. Shortage of operational subsidies

SOURCE: CHAPTER SUMMARY (OWN CREATION)

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1. Strengths

1.1 Influence of increased mobility infrastructure on the GDP

Aside the fact that logistics contributes approximately, depending on the source, the used methodology and the time period taken into account, 10 to 14% to the total GDP of Europe, it also has a substantial impact on the quality of EU manufacturing and service sectors. Estimates prove that logistics account for 10 to 15% of the final cost of finished goods, thereby determining the competitiveness of the EU vis-à-vis other world regions. A 10 to 30% improvement in efficiency in the EU logistics sector would potentially equal € 100 – 300 BLN cost relief for the industry (European Union, 2006; European Intermodal Association, 2013).

It is clear that there is a great influence of the growth in the logistics industry/trade on the growth of the Gross Domestic Product (GDP). Therefore the Department of Transport and Regional Economics at the University of Antwerp (2005) has considered this correlation as a first strength.

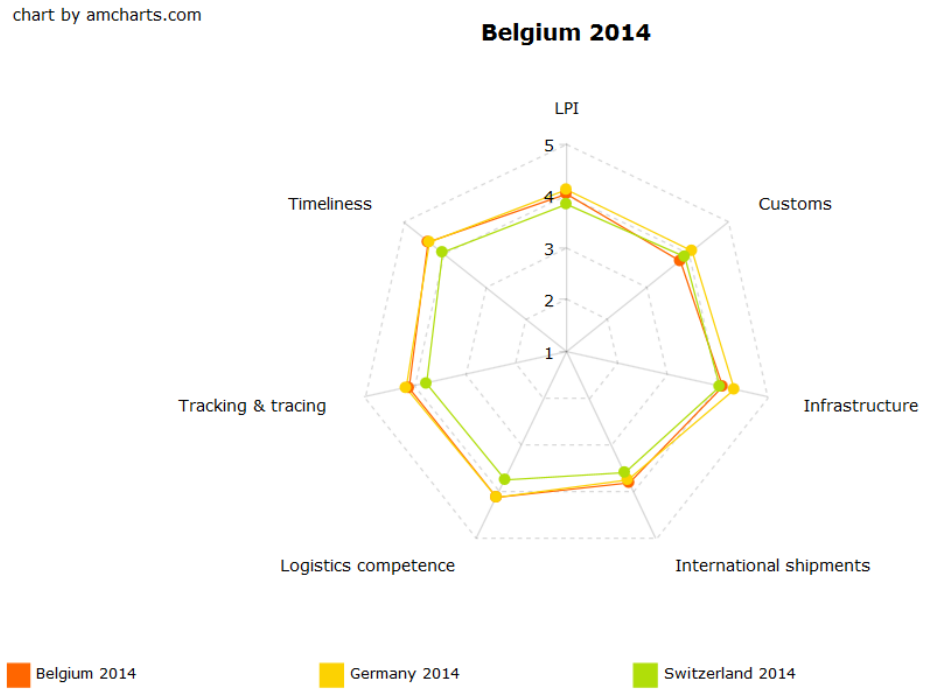
This finding is in line with Bennathan et al. (1992). These authors agree with the statement about the strong correlation between GDP and increased mobility (road tkm), mentioning that "*a cross-sectional study of a sample of 33 countries at different stages of development undertaken by The World Bank using 1989 data, demonstrated that the relationship between gross domestic product (GDP) and road tkm was extremely close*".

Passing the European borders, a look at Chinese studies regarding the effect of efficient logistics on the GDP show that "*logistics Foreign Direct Investment (FDI) is highly relevant to China's economic development, which is the major factor and driving force of China's economic growth.*" As a result, they recommended to improve the quality of FDI to promote the national economic development (Bin & Chaoyuan, 2005; Wang & Wang, 2010).

According to Schwab et al. (2014), the World Economic Forum in Geneva found that transport infrastructure is to be considered one of the 12 pillars determining the competitiveness of a region. Belgium is ranked 18th out of 144 on the Global Competitiveness Index (GCI) for the period 2014-2015, and shifting between the 15th and 19th place over the past years. As a comparison, in 2000 Belgium still claimed the 12th place in the ranking. Looking into detail, in terms of the infrastructure, a special need concerns the road infrastructure with a ranking of 27. Concerning rail infrastructure, Belgium is located on the 14th place. The highest ranking has been achieved in terms of the port infrastructure (6th place).

The Worldbank (2014) has also created a more specific Logistics Performance Indicator (LPI) to evaluate mobility and transportation efficiency. Belgium is currently positioned 3rd in this ranking. Where Switzerland claims the first place in the global competitiveness index, they land on a 14th place in the LPI and Germany leads the board where they stranded on a 5th place in the global competitiveness index. In figure 1 below a comparison on the different elements resulting in the logistics performance indicator can be found for the three above mentioned countries. It can be noticed that Belgium is scoring less on customs and infrastructure compared with leader Germany. Although Switzerland is far behind both countries, for the customs and infrastructure parameters they can keep up with the Belgian performance.

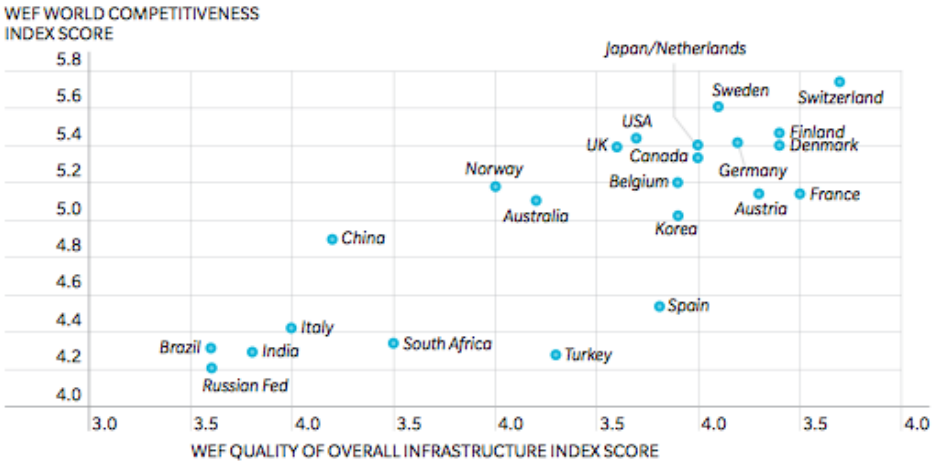
FIGURE 1: COMPARISON OF THE LOGISTIC PERFORMANCE INDICATOR (BELGIUM, GERMANY AND SWITZERLAND)



SOURCE: WORLDBANK, 2015

On a more global scale, the quality of infrastructure could also be compared with the world competitiveness index as shown in figure 2. The study indicates that countries with the most developed transport infrastructure tend to score well in terms of the competitiveness index (Schwab et al., 2011).

FIGURE 2: ROBUST INFRASTRUCTURE SUPPORTS NATIONAL COMPETITIVENESS



SOURCE: SCHWAB ET AL., 2011

However, most of the gateway and corridor infrastructure currently in place could not handle a 50% increase, let alone a doubling or tripling of passengers and freight in 20 years. Many gateways need greater capacity to meet the projected rapidly increasing demand from 2010 to 2030. Importantly, greater inland transport capacity is needed to match additional gateway capacity. The gateway and corridor infrastructures that are actually built will depend on broad national objectives and national and gateway policies and plans for handling such increasing demand. Major infrastructure can take 10-20 years to plan and develop, and the useful life of the infrastructure may be 50 years or more (OECD, 2012).

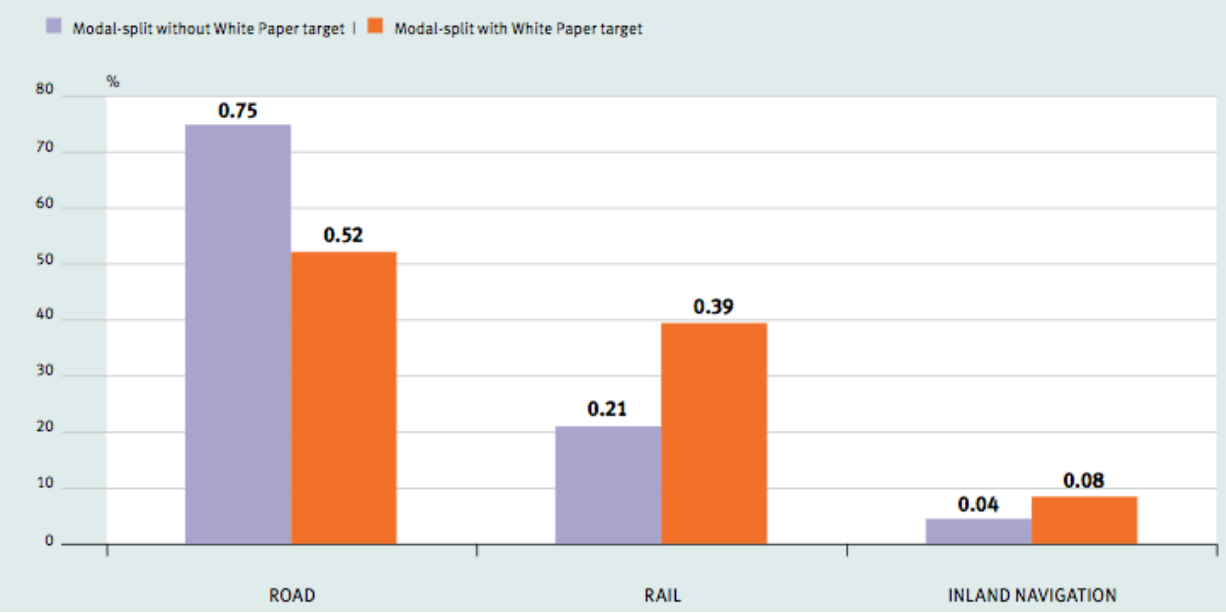
Countries will need to get two crucial things right at the same time if they are to plan, develop and fund the infrastructure needed in the locations and at the time required. These two essentials are the national policy frameworks and assured funding. Within the next sections and chapters, more detail will be given on the status and development of the infrastructure of the rail network (OECD, 2012).

1.2 Better modal split – better allocation of space on the crucial transportation ways

It is generally agreed that for longer distances, freight multimodality has to become the economically attractive option. Therefore, a need exists to establish efficient co-modality and special freight corridors have to be further developed and optimized in terms of energy use and emissions, limited congestion, low operating and administrative cost. More information on these corridors will be given in section 2.1 (European Commission, 2011a).

Also the hinterland is gaining importance, where it has often been ignored in the past. Within this hinterland, some challenges such as congestion are to be faced, which might impact the selection of the most adequate mode of transport. Roads are getting congested at an increasing rate and the logistics activities account for one of the biggest emission factors in the total EU emission. Moreover, annual freight traffic is steadily growing as mentioned before, leading to an increase of above mentioned factors. Therefore, the EU decided to come up with goals for 2030 and 2050 about the modal split for the each mode of transport, as illustrated in figure 3 (Cuypers, 2014; European Commission, 2011a).

FIGURE 3: MODAL SPLIT IN THE EU27 WITHOUT AND WITH THE CHANGED MODAL SPLIT OBJECTIVE



SOURCE: EUROPEAN COMMISSION, 2011A

Describing the European Commission White Paper 2011 targets, the reduction of road transport by 30% leads to a decrease in the share of road from 75% to 52%, an increase of rail transport from 21% to 39%, as well as an increase of inland navigation from 4% to 8%, assuming the shift of road transport would be equally distributed over rail and inland navigation. This means that the volume of rail and inland navigation would increase by 88%.

The question remains why this modal split could be critical for SMEs (small-medium enterprises) and MNCs (multinational corporations). The answer lays in the flexibility option and the capability to deal with the growing demand for transportation. With globalization and outsourcing trends in the trade areas, transportation started growing and accounts for around 14% of the European GDP. Thus, the existing infrastructure wouldn't be able to deal with the coming targets and the possibility of goods getting delayed is rising. For companies, it might be very important to have a backup option and send goods by an alternative mode of transport.

Figure 4: Inland waterways and ports in Belgium, The Netherlands and Luxemburg

Source: European Commission, 2014a

Figure 5: Railways, Ports and Rail-Road terminals in Belgium, The Netherlands and Luxemburg

Source: European Commission, 2014a

The figures 4 and 5 show the detailed mapping of the rail and inland navigation network that are tied to the ports of Antwerp and Rotterdam. In the last years, the aim of the policies was not only to expand the port capacity but also to increase the accessibility of the hinterlands. This policy shift has been translated in the infrastructure projects concerning multimodal hubs and improvements in terms of missing capacity links on the existing rail and inland navigation networks.

Despite all these efforts, road transport continues to have the biggest share between the different land transport modes in EU goods transport as shown in figure 6. Road transport accounted for 71.6% of the total inland freight transport in 2012 (according to the tkm performed) in European Union. The share of rail has dropped dramatically in 2009 due to the negative effects of the financial crisis and has been recovering since to reach 17.2% in 2012. Inland navigation reached in 2012 a competitively high share of 6.3% of the total inland transport in the European Union. Figure 7 shows the same comparison including sea and air transport. It can be concluded that during the past decades, the transport modal split did not change extremely at EU level (European Commission, 2014d).

FIGURE 6: MODAL SPLIT EU-28 – EXCLUDING SEA AND AIR

MODAL SPLIT

(%)

	ROAD	RAIL	INLAND WATERWAYS	PIPELINES
1995	67.3	20.3	6.4	6.0
1998	68.5	19.1	6.3	6.1
1999	69.7	18.2	6.1	5.9
2000	69.5	18.5	6.1	5.8
2001	70.5	17.5	6.0	6.0
2002	71.3	17.1	5.9	5.7
2003	71.5	17.3	5.4	5.8
2004	71.7	17.2	5.6	5.5
2005	72.2	16.7	5.6	5.5
2006	72.3	17.0	5.4	5.3
2007	72.5	17.0	5.5	5.0
2008	72.6	17.0	5.6	4.9
2009	73.4	15.7	5.6	5.2
2010	72.4	16.2	6.4	5.0
2011	71.9	17.4	5.8	4.9
2012	71.6	17.2	6.3	4.9

Note: Road: national and international haulage by vehicles registered in the EU-28.

SOURCE: EUROPEAN COMMISSION, 2014D)

FIGURE 7: MODAL SPLIT EU-27 – INCLUDING SEA AND AIR.

MODAL SPLIT

(%)

	ROAD	RAIL	INLAND WATER-WAYS	PIPE-LINES	SEA	AIR
1995	42.0	12.6	4.0	3.7	37.6	0.1
1998	42.7	11.9	4.0	3.8	37.5	0.1
1999	43.4	11.4	3.8	3.7	37.7	0.1
2000	43.3	11.5	3.8	3.6	37.7	0.1
2001	43.9	10.9	3.7	3.8	37.7	0.1
2002	44.5	10.6	3.7	3.6	37.6	0.1
2003	44.5	10.7	3.4	3.6	37.8	0.1
2004	45.1	10.8	3.5	3.4	37.0	0.1
2005	45.4	10.5	3.5	3.5	37.1	0.1
2006	45.4	10.7	3.4	3.3	37.1	0.1
2007	45.8	10.8	3.5	3.1	36.7	0.1
2008	45.9	10.8	3.5	3.1	36.6	0.1
2009	46.4	9.9	3.6	3.3	36.7	0.1
2010	45.7	10.2	4.0	3.2	36.9	0.1
2011	45.4	11.0	3.7	3.1	36.8	0.1
2012	44.9	10.8	4.0	3.0	37.2	0.1

Notes: Air and Sea: only domestic and intra-EU-28 transport; provisional estimates.
Road: national and international haulage by vehicles registered in the EU-28.

SOURCE: EUROPEAN COMMISSION, 2014D

In table 2 the modal split of freight shipped for Belgium (Flanders), France, Germany and The Netherlands is shown. For all countries, road is the most popular transportation mode, though for The Netherlands the difference is not as significant as for the other three countries and even almost the same to inland waterways. The reason for this lays in the unique geographical location and developed waterways network, especially the Rotterdam - Ruhr area connection, as it could be seen in figure 4 above (Crozet et al., 2014). Meersman et al. (2014) made a similar overview for the region of Flanders, showing the same high market share for road transport (Table 3).

Table 2: Modal Split in Belgium, France, Germany and The Netherlands

	Railways	Inland Waterways	Road
Belgium	12.3	17.1	70.6
France	10.9	3	86.1
Germany	19.5	10.3	70.2
Netherlands	6	46.5	47.5

Source: Crozet et al., 2014

Table 3: Share of TKM of road, rail and inland waterways transport in Flanders

% tkm	weg	spoor	binnenvaart
1990	77,76%	12,52%	9,72%
1991	78,39%	12,32%	9,30%
1992	77,06%	13,49%	9,45%
1993	79,30%	11,75%	8,95%
1994	78,95%	11,75%	9,30%
1995	79,94%	10,59%	9,47%
1996	79,18%	11,00%	9,82%
1997	80,19%	10,45%	9,36%
1998	79,58%	10,88%	9,54%
1999	80,59%	9,73%	9,68%
2000	78,46%	10,16%	11,38%
2001	79,57%	8,99%	11,44%
2002	79,96%	8,71%	11,34%
2003	79,78%	8,82%	11,40%
2004	80,01%	8,59%	11,40%
2005	80,00%	9,36%	10,64%
2006	81,23%	8,92%	9,85%
2007	82,89%	8,17%	8,94%
2008	82,15%	8,46%	9,39%
2009	83,43%	7,68%	8,90%
2010	82,31%	8,31%	9,38%
2011	80,94%	8,94%	10,13%

Source: Meersman et al., 2014

Adding to this the fact that lorries are able to go door-to-door without transhipment and as such no additional handlings, it becomes clear that road haulage tends to offer more cost-efficient and speed-efficient solutions to shippers for these door-to-door deliveries. Some criticalities of railway transportation in comparison with road transport can be briefly traced to (Crozet et al., 2014):

- Low commercial speeds.
- Unreliable travel times also due to time spent in logistics activities (i.e. cargo handling).
- Lack of homogeneity in railway lines performances, with a particular reference to module (limiting the maximum train length), maximum axle load (influencing the wagon weight) and gabarit (containers, swap-bodies and semi-trailers must be consistent with values allowed on the rail lines).

Rail transport is not a self-sustaining mode if compared to all-road transport. This means that also improvement of accessibility to freight terminals/node and optimization of connections among production sites and/or freight nodes is essential in order to exploit synergies coming with intermodality, including a more effective utilization of the ports (Crozet et al., 2014).

During a consultation round concerning this topic, a discussion was raised around the topic of modal split and modal shift. As transport volumes will keep rising in the future, it might be argued that the modal split of these new volumes should be fixed in advance in order to obtain a bigger share for the sustainable modes of transport. One example is found in the new 'Maasvlakte II' in Rotterdam, where compulsory goals are stated for the modal split of this new logistics area (35% by road, 45% by inland waterways and 20% by rail). Nevertheless it is agreed that the sustainable modal split of new volumes alone would not be sufficient as rail and inland waterways need bigger volumes in order to be profitably operational. Therefore the modal shift from road to rail or inland waterways remains desirable (Buyse, 2014; Hoornaert, 2015; Piette, 2015).

In this respect, De Rocker (2014) also mentions that for certain flows and certain cargo types, rail can have a substantial advantage over road transport in case of bigger volumes. For example for the transport of heavy steel coils, one full train can be compared with an average of 60 trucks. This gives a major advantage over loading and discharging operations as well as the time used to perform these actions. Nevertheless, the advantage is lost if the flows have no door-to-door railway connections, as in this case, the shift from rail to road would still be necessary in order to bridge the last mile.

Regarding the successful modal shift towards inland waterways, Hoet (2014) referred to the access of people and tools for networking within this transport mode. These contacts make it possible to easier organize the market, attracting new flows and stimulating the shift from road transport to inland waterway transport. Currently there is still a lack of such initiatives within the rail transport environment.

Buyse (2014) and Cuypers (2014) also refer to the mind shift which is necessary. A lot of initiatives are starting from the point of view of a truck transport company, attempting to build in or match the intermodal rail freight afterwards. This approach obviously does not work. In addition, in terms of costs, it is not the cost of intermodal transport which should be taken into consideration, but the total cost of the complete logistics chain. Some examples show that, although intermodal transport is more expensive as a single factor, the cost of the total chain decreases by more than 10% due to an improved organization, better communication and a clear structure for operations.

Verslype (2014) indicates the strategic incentive by the Port of Ghent against 2020 changing their current modal split by decreasing the 42% road transport share to 35%, mainly in favour of rail transport which would increase from 10% to 15%, and inland waterways, rising from a current 48% share towards 50% as an end target. For the Port of Antwerp, Cuypers (2014) indicates similar figures for rail transport. For the Port of Zeebrugge, road transport currently has the biggest share with 60%. Rail transport is more intensive compared to Ghent and Antwerp with a share of 15%. Inland waterways is marginalized with a share of only 0.5%. The remaining transport is executed via short sea shipping. Future investments in the infrastructure of the port of Zeebrugge are expected to double the rail transport capacity from 750.000 TEU towards 1.5 million TEU on an annual base (Vancauwenberghe, 2014).

To close the argument on the need for a better modal split, the price elasticity can be observed. As it can be seen from table 4 below that price elasticity in Flanders concerning modes of transport are rather inelastic. If the cost of road transport in Flanders would increase by 1%, the use of road transport would decrease by

0.12% and the sustainable transport modes rail and inland waterways would grow by respectively 0.38% and 0.19%. In comparison, an increased cost of rail transport by 1% would result in a drop by 0.83% of rail use and an increase by 0.06% for both road and inland waterways transport (Sys & Vanelslander, 2011).

TABLE 4: PRICE ELASTICITY, THE EFFECT ON TKM IN FLANDERS

	Road	Rail	IWW
Road	-0.12	0.38	0.19
Rail	0.06	-0.83	0.06
IWW	0.09	0.19	-0.34

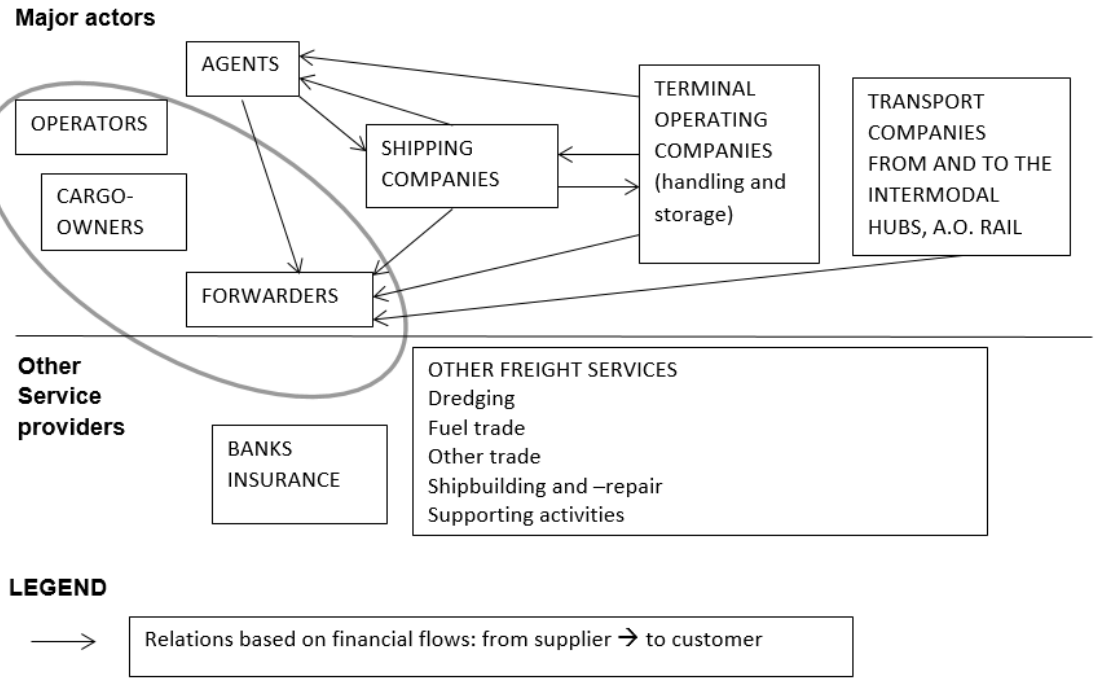
SOURCE: SYS & VANELSLANDER, 2011

1.3 Synergies in the sector of electronics, machinery and infrastructure. Increased output due to increased investments in track infrastructure, locomotives and wagons, and renewal of electronics on the track infrastructure and wagons/locomotives

In most studies, the economic impact of a phenomenon is measured at an aggregate level by indicators such as added value, employment and investment. The aim for this analysis on intermodal rail transport is to define the economic relevance for the national as well as for the regional economy at a disaggregate level. Coppens et al. (2007) already performed such an analysis on the port sector. The used methodology could also be applied to the rail transport sector. In this respect, figure 8 shows an adaptation of the port actors relations used in this study, indicating the different relations between the various actors dealing or involved with rail freight transport, as well as the relations between these actions and the related Belgian industrial sectors.

In case of the rail freight network, important links between rail operators and multimodal forwarders can be observed. Concerning the macroeconomic impact, a considerable correlation between GDP and demand of transport is expected. It has been assumed that rail transport and intermodal transportation have a positive influence on the GDP growth, creating more jobs in the transportation sector and attracting new investments in the related sectors, such as manufacturing and construction. There are many opportunities laid for railway transportation since the increased promotion of sustainable logistics from the European Commission and followed increase of investments into railway infrastructure. This increased transportation efficiency and promoted the international trade between Eastern and Western European countries. However, there are concerns that the main funds would be invested to the Eastern Europe and overall network capacity is going to be insufficient soon. In this case, the market would not be able to deal with the expected growth of the railway logistics and would cause delays and a decrease in the transportation efficiency (Coppens et al. 2007).

FIGURE 8: RELATIONS BETWEEN DIFFERENT ACTORS IN THE RAIL SECTOR



SOURCE: OWN ADAPTATION BASED ON COPPENS ET AL., 2007

In the study of Coppens et al. (2007), these synergies have been analysed and verified through input-output tables. If this methodology is to be followed, Hoornaert (2015) and Van Gastel (2014) point out possible difficulties that might be faced and will need to be resolved before the continuation of the analysis. First of all the data collection might be tough as most NACE H49 data contains all land transport activities, including road and pipe transportation. H49.2 is the most specified cluster for rail freight transport, but data is often poorly available or very unclear due to the change of the NACE system in 2008 and the difficult structure of the different railway operators and the operations on Belgian ground of other European operators without Belgian entity. Cooperation of these parties and Infrabel would therefore be necessary. Secondly, no or little studies have been executed in the past on this topic, putting another burden on data collection. And thirdly, studies often measure only the impact of the economy on transport, but not the other way around. In this sense, the upcoming analysis could bring added value, but seems to be rather complex. Special attention will be given to these points in further follow-up.

In respect to the synergies the rail sector could have with other sectors, Piette (2015) also referred to the trend that companies are starting to realize that the optimization of the supply chain, and as such the optimization of the logistical chain, could bring real added value to a product. The cost savings obtained by this process could differentiate the company from its competitors. This new trend is finally breaking the persistent idea of companies to see logistics as a necessary evil to operate, instead of an opportunity to obtain an increased competitive position. De Rocker (2014) indicates that the concept of TCO (Total Cost of Ownership) is becoming more and more introduced within different business sectors, resulting in more awareness about the consequences of the use of different modes of transport. As an example, the cost of (external) stock and location was often a factor which was not taken into account in the past.

1.4 Job creation in the rail sector

The Shift2Rail program has defined the rail sector as one of Europe's key industrial sectors and therefore stresses the importance of employment that is linked to this sector. Within this program, UNIFE has performed a number of studies throughout the EU15 in 2012, giving more insight on the actual numbers. It is estimated that more than 400,000 people are employed directly by the rail freight industry (European Economic and Social Committee, 2014).

In the Eurostat's Statistical Pocketbook of 2014, the employment by mode of transport is presented for the situation in 2011 for the EU-28 and Belgium. This data refers to direct transportation and storage activities. Figure 9 shows that 5.8% of the European transport employment is linked to the railways industry. When comparing these numbers to the situation in 2008 in figure 10, it can be observed that the importance of the rail industry employment has declined from 8.9% over the last years. For Belgian level, the figures are difficult to compare due to a difference in data collection[1]. Nevertheless, the same downwards trend can be assumed for the Belgian situation on railways employment.

FIGURE 9: EMPLOYMENT BY MODE OF TRANSPORT IN 2011 (IN 1000)

Employment by Mode of Transport (*) (in 1 000) – 2011

	TOTAL	ROAD freight transport	ROAD passenger transport (**)	Railways	Pipelines	Inland water transport	Sea transport	Air transport	Warehousing and support activities	Postal and courier activities
EU-28	10596.0	3 000.0	1 976.6	613.0	27.8	40.8	175.4	375.9	2 530.0	1 856.5
BE	218.9	63.1	12.0	5.3	0.0	0.8	3.4	4.5	90.7	39.1

SOURCE: EUROPEAN COMMISSION, 2014D

FIGURE 10: EMPLOYMENT BY MODE OF TRANSPORT IN 2008 (IN 1000)

Employment by Mode of Transport (in 1 000) – 2008

	TOTAL	ROAD freight transport	ROAD passenger transport (*)	Railways	Pipelines	Inland water transport	Sea transport	Air transport	Warehousing and support activities
EU-27	9 086.5	3 042.2	2 137.9	790.0	23.6	42.5	174.8	411.6	2 463.9
EU-15	7 163.3	2 302.6	1 702.8	487.3	10.8	34.9	158.8	381.5	2 084.7
EU-12	1 923.2	739.6	435.1	302.7	12.8	7.6	16.0	30.1	379.2
BE	191.4	59.9	36.6	36.2	0.3	0.6	0.6	6.3	50.8

SOURCE: EUROPEAN COMMISSION, 2011C

Van Geyes (2012) indicates that over the last decades, the railway industry has tried to reorganize their operations and to cut down its cost. That way, the number of staff in 2010 shrunk by 7.5% compared to 2000.

[1] Since 2009, employment values for transport activities became confidential in the case of Belgium. Therefore Move Transport Data decided to estimate the values for Belgium by arithmetic deductions, although these figures remain merely indicative estimates.

Nevertheless, exploring the European railway map network and opening a railway station connection would still require hiring extra personnel. Another interesting case is CombinAnt, a multi-modal platform in the port of Antwerp by the joint venture of BASF, Hupac and Hoyer. They handle up to 12 trains per day, 150,000 wagons on a yearly basis and around 40 to 50 jobs are created to operate this platform (Combinant, 2012).

In conclusion, UNIFE underlines several trends that could impact the employment such as:

- The importance of the evolution of the market share growth of the industry.
- The growth of the international trade.
- The establishment of R&D centres for the railway industry.
- The railways market opening and liberalization trend.
- And the rapid growth and usage of multi-modal platforms.

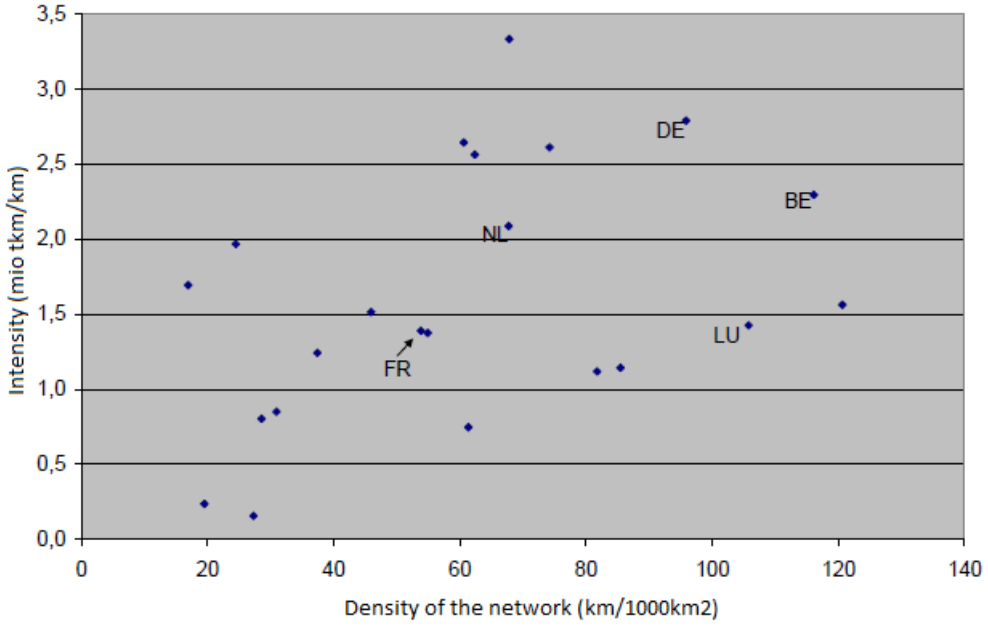
2. WEAKNESSES

2.1 Insufficient capacity of the existing network – missing links

In the previous chapter, the importance of infrastructure was already mentioned. During the last decades, the transport sector has experienced a considerable growth as a consequence of the globalization of the economy. This has caused congestion on certain routes and in certain areas, which is starting to threaten the growth of the economy. Certain measures to tackle this congestion are needed to see a continuing economic development. Therefore, the European transport policy is focusing on rail transport as one of the major ways of enhancing economic development. There are several objectives regarding this policy. One of them is managing the existing capacity as well as its expansion, which is very costly.

The Belgian railway network is over 3,500 kilometres long. Within the European Union, Belgium scores well both in terms of density and intensity of the railway network as can be seen in figure 11 below. The density of the Belgian network is the result of years of investment by the Belgian State in the maintenance, development and management of the railway infrastructure, shown in table 5. In proportion to the size of the national economy of the European countries, only Luxembourg spent more on railway infrastructure between 1996 and 2006. In the period under review, the Belgian government has invested about 13 billion euros in railway projects, compared to 39 billion euros by the German, 37 billion euros by the French, 33 billion euro by the Italian and 23 billion euros by the Dutch government. The intensity could be explained by the beneficial geographical position of Belgium in the Blue Banana, which will be handled in the next section (FOD Economie, K.M.O., Middenstand en Energie, 2010).

Figure 11: Intensity and density of the rail network – European comparison (density in km/1000 km²; intensity in mio tkm/km)



Source: FOD Economie, K.M.O., Middenstand en Energie, 2010.

TABLE 5: AVERAGE YEARLY GOVERNMENT INVESTMENT IN RAILWAY INFRASTRUCTURE (IN % OF THE TOTAL GDP 1996-2006)

Country	LU	BE	NL	SE	FI	IT	FR	DE	EL	IE	DK	ES	AT	GB	PT
1996-2006	0,434	0,318	0,315	0,282	0,185	0,180	0,162	0,124	0,106	0,090	0,084	0,017	0,004	0,001	0,000

SOURCE: FOD ECONOMIE, K.M.O., MIDDENSTAND EN ENERGIE, 2010.

Table 6 shows that before the economic crisis, approximately 15 million tons of goods were transported each year from other European countries to Belgium. More than 37% originates from France and 21% came from Germany. Compared to the total imports from the two countries in 2008, 8.8 million tons or 15.4% was delivered by rail. Although the traffic of goods from abroad increased significantly year by year, a decline started in 2008 due to the economic crisis (FOD Economie, K.M.O., Middenstand en Energie, 2010).

TABLE 6: CARGO FLOWS TOWARDS BELGIUM BY RAIL FROM 2004-2008

FROM	2004	2005	2006	2007	2008	Average transported tonnage 2004-2008	%
FR	4.913	5.748	5.860	5.932	5.279	5.547	37
DE	2.165	1.968	4.166	4.491	3.502	3.258	21
IT	1.959	2.245	2.367	2.449	1.889	2.182	14
NL	1.260	942	1.559	1.962	1.813	1.507	10
LU	792	792	1.171	978	843	915	6
CH	356	341	349	421	387	371	2
AT	0	440	477	392	397	426	3
SE	257	239	250	240	220	241	2
ES	180	246	177	174	132	182	1
CZ	80	314	85	99	90	133	1
Other	817	431	382	417	350	394	3
TOTAL	12.777	13.705	16.844	17.557	14.902	15.157	100

SOURCE: FOD ECONOMIE, K.M.O., MIDDENSTAND EN ENERGIE, 2010.

The same results can be found for the traffic of goods from Belgium to other European countries, shown in table 7. Before the full outbreak of the crisis, approximately 22 million tons of goods were exported each year by rail. 27% go to both France and Germany. Again the decline started in 2008, mainly due to a significant drop in export by rail towards Germany (FOD Economie, K.M.O., Middenstand en Energie, 2010).

TABLE 7: CARGO FLOWS FROM BELGIUM BY RAIL FROM 2004-2008

FROM	2004	2005	2006	2007	2008	Average transported tonnage 2004-2008	%
DE	3.948	4.198	7.236	7.957	5.810	5.830	27
FR	5.598	5.935	5.823	5.778	6.003	5.828	27
IT	3.440	3.139	3.544	3.323	2.726	3.234	15
NL	2.222	1.498	2.325	2.499	2.196	2.148	10
LU	1.890	1.659	1.839	1.568	1.435	1.678	8
CH	1.102	1.137	1.195	1.122	1.208	1.153	5
AT		64	68	55	37	565	3
ES	48	56	53	50	39	494	2
SE	22	24	26	25	23	244	1
GB	42	29	25			215	1
Others	1.067	33	34	58	61	477	2
TOTAL	20.399	19.651	24.037	24.180	21.062	21.866	100

SOURCE: FOD ECONOMIE, K.M.O., MIDDENSTAND EN ENERGIE, 2010.

Table 8 focuses on the numbers after 2008, taking into account the financial and economic crisis, it can be seen that the rail cargo flows continued to drop in 2009, stabilizing in 2010 and 2011.

TABLE 8: CARGO FLOWS FROM AND TOWARDS BELGIUM BY RAIL FROM 2008-2014

From	2008	2009	2010	2011	Average transported tonnage 2008-2011	%
FR	5279	2692	3676	3696	3.836	29%
DE	3502	3017	4120	4143	3.696	28%
IT	1889	1478	2018	2028	1.853	14%
NL	1813	1457	1990	2001	1.815	14%
EU28	**14902**	**10291**	**14051**	**14127**	**13.343**	**100%**

Towards	2008	2009	2010	2011	Average transported tonnage 2008-2011	%
DE	5810	3787	4265	4773	4.659	25%
FR	6003	3884	2128	3475	3.873	21%
IT	2726	2351	2590	3971	2.910	16%
EU28	**21062**	**16399**	**18987**	**18198**	**18.662**	**100%**

SOURCE: OWN CREATION BASED ON EUROSTAT DATA, 2015

In order to understand the current situation of the infrastructure of the rail network in Belgium, it is important to have a detailed look at the different corridors. The European Union defined these cargo corridors by regulation No 913/2010 in order to stimulate the international transport by rail. In total there are nine initial corridors, where cooperation between different operators is the main driver to reach an improved quality of the service by centralizing the needs of the customer. End of 2014, the European Commission published nine studies on the current development of these nine corridors, indicating the current status, problems and actions to be taken in order to reach the target of a fully operational core network by 2030 as planned (European Commission, 2015).

On the territory of Belgium, there are several important network connections. Figure 12 and 13 show the three corridors that are connected to the Belgian rail network. This could imply an increase in traffic in the future. The three freight corridors passing Belgium are (European Commission, 2014b):

Corridor 1: Zeebrugge – Antwerp/Rotterdam – Duisburg – Basle – Milan – Genoa

The **Rhine-Alpine Corridor** connects the North Sea ports of Antwerp, Rotterdam and Amsterdam along the Rhine valley via Basel to Milan and the Italian port of Genova. It covers rail, road, airports, ports, RRT's and the Rhine as inland waterway. The key projects are the Alpine base tunnels Gotthard and Lötschberg and their access lines.

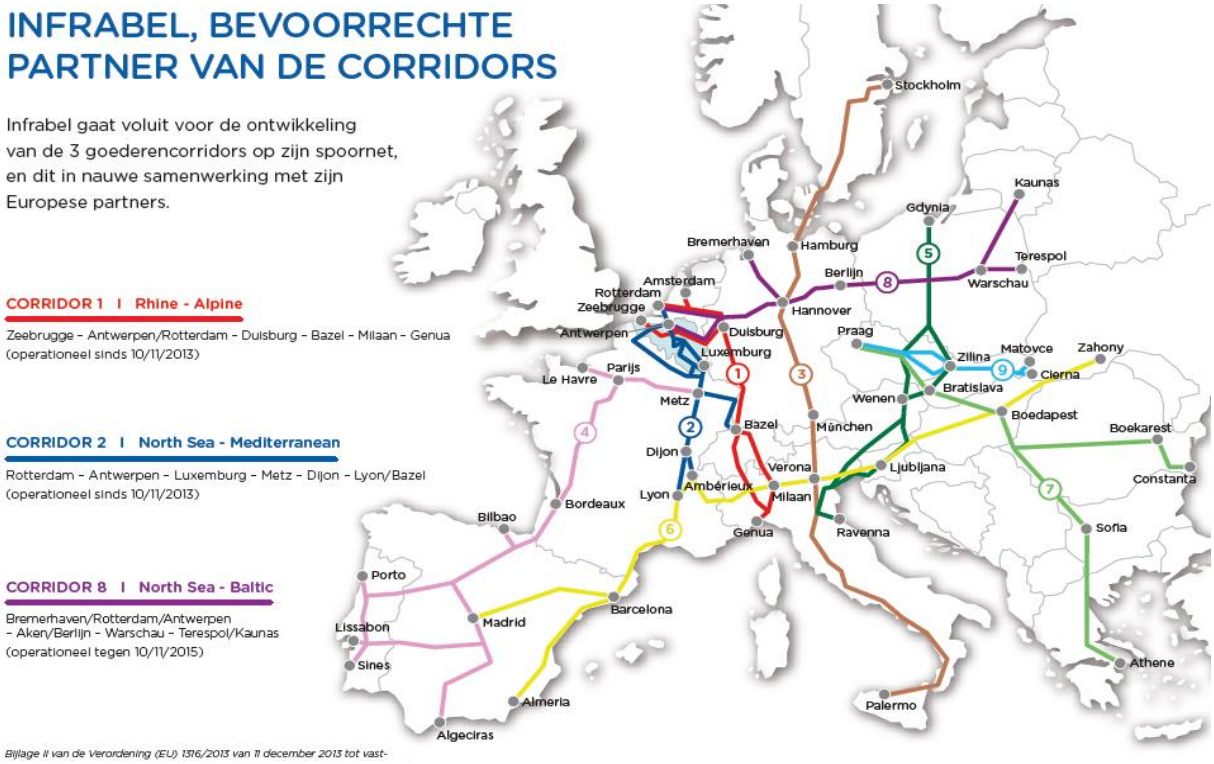
Corridor 2: Rotterdam – Antwerp – Luxembourg – Metz – Dijon – Lyons/Basle

The **North Sea-Mediterranean Corridor** stretches from Belfast and the Irish ports of Cork and Dublin, as well as from the northern UK ports Glasgow and Edinburgh through Belgium, with a branch from, Amsterdam and Rotterdam, via Luxembourg to Strasbourg and Basel and via Lyon to the southern French ports of Fos/Marseille. It covers rail, road, airports, ports, RRT's and the Dutch-Belgian inland waterway system as well as the Rhône river. The key project is the Seine-Escaut inland waterway.

Corridor 8: Bremerhaven/Rotterdam/Antwerp – Aachen/Berlin – Warsaw – Terespol/Kaunas

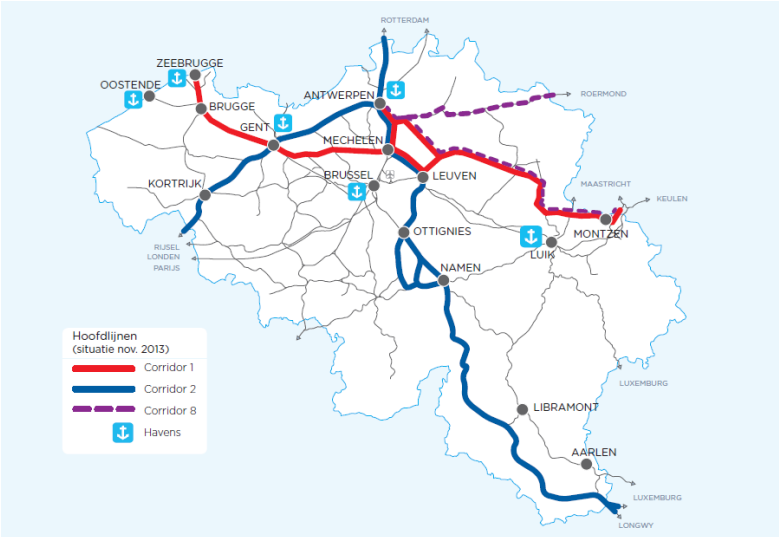
The **North Sea-Baltic Corridor** stretches from the North Sea ports Antwerp, Rotterdam, Amsterdam, Bremen and Hamburg through Poland to the Belarus border and to the Baltic countries' ports Klaipeda, Ventspils, Riga and Tallinn as well as to Helsinki. It covers rail, road, airports, ports, RRT's, inland waterway as the "*Mittelland Kanal*" and "*Motorway of the Sea*" links to Finland. The key project is "*Rail Baltic(a)*", a UIC (International Union of Railways) standard gauge railway between north-eastern Poland, Kaunas, Riga and Tallinn.

FIGURE 12: EUROPEAN RAIL FREIGHT CORRIDORS – 2013-2015



SOURCE: INFRABEL, 2014

FIGURE 13: RAIL CORRIDORS IN BELGIUM



SOURCE: INFRABEL, 2014

The existing infrastructure however has to be further evaluated. The focus of the further inquiries and research will lay on the need of constructing new lines, adding additional lines to the existing ones and repairing or upgrading some pieces of the existing rail network. Also the European TEN-T network guidelines and future European corridors have to be further evaluated. Within the Belgian rail network, there are some missing links and bottlenecks that need to be handled in the upcoming years, although Infrabel believes the gap to overcome is fairly modest and manageable compared to some other countries. The general company policy of Infrabel is to have the infrastructure ready to be in line with the European framework by 2030 (INFRABEL, 2014; Houtman, 2014).

An obstacle for the trade with Eastern European countries will be the underdeveloped infrastructure. As it has been mentioned in the EIA Annual Report, the absence of reliable railway connections and railway hubs create a bottleneck to growth. Thus, the EU needs to invest more funds in developing the Eastern European railway infrastructure to provide an opportunity to increase the rail modal split and to connect the opposite parts of Europe. Moreover, there is an increasing need for standardization, which will be handled within the next chapters. Currently, the ex-Soviet Union member countries are still using another type of railway gauges, which is also slowing down the growth of international trade (European Intermodal Association, 2013).

In France and Germany, railways are historically a popular means of transport and therefore further developed. These countries are big, making transport distances sufficiently large to increase possible attractiveness of rail transport, and the network is decentralized. In terms of logistics perspective, this creates an attractive situation for railway transportation. In Belgium, the situation is more balanced as distances are shorter. Although as some large ports and many distribution centres are located in this country, the network should be very flexible in terms of transportation, including the rail transport option (Crozet, 2014).

Concerning the lack of capacity of the current existing network in Belgium, Hoornaert (2015) points out the important role of Antwerp and the increasing capacity gap in all transport modes around this area. Concerning rail transport, the second access of the port could bring some improvement although this should be further investigated.

During the European Rail Freight Days Conference (European Commission, 2014h), it was also agreed that the infrastructure congestion and bottlenecks, and the insufficient cross-border cooperation, are two main weaknesses that need to be addressed with high priority. Regarding the Rail freight corridors (RFCs), the panellists agreed on the fact that they are improving the cooperation between countries and infrastructure managers, although it was also mentioned that soft quick win measures, such as increasing the train length to increase capacities in the short run, should not be neglected. In addition, the involvement of terminals within the RFCs should also be considered in the short run.

In terms of intermodal terminals, capacity is not suffering from a lack of these terminals, yet the organization is not adequate for the number currently operating. This results in a strong survival competition where each terminal is attacking road transport by itself without any cooperation. These intermodal terminals should operate as one relevant chain in order to become profitable and take back market share from road transport. Triggers for this cooperation or collaboration could be (Buyse, 2014):

- Shipping companies, expecting their equipment to be used.
- Co-modality of shipping companies with road transport, although trust between both parties is necessary.
- And a clustering of shippers.

The last point however might also benefit road transport, as these days some 20% of the trucks are driving empty on the road (Buyse, 2014).

In addition to the above, the current lack of capacity exists due to the fact that over the past decades, a lot of network links have been abandoned. The reason behind this is a chicken or the egg causality dilemma. A decrease in use of rail transport leads to a drop in maintenance of the infrastructure on the network, making it even less attractive to be used. Although it is unclear which is the first step: did a lack of maintenance result in a lower use of the companies connected to the rail network as they are not satisfied with the quality, or has the use of the companies declined, leaving the infrastructure administrator to think the connection is no longer necessary and therefore lowering maintenance on these parts? Nevertheless, it would also not be sustainable having each and every company connected to the rail network. This would imply an enormous maintenance cost which would not be balanced by benefits these links to the infrastructure could bring, as many of them would never be used. The same has happened for example with the port in Ostend, receiving a rail connection which has never been used up to now. In this respect, caution should be given to when and where infrastructure could be developed bringing the necessary added value (Cuypers, 2014; Piette, 2015; Stojadinovic, 2015).

A gloss upon this weakness is the idea that infrastructure in itself does not stimulate the use of intermodal rail freight. It is not the case that the development of new infrastructure is automatically leading to an increase in rail or intermodal freight transport. This is triggered by the consequences of good and strategic infrastructure investments, resulting into a decrease in cost and an improvement of the efficiency of these transport modes. The new Liefkenshoektunnel in Antwerp can be taken as an example, which in itself will not convince users to generate more traffic by rail. It will be the effects of this new tunnel, such as a limitation in moves, a decreased distance and as such an increased cost-efficiency, which will lead towards more rail usage. In this respect, infrastructure can be seen as a condition, rather than a true trigger, driver or stimulator for rail transport development (Cuypers, 2014).

In conclusion, Piette (2015) indicates that the freight volume transported by rail in Belgium in the past has been higher, and as such it might be assumed that the capacity should be present already for a new rise in volume. Nevertheless, it should be clear that the volume of passenger trains has also increased over the past 15 years. In table 9 below, we can see that total amount of passengers transported increased by 55%, while the total kilometres done by passenger trains has increased by 10%. In section 4.3 the link between passenger and freight transport will be further investigated.

TABLE 9: PASSENGER TRAFFIC BY RAIL IN BELGIUM, 1997 - 2010

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
Vervoerde reizigers (mln)															
Totaal	144	146	147	153	160	165	168	178	187	198	207	217	220	224	**55,56%**
Afgelegde trein-kilometer (mln km)															
Totaal	73,2	75,5	76,9	77,1	76,2	76,9	77,2	78,2	77,5	78,3	79,6	79,7	80,8	n.b.	**10,38%**

SOURCE: FOD ECONOMIE, K.M.O., MIDDENSTAND EN ENERGIE, 2013

2.2 Shifting the transportation from other sustainable transportation modes such as inland navigation or other existing routes of a sustainable transportation mode

Shifting the transportation from other sustainable transportation modes such as inland navigation is one of the considerable weaknesses. In order to determine the effect, transportation modes are to be analysed by different parameters in this respect. The focus lies on infrastructure, lead-time, sustainability, cost of shipment and the total volume that could be shipped.

In terms of lead-time, the example from Antwerp to Duisburg, with a total trip length around 180 km, shows a clear difference between inland waterway transport and rail transport. Shipping this route by barge takes up to 48 hours, whilst only 24 hours are needed by the railway connection (Port of Antwerp, 2013a).

For the shipping of great volumes, there is an advantage for inland waterways transportation. Barges can ship in about 10 times more containers, compared to full trains. The average capacity of trucks is 2 TEU, one train can take up to 80 TEU, equivalent to 40 trucks, and a barge can transport up to 824 TEU, equalling more than 10 trains or 400 trucks in one go (Port of Rotterdam, 2012). In terms of tonnages, one barge (1,500 tons) can take up to 15 times the weight of one railcar (100 tons) and 60 times the weight of one semi-trailer (25 tons) (U.S. Department of Transportation, 2013).

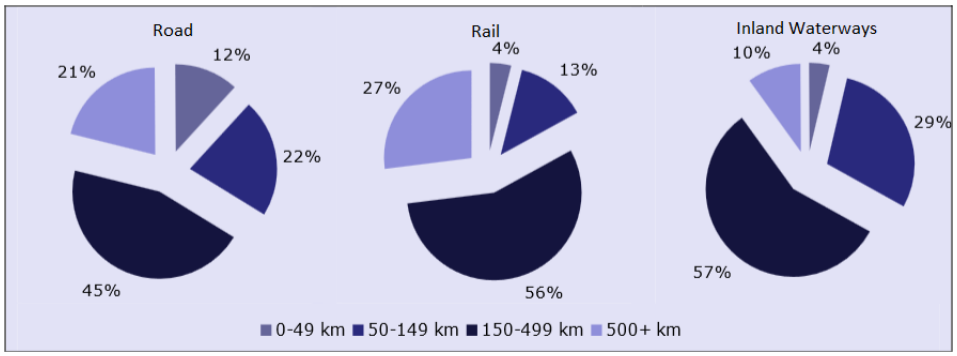
From a financial point of view, Walker & Criss (2013) stated that "*complex accounting, preferential subsidies, regulations, tax structures etc. complicate the picture in such way that it is nearly impossible to determine the true cost of all the factors. We can only point out obvious omissions from simplistic calculations. Time, service and infrastructure all have values and costs. As for time, barges typically travel only 4 to 11 miles per hour, much slower than trains or trucks. As for service, trucks rapidly move cargo door to door, can take alternative routes in case of road problems, and are clearly preferred for short hauls. In many cases, trains can also provide rapid, door-to-door service, for example they can move coal directly from mine to power plant. Trucks pay fuel taxes and fees, and the roads they use are available to all citizens. In contrast, barges and rail use an exclusive system almost entirely built and maintained at taxpayer cost.*"

Following McKinnon & Piecyk's (2010) framework, railway transportation is emitting 30% less CO_2 compared to barge. In addition, inland barge transportation is more energy efficient, performing a one ton transport over a distance of 218 km on 1 litre of fuel. Transporting this one ton by rail and truck would only reach respectively 85 km and 25 km (U.S. Department of Transportation, 2013).

Subsidies might also result in an unintended shift between the different modes of transport, and as such result in an undesired shift from one sustainable mode of transport to the other. Rail transport and inland waterway transport are continuously fighting each other in order to obtain the best subsidies. As there is currently little engagement, approximation and coordination, this process will continue in the future. In order to break this trend, a political foundation should exist, making a fundamental choice between rail and inland waterways (Hoet, 2014).

So, in conclusion, we may consider by the volume that could be transported and the opportunity to ship containers directly from the port, barges could be more attractive to use for the 3PL's rather than rail. Nevertheless, in case of a modest volume or longer distances, there might be an advantage for rail, which can transport goods faster and emits less CO_2 than barges. The long distance opportunity for rail is also clear from figure 14 above, showing 83% of the rail transports are above 150 km. Nevertheless, these opportunities still depend on the route and the type of cargo, as well as the necessary handling activities, in order to determine whether rail transport would become the better option (De Rocker, 2014).

FIGURE 14: FREIGHT TRANSPORT BY DISTANCE AND MODE OF TRANSPORT



SOURCE: MEERSMAN ET AL., 2009

The same remarks are made by Buyse (2014), stating that rail transport always needs a certain distance and inland waterway transportation needs capacity in order to be profitable. Therefore, both will automatically find a balance in the market, limiting this weakness to a minimum in the long term. Nevertheless, the threat remains that imbalanced subsidies, regulation and other government actions might result in a shift of behaviour, changing from one sustainable mode of transport to the other. This will be handled in Chapter 4.

2.3 Increased traffic and lack of flexibility can bring delays and network failures

Railway freight isn't as flexible as road or sea freight. In addition, this mode of transport often cannot deliver door-to-door as special infrastructure would be required. Cars/ships are able to use different routes and roads, where rail transport is limited to the foreseen infrastructure and network, increasing the inflexibility which poses a real weakness. Because of globalization and the increase of PPP and GDP, international trade is growing and railway usage is rising with it as mentioned earlier. Thus, there could be a potential problem that at some point of time, there would be not enough capacity to transport goods by rail given the existing infrastructure. Potential delays and bottlenecks could be caused by (Grosso, 2011; Vandressen et al., 2012; Stojadinovic, 2015):

- An insufficient railway network (small number of routes available to send shipments).
- Delays at the station (waiting time needed to load/unload the trains at the stations).

In the first case, governments need to invest in a new railway connection between key cities and strategic regions. Projects already exist to expand the railway network, supported by the TEN-T program. For the second issue, a potential solution could be the increase of the number of multi-modal hubs and the number of lines inside of them, taking into account the earlier mentioned threat of competition and the need for more cooperation (Vandressen et al., 2012).

Increased passenger traffic could also mean additional delays and insufficient capacity for rail freight transport. Recent projections of the federal plan office indicate, compared to 2008, an increase in the number of pkm travelled by train by 43% and the number of tkm for rail freight by 72% by 2030.

Hoet (2014) also mentions the risk of increasing passenger traffic using the same rail infrastructure network. As passenger trains always receive priority over rail freight, a negative impact on the efficiency of cargo transport by rail is reached, as well as a decline in service due to uncertain deliveries. More insight on this phenomenon will be given in section 4.3.

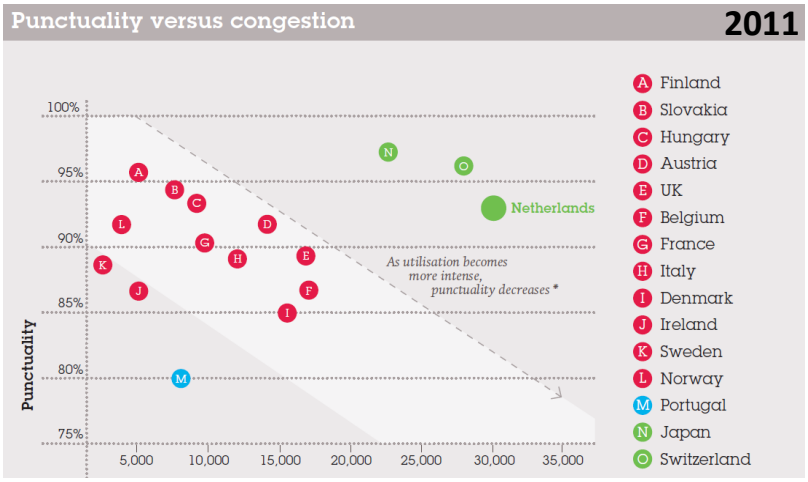
De Rocker (2014) indicates that one of the problems with rail transport is also the fact that a certain path cannot be completed at once, as often locomotives are not adapted to the route and need to be changed and train drivers cannot continue as they do not possess the correct knowledge or certificates. Therefore it is often impossible to optimize rail transport, as it becomes impossible to operate a full train in both directions of the past, decreasing the efficiency and flexibility. Road transport does not have this disadvantage, as truck drivers can more easily operate routes in both directions, or even find a freight to other destinations where traffic can be found and as such avoid empty transportation. Also barge transport has this advantage as they also have more deviation options compared to rail transport. Increased traffic could make this existing weakness of rail transport even bigger in the future, if no adequate actions are taken (Vanfleteren & Kockx, 2014).

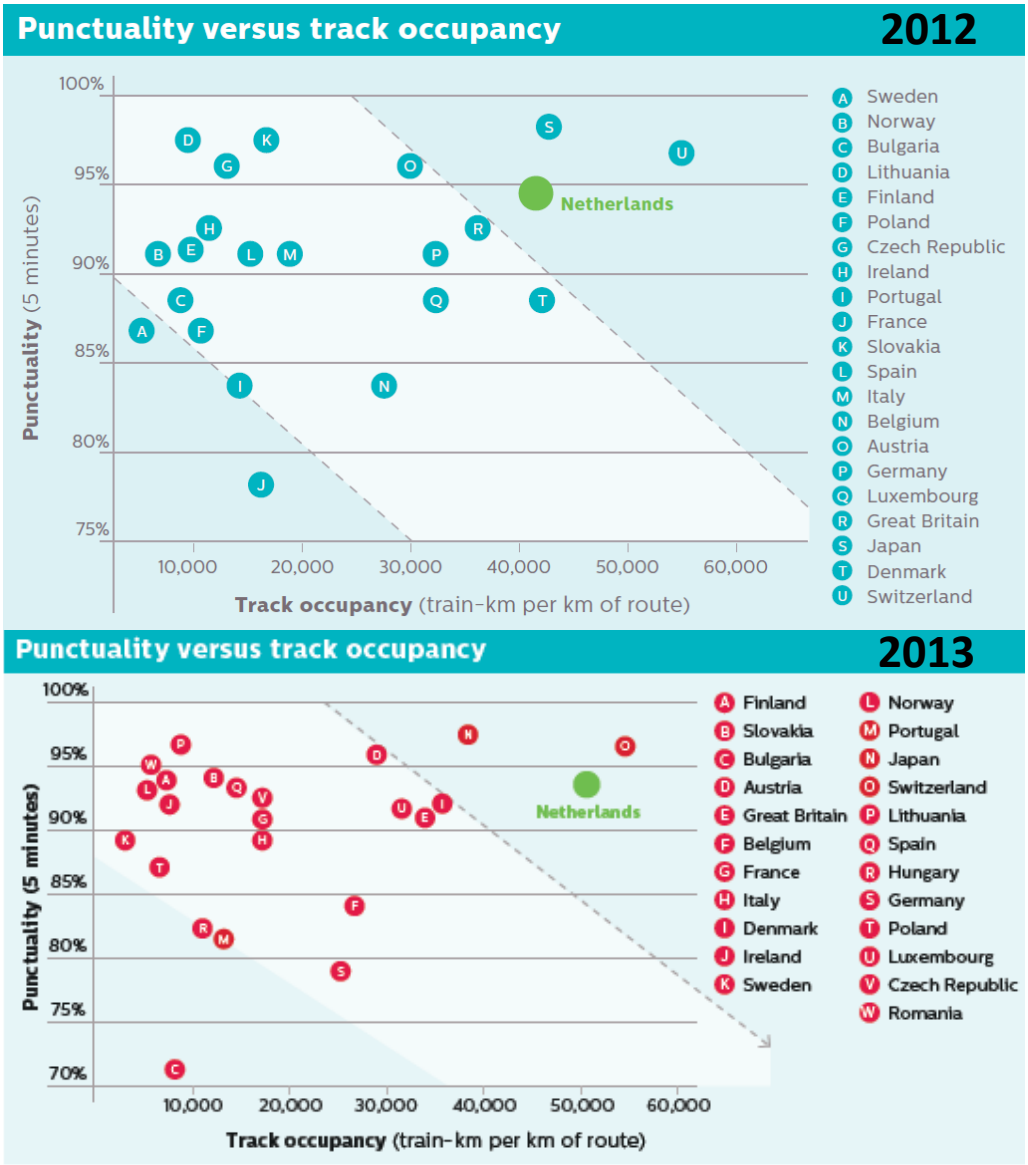
In addition, the decrease in flexibility has grown over the years, as the railway operators have created a fixed framework for orders or bookings, in an attempt to increase the profitability of their operations. As a result, they increased planning of passenger and rail transport operations, fixing rail paths almost 18 months to one year in advance (fixed rail path catalogue) and expecting a final confirmation of the customer a few weeks before execution. Otherwise organization of the rail path cannot be guaranteed or penalties will be applied. The use of ad-hoc trains, outside of this system, is difficult and time-consuming to be organized. From a business perspective, this lack of flexibility is one of the biggest weaknesses of rail transportation (Cuypers, 2014; De Rocker, 2014).

Linked to this weakness, it is important to mention that intermodal rail transport is only possible when a flow on both directions can be set-up. It is inefficient, especially for rail transport within intermodal transport, to have a full train running towards a certain hub or destination, but returning empty to its origin. In this respect, it is often difficult to set-up intermodal transport with rail transport as a part of the chain. As an example, the region around Paris could be taken, which is mainly a consumption area, resulting in the need for a lot of transportation towards the region, but lacking opportunities to return the vehicles with a full load (Cuypers, 2014).

In conclusion, Figure 15 shows a comparison of the EU-15 in terms of punctuality and track occupancy in the period 2011-2013. In terms of punctuality, Belgium scores a stable but weak position of around 85%. In 2011, only Denmark and Portugal performed at a lower punctuality. In 2012, France had a bad performance and in 2013, Bulgaria, Hungary, Portugal and Germany performed less than the Belgian railways. It can be noticed that many countries have a fluctuating performance in terms of punctuality. The Netherlands and Switzerland are continuously performing well. It is clear from the figure that an increase in traffic might negatively impact the punctuality and performance of rail transport, making it vulnerable to market share loss.

FIGURE 15: PUNCTUALITY VERSUS TRACK OCCUPANCY IN THE PERIOD 2011-2013





SOURCE: NS, 2011; NS, 2012; NS, 2013

3. OPPORTUNITIES

3.1 Reduced external costs – congestion, emissions and accidents

Table 10 gives an overview of the different possible external costs, as well as a first approach on its possible internalization.

TABLE 10: RELATION BETWEEN MARGINAL AND AVERAGE COSTS, AND LINKS TO INTERNALIZATION

Cost component	Difference between marginal and average costs	Practical implementation and proposed differentiation
Costs of scarce infrastructure	In congested areas, marginal costs are above average costs. The difference is relevant to define external costs.	Estimation of marginal cost based on speed-flow curves for specific traffic clusters (urban-interurban, peak-off-peak). Top-down approaches are not feasible.
Accident costs	Marginal costs differ individually (for non-scheduled traffic). Clustering of infrastructure users according to accident risk is possible (and typically applied by insurance companies). Thus, average and marginal costs can be assumed to be similar in each cluster.	Differentiation (cluster of users) according to schemes applied by insurance companies.
Air pollution costs and human health and building/material damages	Linear dose-response function: Marginal costs similar to average costs.	Marginal (averaged) costs per type of vehicle (EURO-class) and traffic and population clusters (urban, interurban).
Air pollution and nature	Linear dose response function: Marginal costs similar to average costs.	Marginal (averaged) costs per type of vehicle (EURO-class) and traffic clusters (urban, interurban).
Noise	Decreasing impact of an additional vehicle with increasing background noise due to logarithmic scale. Marginal costs below average costs.	Marginal (averaged) costs per traffic and population clusters (urban, interurban).
Climate change	Complex cost function. As a simplification: marginal damage costs similar to average costs (if no major risks included). For avoidance costs, marginal costs are higher than average costs.	Marginal (averaged) costs per type of vehicle and/or fuel.
Nature and landscape	Marginal costs are significantly lower than average costs.	Averaged (or marginal) variable costs per type of Infrastructure.

SOURCE: EUROPEAN COMMISSION, 2014C

If these cost components are split over the different modes of transport, a number of differences can be observed as shown in table 11. Studies in the past have shown that road transport has the biggest share in the total external costs of transport. Nevertheless, some important factors can be considered as well for rail, air and water (European Commission, 2014c).

TABLE 11: DIFFERENCES IN EXTERNALITIES OVER THE DIFFERENT MODES OF TRANSPORT

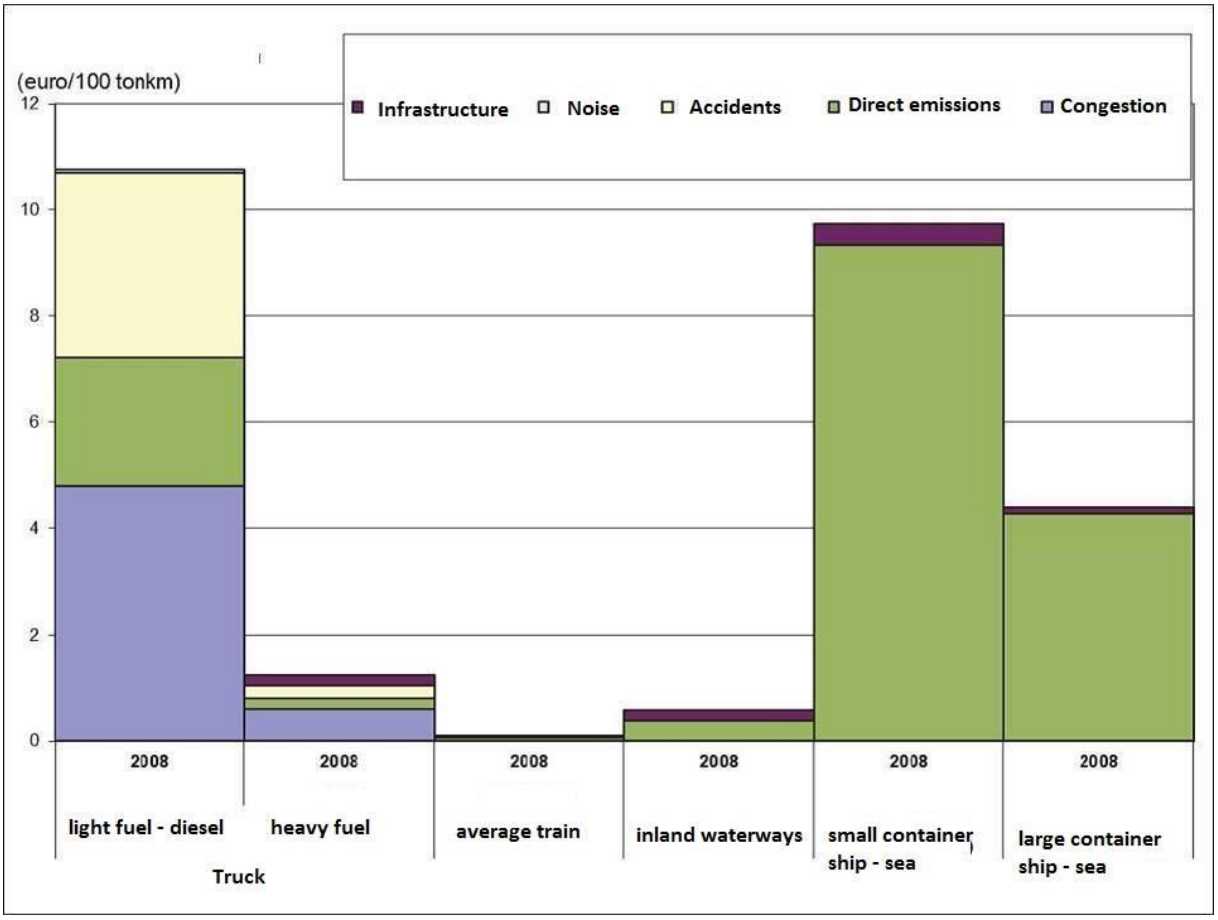
Cost component	Road	Rail	Air	Water
Costs of scarce infrastructure	Individual transport is causing collective congestion, concentrated on bottlenecks and peak times.	Scheduled transport is causing scarcities (slot allocation) and delays (operative deficits).	See rail.	If there is no slot allocation in ports/channels, congestion is individual.
Accident costs	Level of externality depends on the treatment of individual self - induced accidents (individual or collective risk) insurance covers compensation of victims (excluding value of life).	Difference between driver (operator) and victims. Insurance is covering parts of compensation of victims (excluding value of life).	See rail.	See rail.
Air pollution costs and human health and building/material damages	Close link between population density and damage costs.	The use of diesel and electricity should be distinguished.	Air pollution impacts in high altitude have to be considered.	Air pollutants in harbour areas are complicated to allocate.
Air pollution and nature	Close link between population density and damage costs.	The use of diesel and electricity should be distinguished.	Air pollution impacts in high altitude have to be considered.	Air pollutants in harbour areas are complicated to allocate.
Noise	Close link between population density and damage costs	Rail noise is usually considered as less annoying than other modes (rail bonus). But this depends on the time of day and the frequency of trains.	Airport noise is more complex than other modes (depending on movements and noise max. level and time of day).	No major issue.
Climate change	All GHGs relevant.	All GHGs relevant, considering use of diesel and electricity pollution.	All GHGs relevant (Air pollution impacts in high altitude to be considered).	All GHGs relevant.
Nature and landscape	Differentiation between historic network and motorways extension.	Differentiation between historic network and extension of high speed network.	No major issues.	Relevant for new inland waterways (channels). External costs of single accidents may be extremely high (e.g. oil spills).

SOURCE: EUROPEAN COMMISSION, 2014C

Internalizing the external costs is an important step to reach a more sustainable mobility. The studies by Grosso (2011) and Delhaye et al. (2010) were conducted to determine which transport mode has the greatest influence on the externalities per 100 tkm. Both studies conclude that the major factor in the externalities is the cost concerning congestion of roads by road transport. The other external influences concern an impact on the environment, mainly due to emissions of air pollutants, noise and safety, as well as the impact of infrastructure.

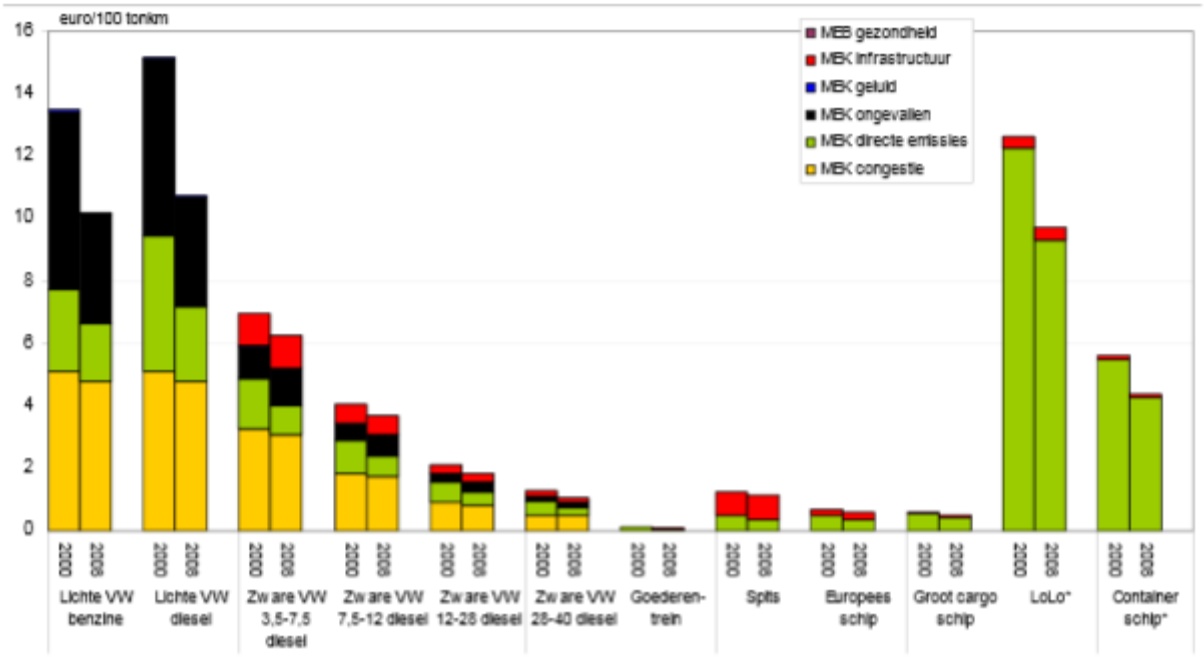
Figures 16 to 19 below show the comparison between the external costs of the different modes in general and for some specific routes. It can be concluded that road has the greatest external costs in comparison with other modes, and as a consequence rail and IWW have the lowest external costs. Due to increased regulation on emissions, the external costs for almost each transport mode has decreased over the period 2000 to 2008.

FIGURE 16: MARGINAL EXTERNAL COSTS OF FREIGHT TRANSPORT



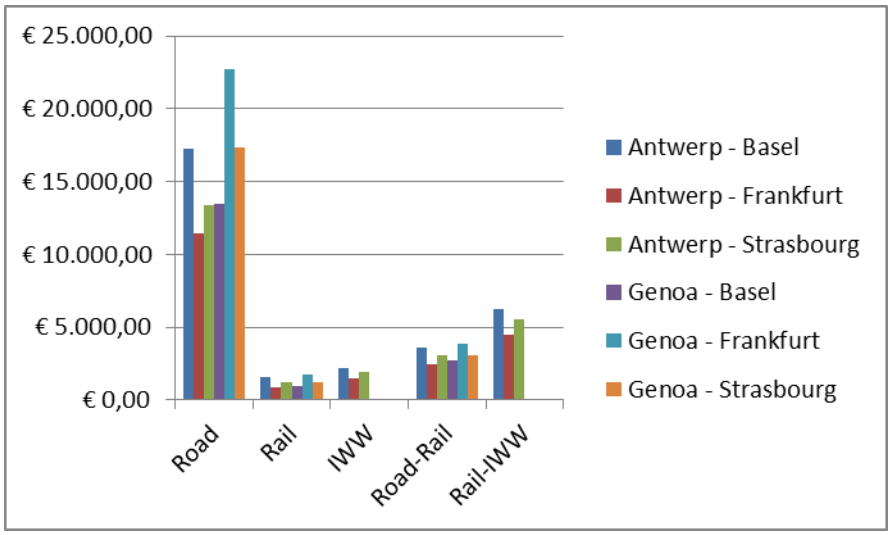
SOURCE: DELHAYE ET AL., 2010

FIGURE 17: MARGINAL EXTERNAL COSTS OF FREIGHT TRANSPORT, 2000-2008 COMPARISON



SOURCE: VLAANDEREN, DEPARTEMENT MOBILITEIT EN OPENBARE WERKEN, 2010

FIGURE 18: TOTAL EXTERNAL COSTS OF FREIGHT TRANSPORT AMONGST SEVERAL BELGIAN RAIL ROUTES



SOURCE: GROSSO, 2011

FIGURE 19: GHG EMISSION FROM TRANSPORT BY MODE

GHG Emissions from Transport – 2012
BY MODE (MILLION TONNES CO_2 EQUIVALENT)

INCLUDING INTERNATIONAL BUNKERS

	TOTAL CIVIL AVIATION	Civil Aviation (domestic) (*)	International Bunkers – Aviation	ROAD TRANSPORTATION	RAILWAYS	TOTAL NAVIGATION	Navigation (domestic) (*)	International Bunkers – Maritime Transport	OTHER TRANSPORTATION	TOTAL TRANSPORT	TOTAL EMISSIONS (*)
EU-28	150.7	16.1	134.6	843.2	7.1	162.8	17.2	145.6	9.4	1173.3	4824.4
BE	4.1	0.0	4.1	24.2	0.1	20.1	0.5	19.6	0.2	48.6	140.2
BG	0.5	0.0	0.5	7.8	0.1	0.2	0.0	0.2	0.5	9.1	61.8
CZ	1.0	0.0	1.0	16.5	0.3	0.0	0.0		0.1	17.9	132.4
DK	2.7	0.1	2.5	11.4	0.3	2.1	0.5	1.5		16.3	55.7
DE	27.5	1.9	25.6	147.4	1.1	9.2	1.0	8.2	4.2	189.3	972.9
EE	0.1	0.0	0.1	2.2	0.1	0.6	0.0	0.5		2.9	19.8
IE	1.8	0.0	1.8	10.4	0.1	0.6	0.2	0.4	0.1	13.1	60.7
EL	3.0	0.5	2.5	13.8	0.1	9.2	1.7	7.4	0.0	26.1	121.0
ES	16.8	3.2	13.6	74.3	0.3	29.6	2.7	26.9	0.3	121.2	381.3
FR	21.4	5.1	16.3	125.1	0.5	9.3	1.3	8.0	0.5	156.9	514.5
HR	0.4	0.1	0.3	5.4	0.1	0.1	0.1			6.0	26.7
IT	11.6	2.2	9.4	98.2	0.0	10.6	4.9	5.7	0.7	121.1	475.2
CY	0.8	0.0	0.8	2.0		0.6		0.6		3.5	10.7
LV	0.4	0.0	0.4	2.5	0.3	0.8	0.0	0.8	0.0	4.0	12.1
LT	0.2	0.0	0.2	4.1	0.2	0.4	0.0	0.4	0.2	5.1	22.2
LU	1.1	0.0	1.1	6.5	0.0	0.0	0.0	0.0		7.6	13.0
HU	0.5	0.0	0.5	10.7	0.1	0.0	0.0			11.3	62.5
MT	0.3	0.0	0.3	0.5		3.8	0.0	3.7	0.0	4.6	7.2
NL	10.2	0.0	10.2	33.2	0.1	44.3	0.7	43.6		87.7	245.4
AT	2.2	0.1	2.1	21.0	0.1	0.1	0.0	0.1	0.4	23.8	82.2
PL	1.7	0.1	1.7	45.8	0.4	0.5	0.0	0.5	0.6	49.0	401.4
PT	3.1	0.4	2.7	16.4	0.0	2.3	0.2	2.1		21.9	73.6
RO	0.5	0.1	0.4	14.2	0.6	0.2	0.1	0.0	0.0	15.5	119.2
SI	0.1	0.0	0.1	5.7	0.0	0.2		0.2	0.0	6.0	19.2
SK	0.1	0.0	0.1	6.5	0.1	0.0	0.0	0.0	0.0	6.7	42.8
FI	2.1	0.2	1.9	11.2	0.1	0.9	0.5	0.4	0.6	15.0	63.2
SE	2.7	0.5	2.2	17.9	0.1	6.2	0.3	5.9	0.3	27.2	65.7
UK	33.9	1.5	32.3	108.4	2.1	11.2	2.3	8.8	0.5	156.0	622.0
MK											
TR	11.6	3.8	7.8	55.7	0.4	4.2	1.6	2.6		72.0	450.3
IS	0.5	0.0	0.4	0.8		0.2	0.0	0.2		1.5	5.1
NO	2.5	1.2	1.2	10.1	0.0	3.6	2.0	1.6	1.8	18.0	55.5
CH	4.8	0.1	4.7	16.0	0.0	0.2	0.1	0.0	0.0	21.1	56.2

SOURCE: EUROPEAN COMMISSION, 2014D

According to the European Commission (2011a), it is necessary to create a level playing field between the different modes of transport which are in competition with each other. Therefore the internalisation of externalities, the elimination of tax distortions and unjustified subsidies and free and undistorted competition are mentioned in the White Paper. It is the goal of the European Commission to conduct a policy aligning the market choices with the sustainability needs and to capture the effects and economic costs of non-sustainability.

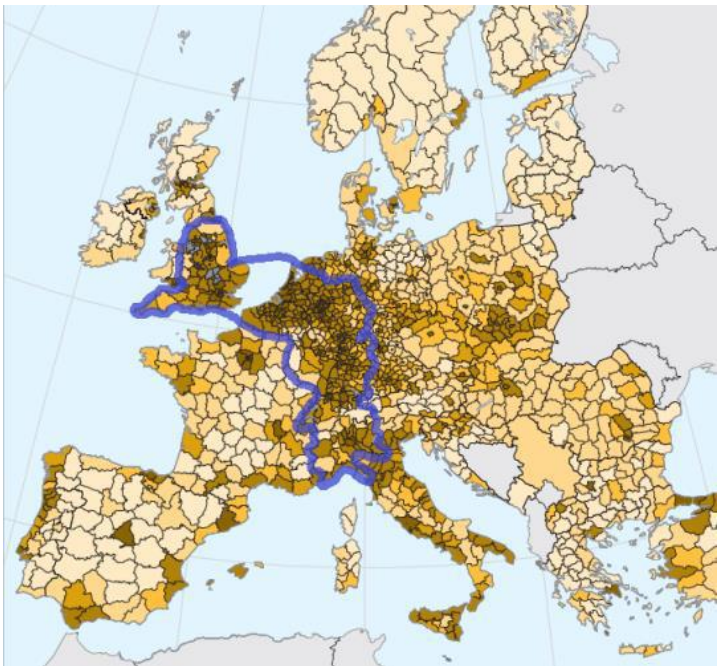
In conclusion, Finger (2014) points out that this is a realistic opportunity, as the government will need to respond to the social pressure and will have no choice but to implement more regulation in order to internalize the external costs, mainly in road transport. In this way, intermodal rail freight might become a more attractive option. Nevertheless, Buyse (2014) indicates that it might be a tough choice for governments to take these measures, as it would penalize the economy. Therefore the goal should be to show that intermodal rail transport can be a profitable and cheaper alternative by itself, rather than waiting for truck transport to become the lesser attractive option due to the forced price increase.

As mentioned already in the chapter on transportation mode competitiveness (1.2 B), the length of the pre- and post-haulage operations are of great importance when the effects of internalization of external costs on intermodal transport is studied.

3.2 The percentage of the European GDP in the area surrounding Belgium. Most traffic now and in the future will be in the area of Belgium towards Germany/Poland and Switzerland/Italy.

The Blue Banana is the central region indicated by a blue contour on the figure 20. It has its origin in central England and includes the areas around London, then crosses the Channel, contains the major regions of The Netherlands, Belgium, the northern regions in France, Western and Southern Germany, Switzerland and Northern Italy. In Germany, it contains the following regions of great importance: Rhine-Ruhr, Rhine-Main, Rhine-Neckar and Stuttgart. In France, it contains the regions Alsace and Lorraine. In total 148 Million people live in the Blue Banana, which is 28% of the total European population, a considerable part of the consumption market (Mitusch et al., 2014).

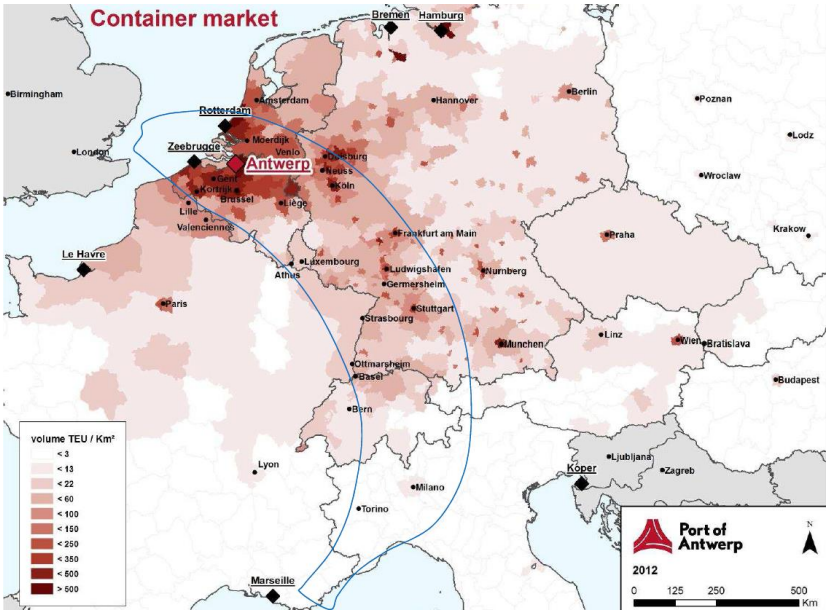
FIGURE 20: DENSITY OF THE POPULATION IN THE EU



SOURCE: MITUSCH ET AL., 2014

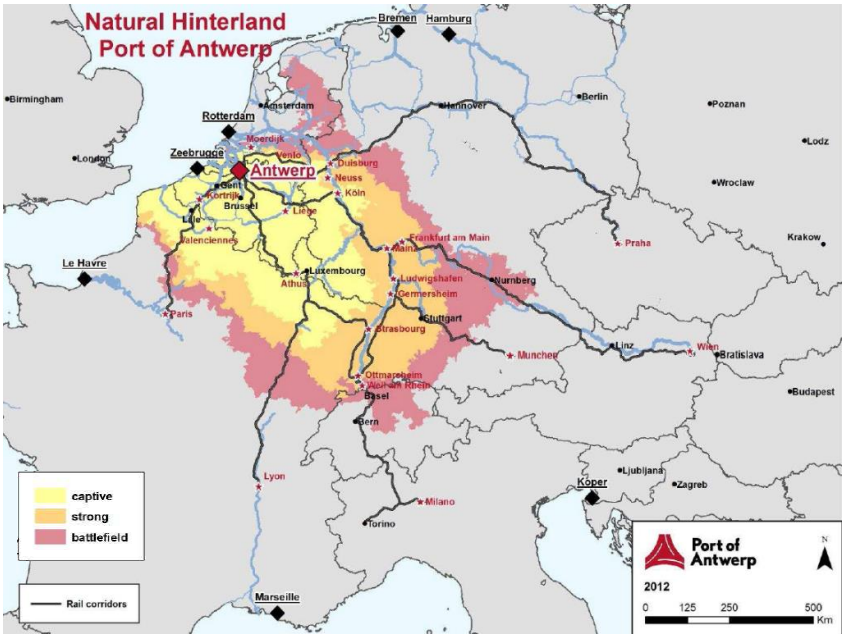
If the container market is visualized in terms of volume (TEU) per km², as done in figure 21, a similar blue outline can be drawn capturing the biggest part of this market. It can be seen from the figure that Belgium has an excellent geographical position within this area, creating a lot of opportunities. This can also be seen from figure 22, where the natural hinterland of the Port of Antwerp is shown, linked to the different rail corridors within the area. In this respect, it can be mentioned that the container market in Flanders, measured in origin and destination locations, is bigger than the entire container market in France. An explanation can be found in the use of conventional road transport from inland French origins towards the port of Antwerp or a hinterland hub, where goods are consolidated into a container (Cuypers, 2014; Port of Antwerp, 2013b).

FIGURE 21: CONTAINER MARKET AND THE BLUE BANANA



SOURCE: PORT OF ANTWERP, 2013B

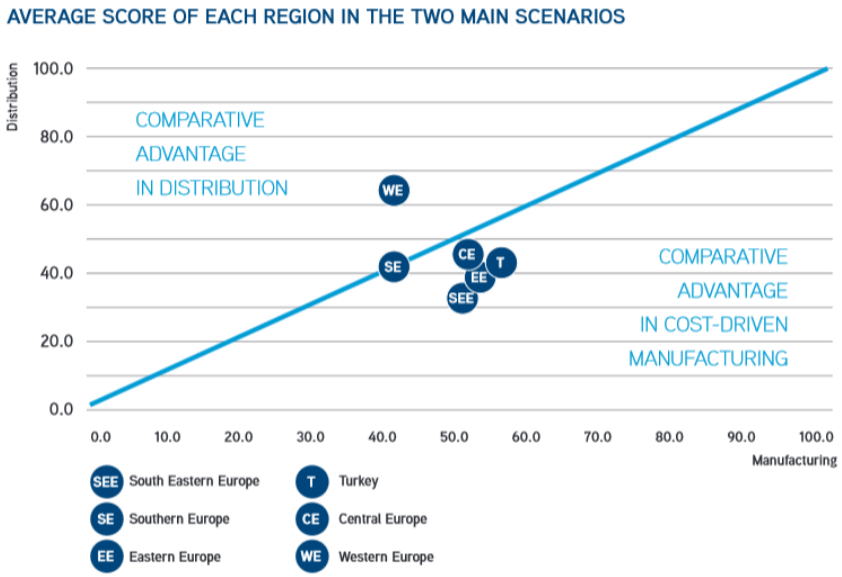
FIGURE 22: NATURAL HINTERLAND OF THE PORT OF ANTWERP



SOURCE: PORT OF ANTWERP, 2013B

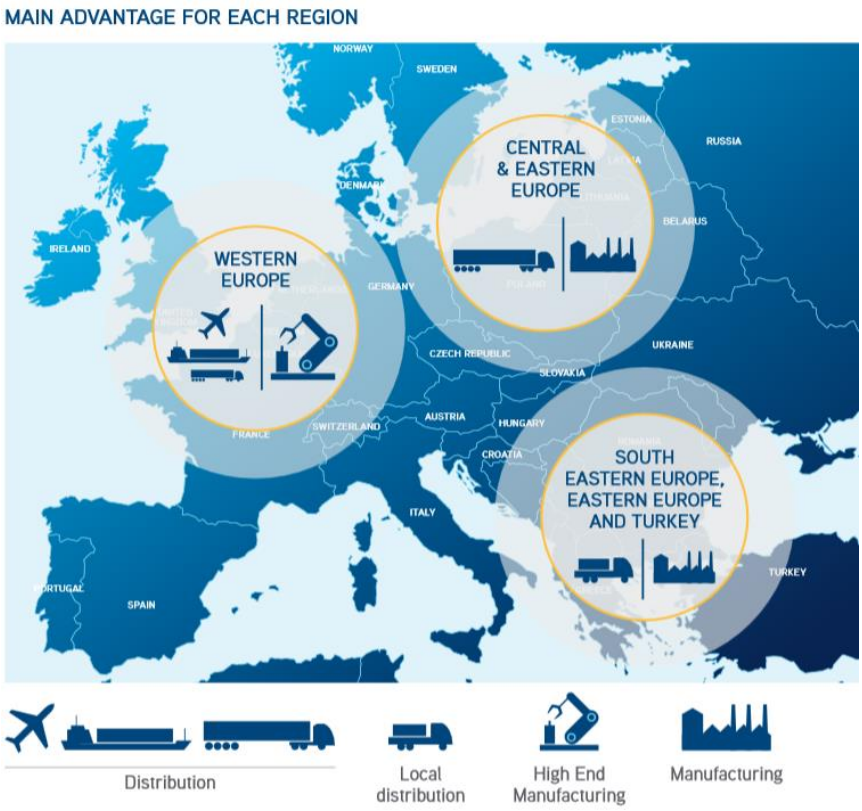
Antwerp, Rotterdam and Düsseldorf are the best logistical hubs in Europe, but are facing a growing challenge from emerging hubs in the east of the continent, having a major manufacturing advantage over Western Europe. These three cities form part of the described Blue Banana, which remains the ideal platform for pan-European distribution activities for the majority of the European consumer market. Figures 23 and 24 capture these main advantages for each region, indicating that the future for Western Europe will be in distribution and high-end manufacturing, whilst Central and Eastern Europe will perform well on complementary distribution and manufacturing. This can also be seen from the shift of the automobile sector towards the East (Colliers International, 2013; De Rocker, 2014).

FIGURE 23: AVERAGE SCORE OF EACH REGION IN THE TWO MAIN SCENARIOS



SOURCE: COLLIERS INTERNATIONAL, 2013

FIGURE 24: MAIN ADVANTAGE FOR EACH EUROPEAN REGION

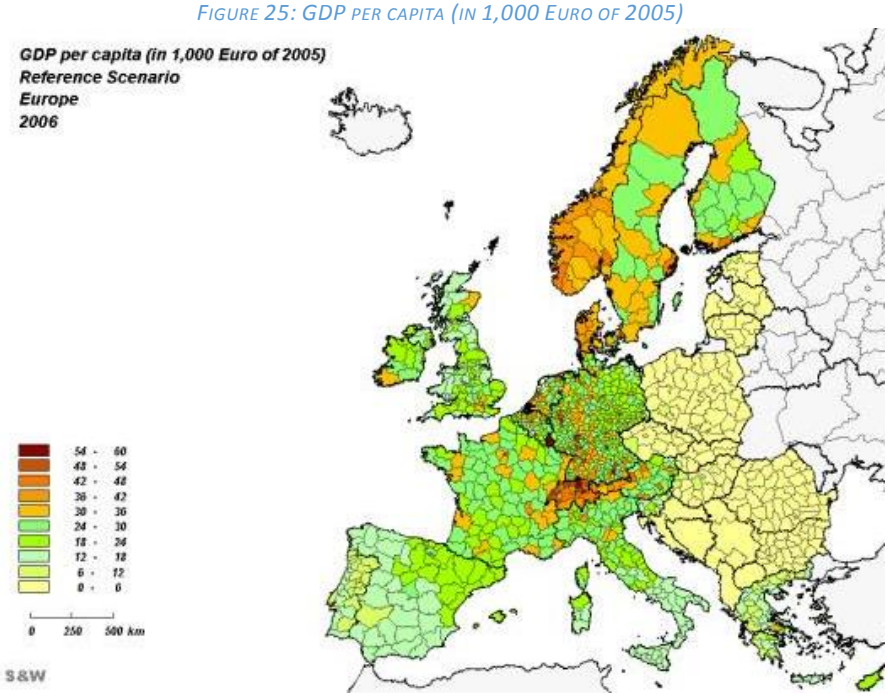


SOURCE: COLLIERS INTERNATIONAL, 2013

Also according to Mitusch (2014), Eastern Europe is the best location for low-cost distribution, with Kiev, Istanbul and Bratislava as a top three. Nevertheless, its distribution benefits remain of a local or sub-regional nature. Nevertheless, Western Europe's dominance will be increasingly challenged by some CEE hubs, such as Prague or Bratislava, as the centre of Europe gradually shifts to the east.

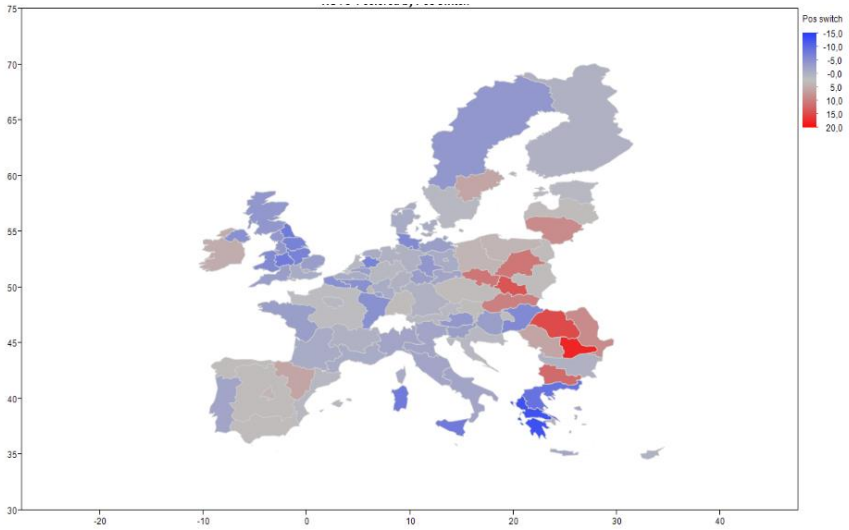
As it will be analysed in the next section, there are many recommendations to build production and warehouse facilities in Eastern and Southern Europe. Therefore, demand for railway transportation would also need to follow that trend in order to be able to capture this rising market. There might be a need to invest in the construction of specific European railway corridors in this direction, in order to be able to serve the rapidly rising demand. Figure 25 shows the intensity of GDP per capita in Europe. It indicates that the regions in the blue banana have a great GDP intensity per capita. Nevertheless, figure 26 shows an analysis of the evolution of the purchasing power per person over the last 10 years. It indicates that in East-European countries, the Purchasing-Power Parity (PPP) has risen significantly, whereas it has stabilized or declined in Western Europe.

FIGURE 25: GDP PER CAPITA (IN 1,000 EURO OF 2005)



SOURCE: MITUSCH ET AL., 2014

FIGURE 26: INCREASE IN PURCHASING POWER STANDARD PER INHABITANT FOR THE LAST 10 YEARS



SOURCE: HINTJENS ET AL., 2014

Nevertheless, shifting to the east wouldn't be rapid, even in the future, due to the non-existence of large first-call ports as there are in the west, such as Antwerp, Rotterdam and Hamburg. They account for the largest European shipment flows and most of the companies would use them as main hubs. Therefore, it will be a complicated decision making process for executives to decide whether they want to follow cheap labour and to ship raw materials from Belgian or Dutch ports to the East or to stay relatively close to the ports and save costs and a lead-time (Mitusch, 2014; Colliers International, 2013).

In conclusion, Eastern Europe is the best location for low-cost manufacturing, but its distribution benefits remain of a local or sub-regional nature. Reports show that a further shift eastwards entails a further reduction in total costs, but equally comes with reduced market access, which is assumed a crucial dimension under this scenario. As Central and Eastern European's (CEE) economies grow further, increasing GDP/capita rates in CEE, the rationale for having more than one pan-European centre –both inside and outside the Blue Banana will gain more credence. There is already a need for certain goods to be distributed to the markets of CEE, and for manufactured product to be distributed back into the production lines of Western European companies. However, infrastructure and market access issues remain a constraint limiting the genuine capacity for CEE hubs to act as a competitor to more established Western European hubs within the blue banana. These locations complement each other, particularly for operators looking to a supply-chain platform with which to cover pan-European markets (Colliers International, 2013).

If the opportunity of the growing market in Eastern Europe is to be captured, more effort will have to be taken in the field of connecting the European corridors between the corners of Europe.

3.3 Connecting the European corridors and creating a high speed Trans-European East-West transport network. Doing this allows to connect to the Eurasian landbridge, creating more demand and more output for the rail freight transportation sector

The development of the European corridors described above will contain a lot of new opportunities for rail freight transport and its position within intermodal transport, such as increased bundling due to an increased attractiveness of new or existing flows, once the delivery points become connected to the rail network. When modal split shares in the European Union were discussed earlier, all shipments made within the EU for all distances were taken into account. However, some very interesting facts are being hidden behind these numbers. For example, in France, the average distance of the transported goods is less than 100 km with an average of 90 km for road freight and 350 km for rail freight. All road shipments represent about 70% of the whole amount of freight transported, while looking at the distances of more than 150 km, this share decreases to only 20%. Thus we can make the conclusion that, in the case of France, the market is overloaded by short-distance shipments which are mainly executed by road transport, while railways shipments are accounted for the major long-distance shipments of more than 150 km. In a more general way, it could be stated that container transports of less than 200 km are almost of no importance for railways, whereas this mode of transport could become the modal split leader for distances above 400 km. In this sense, the Eastern market is to be considered an opportunity for rail transportation from Western European countries (Crozet et al., 2014; De Rocker, 2014; Mitusch et al., 2014).

The data of the example above could easily be explained by the fact that railways are not such a self-sustaining transportation mode as is the case with road transportation. In a majority of the circumstances it requires additional handling activities and road transport is often still required for door-to-door deliveries. Looking at the supply chain network structure, we can see that remodelling the usual distribution network would imply

creating an extra space for the short-distance freight transportation. For example, this involves creating the distribution centres around the cities, shipping to them and then perform the lean deliveries for the whole region. There might be some other examples of city distribution, using the railway network, new types of storage of containers, etc. For many current large cities it would not be easy to implement these, though for engineering the new cities or districts such studies should be taken into account (United Nations Economics Commission for Europe, 2013).

Important parts of the main transport infrastructure (roads, waterways and railways) in Belgium belong to the TEN-T network. The guidelines for TEN-T networks are of great importance to meet the European standards. By 2030, all infrastructures that are part of the core network in accordance with the criteria should have been rebuilt. The comprehensive network should be designed in 2050. Establishing the TEN-T guidelines and the CEF (Connecting Europe Facility) have been completed. For the materialization of better European transport, energy and digital networks, the European Commission foresees a budget of 50 billion EUR which contributes to closing the missing links in the backbones of the European energy, transport and digital networks. In addition, Europe is also trying to engage heavily in the context of the TEN-T networks and the ITS Action Plan in the development of intelligent transport systems. With the ITS Directive and the associated ITS plans, the European Commission wants to give a new boost to the deployment and use of ITS systems in road traffic. (European Commission, 2011b; Vlaanderen Departement Mobiliteit en Openbare Werken, 2010).

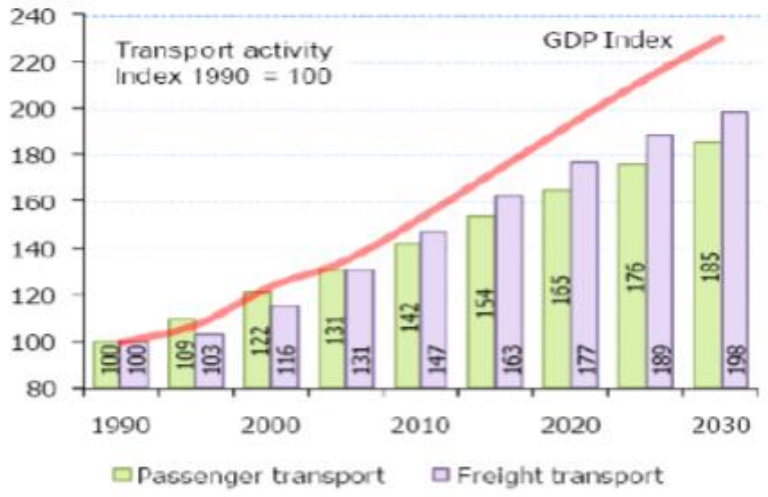
Trans-Siberian connections also became cheaper due to a greater usage. This can be observed from the statistics in the period 2012-2014. According to Trans-Siberian CCTT, in the period January till September 2013 international traffic of high capacity containers via the Trans-Siberian mainline totalled 525,552 TEU, equalling a growth of +11.6%. This includes 240,027 TEU of imports, a growth of +18.1%, and 198,651 TEU of exports, a growth of +4.46%, and 86,874 TEU of transit traffic, a growth of +11.9%. As from 1 May 2012, rail rates were reduced by 33% for transit container transportation from the European Union towards China via Brest and Zabaykalsk, the Ukrainian border crossing points. In addition to this, Trans-Siberian trains are becoming much faster. With the arrival of a train in the Northern-German city of Hamburg which started its journey in the Chinese city of Zhengzhou, a new cargo train route has opened up. This train, carrying 51 containers, completed the 10,214 Kilometre (6,344 miles) trip in only 15 days, which is about half the time it would have taken to ship the same goods overseas. We can estimate that this data will push the popularity of transcontinental trains in the nearest future and bring more innovations to improve the existing but currently still underdeveloped link between West and East. (EIA Annual Report 2013 / Trendwatch 2030).

Nevertheless, Cuypers (2014) warns against overly enthusiastic conclusions as all current actions on rail transport towards China are still under test phase. There are still a number of challenges that need to be addressed, such as the possibilities to obtain full trains and containers in both directions, with goods that can be charged in the same units without the need for cleaning, as this would mean additional handlings and as such an increased cost. In addition, climate factors and safety issues in some areas are increasing the difficulties to run a stable and efficient fixed rail path throughout the year. Due to these reasons, it is to be expected that it will take another 10 to 20 years before rail traffic towards China will become mature enough to count.

3.4 Increase in GDP has a positive influence on the demand of mobility

The influence of increased mobility infrastructure on the GDP has already been described as a strength above. As it was mentioned, the increased GDP influences in its turn the demand for mobility, holding opportunities for intermodal rail freight to develop. In recent years, a strong increase of trade flows has been observed at global level. The TRANSvisions study of the European Commission has estimated the trend of trade flows up till 2030 as shown in figure 27. The study has been based on a continuation of the trend to globalization and further growth of international flows of goods to and from the European Union. This is particularly enhanced by higher direct investment of European countries in non-European countries and a shift of manufacturing to countries with a better relationship between productivity and labour costs, as stated in the previous opportunities. A possible increase in transportation cost will not reverse this trend, but can only adjust the nature of globalization to become more regionalized. An average yearly growth of 1.7% is expected for freight transport (European Commission, 2009a).

FIGURE 27: TRANSPORT ACTIVITY GROWTH 1990-2030

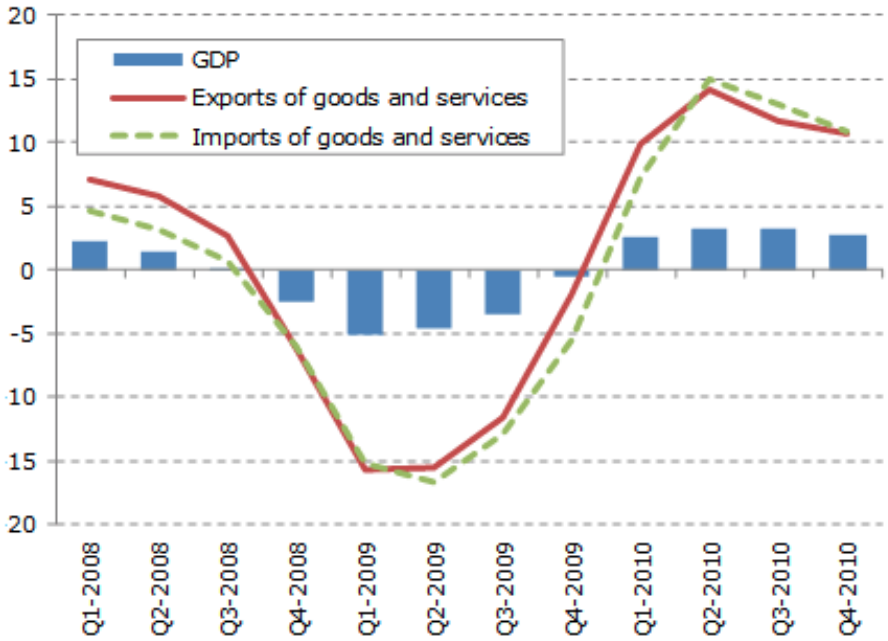


SOURCE: EUROPEAN COMMISSION, 2009A

Economic growth and the future trade flows will determine mobility development (Figure 28 and 29). Especially developments of multimodal hubs in seaports and airports play an important role in the facilitation of these flows. Throughout the years, a close correlation has been observed between the development of the maritime traffic, the GDP growth and the development of foreign trade (Rashed, 2014).

There are a lot of opportunities for the freight transportation industry connected with a development of the emerging markets. As they are growing, their purchasing power is increasing, their market becomes more competitive, they are attracting more foreign direct investment and increasing export/import opportunities for domestic and/or foreign companies arise. As we can see from the graphs presented below in figure 28 and 29, there is a strong correlation between world merchandise trade and the change of the real GDP. This trend became even more obvious during the crisis in 2008-2009, when a decrease of the world GDP by 3 to 5% was followed by a decrease in the world trade of about 12 to 15%.

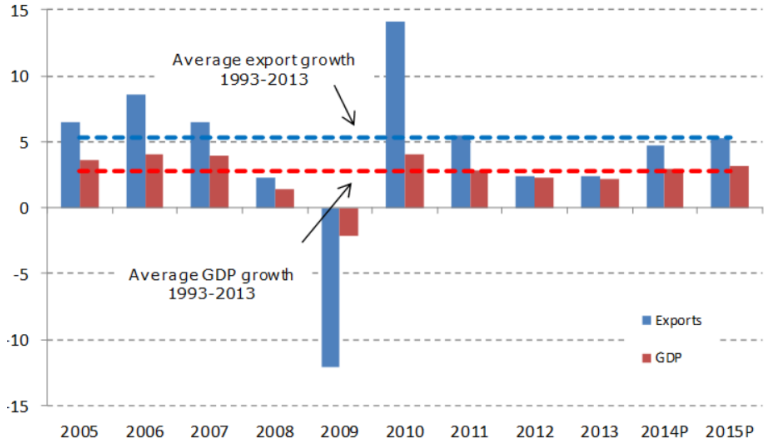
FIGURE 28: REAL GDP AND TRADE GROWTH OF OECD COUNTRIES, 2008-2010



Note: Q4-2010 exports and imports estimated based on available data.

SOURCE: WTO, 2011

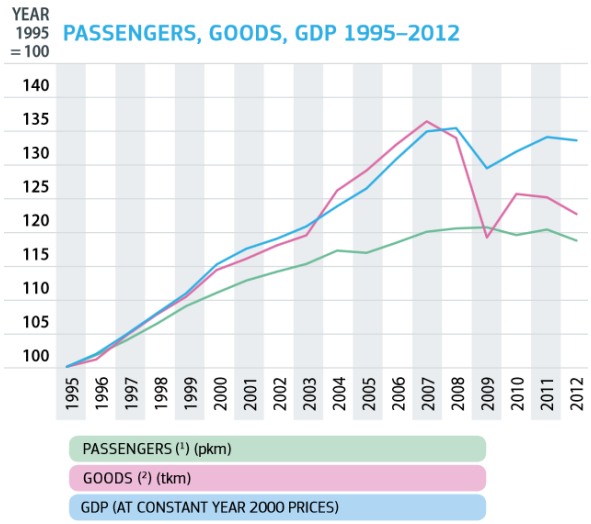
FIGURE 29: GROWTH IN VOLUME OF WORLD MERCHANDISE TRADE AND GDP, 2005-2015



SOURCE: WTO, 2014

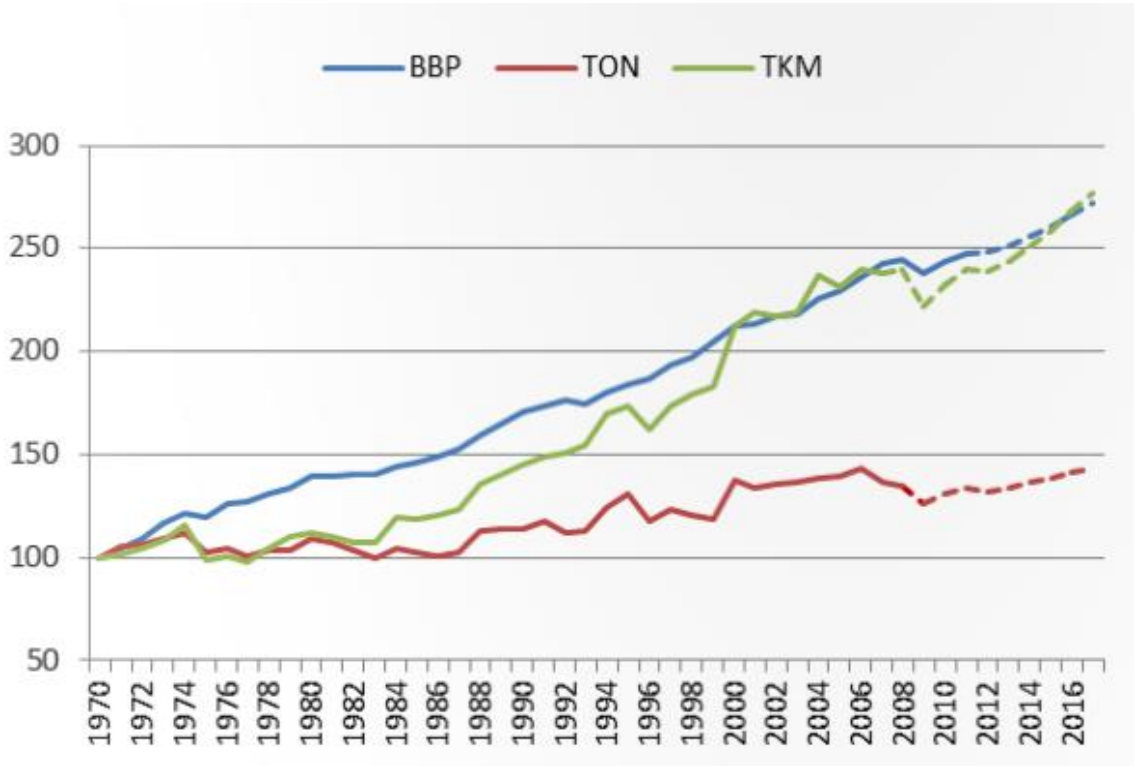
The same strong correlation is found between the change of the global GDP and the change in the freight transportation industry (Figure 30). However, as it can be seen from this graph, a slight increase/decrease of the world GDP correlates with the rapid growth/decline of the transported volume of goods in tkm. For Belgium, the same relation can be identified in figure 31. Looking at the European Union statistics, we can see that the main increase affected road and sea transportation, while the number of railway tonne-kilometres remained stable over the years (Figure 32 and 33). However, as it has been mentioned in previous chapters, a lot of projects are organized to promote sustainability and greener transportation within the union, with the aim of increasing the share of railway usage and as such an increased number of tkm.

FIGURE 30: TRANSPORT GROWTH EU-28



SOURCE: EUROPEAN COMMISSION, 2014D

FIGURE 31: EVOLUTION OF THE GDP, TON AND TKM IN BELGIUM



SOURCE: MEERSMAN ET AL., 2013

FIGURE 32: EU-28 PERFORMANCE ON FREIGHT TRANSPORT BY MODE

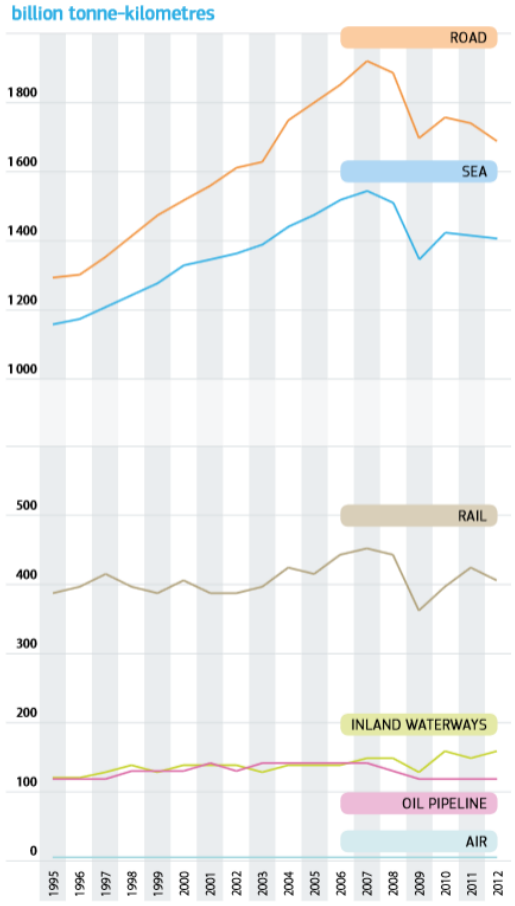
FREIGHT TRANSPORT

billion tonne-kilometres

	ROAD	RAIL	INLAND WATER-WAYS	PIPE-LINES	SEA	AIR	TOTAL
1995	1289	388	122	115	1154	2	3069
1998	1414	394	131	126	1240	2	3308
1999	1472	385	129	125	1276	2	3390
2000	1522	405	134	127	1323	2	3513
2001	1563	388	133	134	1343	2	3563
2002	1613	386	133	130	1364	2	3628
2003	1634	394	124	132	1387	2	3673
2004	1751	419	137	133	1437	3	3879
2005	1803	416	139	138	1471	3	3969
2006	1858	438	139	137	1515	3	4089
2007	1925	452	145	132	1542	3	4199
2008	1892	443	146	126	1508	3	4118
2009	1700	364	131	121	1345	2	3662
2010	1764	394	156	122	1424	3	3862
2011	1745	422	142	118	1417	3	3847
2012	1693	407	150	115	1401	3	3768
1995–2012	31.3 %	4.9 %	22.8 %	−0.1 %	21.4 %	25.8 %	22.8 %
per year	1.6 %	0.3 %	1.2 %	−0.0 %	1.1 %	1.4 %	1.2 %
2000–2012	11.2 %	0.4 %	12.0 %	−9.7 %	5.9 %	2.7 %	7.3 %
per year	0.9 %	0.0 %	0.9 %	−0.8 %	0.5 %	0.2 %	0.6 %
2011–2012	−3.0 %	−3.6 %	5.6 %	−3.1 %	−1.1 %	−0.0 %	−2.1 %

SOURCE: EUROPEAN COMMISSION, 2014D

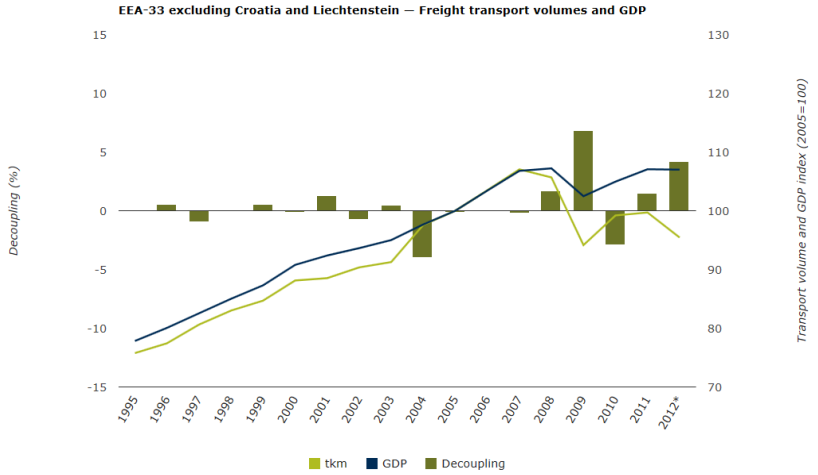
FIGURE 33: EU-28 PERFORMANCE BY MODE FOR FREIGHT TRANSPORT



SOURCE: EUROPEAN COMMISSION, 2014D

As it can be seen on figure 34, from 1999 on the close relationship between GDP and tkm has undergone a decoupling from each other. There is a certain positive influence between the two variables, but the GDP has increased faster throughout the years compared to the rise of tkm of freight transport. This decoupling effect of the economy and transport can be explained through a more efficient usage of transport modes and a better modal split. Also a great effect has been the rise of the service sector and IT industry, which makes a greater share of the contemporary economy (European Environment Agency, 2014).

FIGURE 34: ECONOMIC GROWTH AND FREIGHT TRAFFIC IN EUROPE BEFORE AND AFTER THE 2008 CRISIS



SOURCE: EUROPEAN ENVIRONMENT AGENCY, 2014

Hoornaert (2014) refers to the desire of this decoupling effect for road transportation, and the attempt to avoid this effect for more defensible transportation modes in order to obtain the anticipated sustainable modal split.

The decoupling effect could also be linked to external factors such as EU enlargement. The impact of the EU enlargement was analysed more in detail by McKinnon (2007), who stated that "*the enlargement of the EU in 2004 and eastward migration of industrial capacity to the lower labour cost countries of Central and Eastern Europe is further strengthening this trend*".

Also Hilferink (2003) stated that there are other factors that can influence this relationship, such as:

- The development of technology leading to a rising average value of one ton produced goods.
- The development of international trade as a result of the withdrawing of trade hindrances such as quota and import taxes. In particular the enlargement of the European Union is important.
- The objective of decoupling which has been stated (in European policy papers as well as in national policies) as an instrument to reduce the negative impacts of transport and to meet the Kyoto criteria.
- The correlation between an increase in logistics investments with a growth of the national GDP. Therefore, it can be said that promoting the logistics industry or manufacturing activities that would affect the increase in the trade balance, would also have a positive effect on the national GDP.

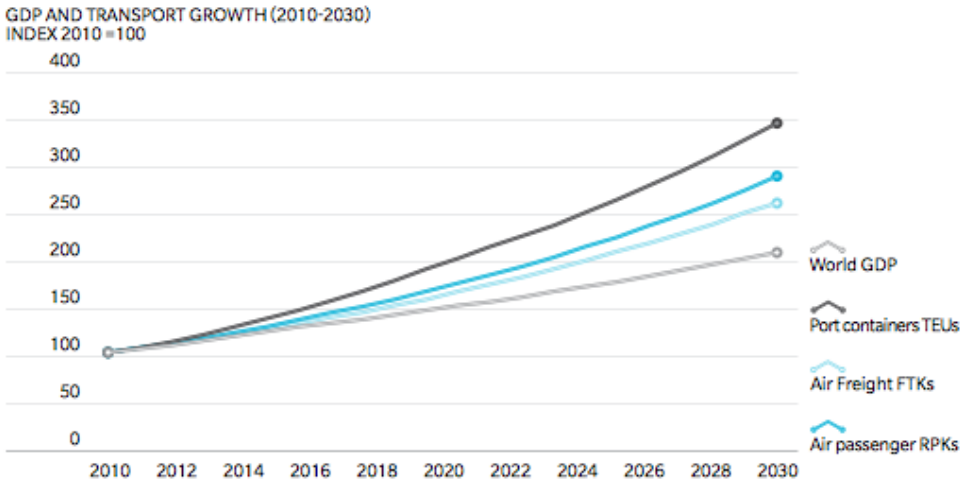
The relationship between freight traffic and economic growth is also known as income elasticity. For goods, the distance/GDP elasticity has been higher than 1 in the last decades. This implies that an increase by 1% of the GDP, results in an increase of above 1% in tkm. This explains why, even though there is little increase in tonnages loaded in Europe, the amount of tkm keeps increasing steadily. Therefore, even though the share of the services industry represents an increasing part of the GDP, the demand for goods transport is still more correlated to an increase of GDP than to that of industrial production (Konings et al., 2008).

This correlation works both upwards and downwards. When there is a fall in GDP and industrial production, as it was the case in 2009, freight traffic drops too as shown in figure 36. It can even be said that it overreacts, since elasticity is variable. As shown in figures 35 and 36, the link between freight traffic and economic growth is not a linear relationship. When the economic growth accelerates, traffic increases more than proportionally, and in an economic slowdown, traffic decreases more than proportionally (Bonnafous, 2005; UNCTAD, 2014).

Indeed, during the economic downturns of 2001 and 2003 there was a decoupling to some extent. Freight traffic grew less rapidly than the GDP. However, in the period 2004–2006, growth accelerated and traffic grew faster than the GDP. The whole issue therefore comes down to whether this phenomenon will reoccur in the context of the ongoing economic recovery in Europe. If the economic recovery continues, overall traffic will continue to grow in Europe, even if decreasing transport elasticity to economic growth can be expected (Crozet et al., 2014).

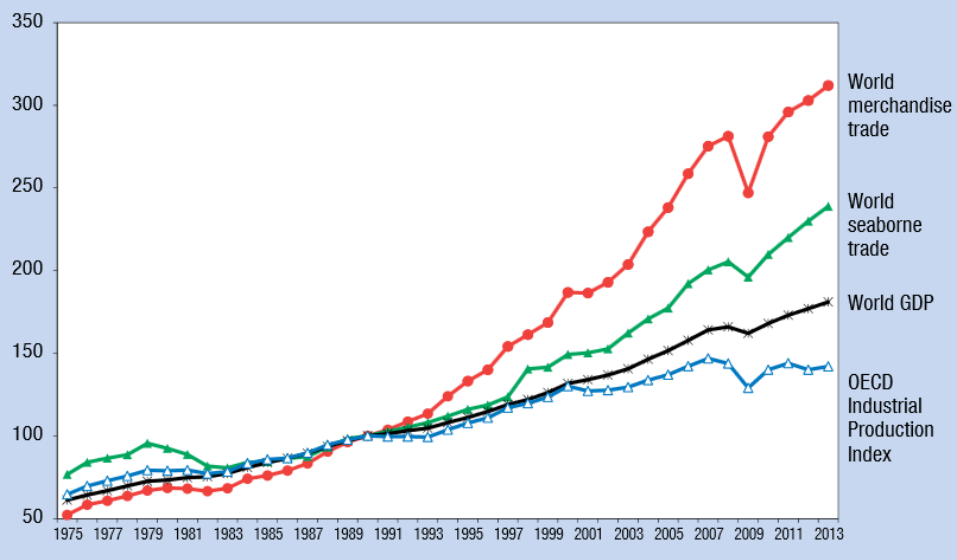
The evolution for increasing international transport demand is widely spread across regions and transport modes. As shown in figures 35 and 36, the global GDP is expected to double by 2030 and airline traffic worldwide could grow by around 4.7% per annum over 2010-30; air freight could increase by around 5.9% per annum over the same period; maritime container traffic could increase by more than 6% per annum; and rail passenger and freight traffic worldwide could increase at around 2-3% per annum on this basis (Airbus, 2009; UNCTAD, 2014).

Figure 35: Global GDP and transport need expected to grow



Source: Airbus, 2009

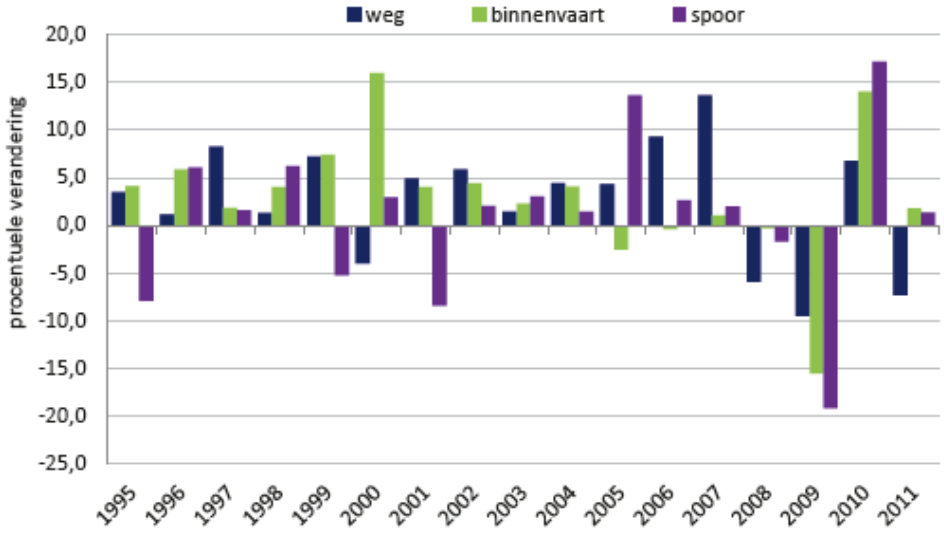
FIGURE 36: THE OECD INDUSTRIAL PRODUCTION INDEX AND INDICES FOR THE WORLD: GROSS DOMESTIC PRODUCT, MERCHANDISE TRADE AND SEABORNE SHIPMENTS, 1975–2013 (1990 = 100)



SOURCE: UNCTAD, 2014

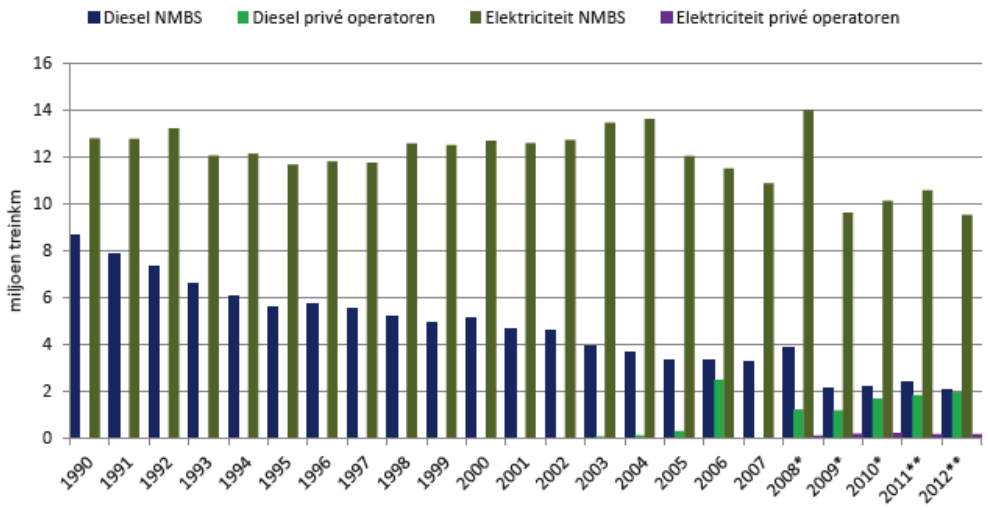
In conclusion, figure 37 below shows the evolution of tkm for road, inland waterways and rail transport in Belgium. The economic crisis has gravely impacted rail transport with a decline of almost 20%. However, during the aftermath of the crisis rail transport quickly recovered with a rise of 15% and 2% in 2010 and 2011 respectively. Figure 38 below gives an overview of the train kilometres performed in Belgium by type of traction. It can be noticed once again that the total number of kilometres has plummeted due to the crisis in 2008-2009. Afterwards a slow increase can be observed, although the results from before the crisis are still far from reached. In addition to the environmental impact mentioned earlier, it can be noted that the national operator is mainly using electricity driven locomotives, where private operators almost exclusively use diesel locomotives (Meersman et al., 2013).

FIGURE 37: EVOLUTION OF TKM IN BELGIUM FOR ROAD, INLAND WATERWAYS AND RAIL (% CHANGE)



SOURCE: MEERSMAN ET AL., 2013

FIGURE 38: EVOLUTION OF TKM IN BELGIUM FOR ROAD, INLAND WATERWAYS AND RAIL (% CHANGE)

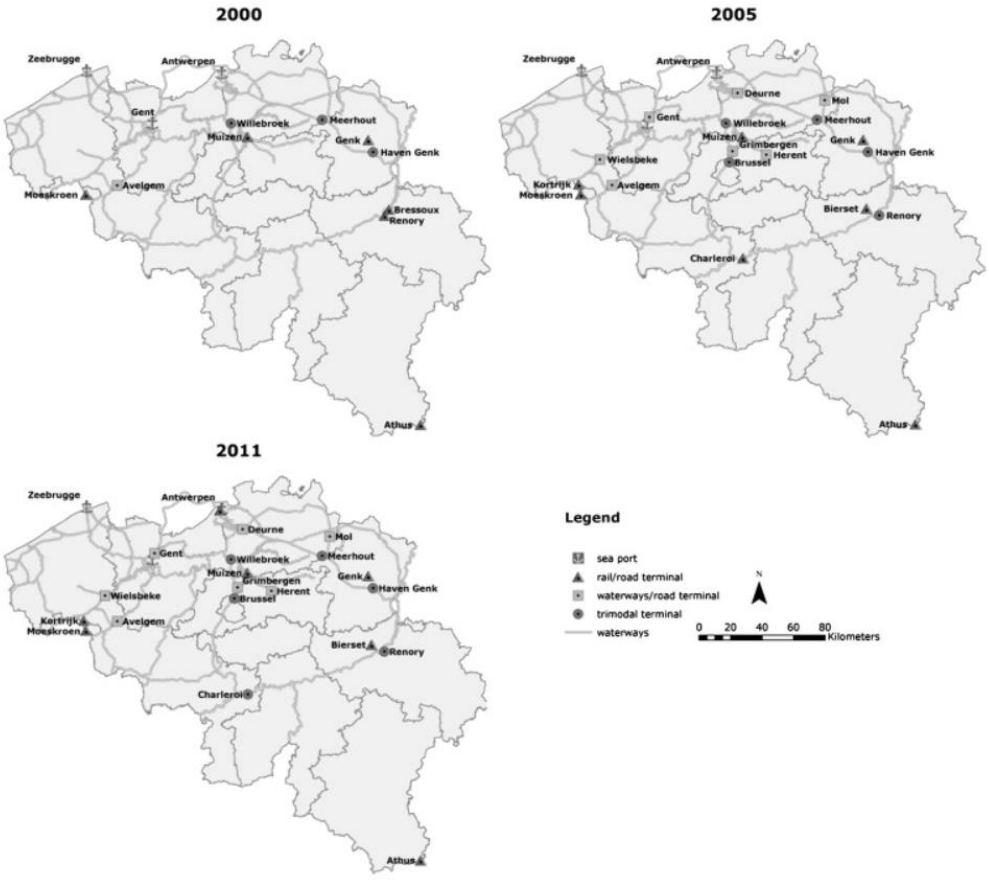


SOURCE: MEERSMAN ET AL., 2013

3.5 Intermodal platforms and multimodal hubs can mean an uplifting for rail transport

The report on mobility in Flanders from the Department of Mobility and Public Works (2010) states that multimodal freight terminals (Figure 39) act as regional hubs where flows are bundled and shifted from one transportation mode to another. The multimodal terminals act as a complement of the seaport terminals. The concept of extending the economic gateways, known as extended gateways, seeks for devolved bundling whereby the logistics activities are located in the hotspots that give rise to the lowest total logistics cost. The intermodal terminal landscape has changed considerably since the start of the first inland / road terminals in Avelgem (1991) and in Meerhout (1996).

FIGURE 39: EVOLUTION OF INTERMODAL TERMINALS IN BELGIUM BETWEEN 2000 AND 2011



SOURCE: VLAANDEREN DEPARTEMENT MOBILITEIT EN OPENBARE WERKEN, 2010

As far as bi-modal terminals are concerned, there is the road / rail terminal network set up by IFB, a daughter company of SNCB. The number of road / rail terminals has remained fairly stable and is currently at six in Belgium of which three are located in Flanders. This number has remained virtually unchanged since 1999, however the locations partly changed over the years as the terminal in Bressoux was closed due to reorganization, while in Kortrijk a new terminal was opened. In addition, there are the terminals along navigable waterways (waterway / road terminals). By the end of 2011, seven waterway / road terminals were operational, all of them in Flanders.

The number of tri-modal terminals in Belgium increased from two in 1999 to six in 2010, from which three are situated in Flanders. The inland water navigation container terminal along the Albert canal in Meerhout is an example of a tri-modal transfer point, where goods can be moved between ship, train and truck. The total capacity amounted to 100,000 TEU initially but was extended to 200,000 TEU in 2000. The port has an area of 10 ha, a storage capacity of 8,000 TEU and is located about 50 km from the port. On June 16, 2008 the construction of another intermodal platform was launched in Lanaken, also near the Albert Canal. This construction is part of the plan to reuse the abandoned railway line Lanaken-Maastricht (European Commission, 2011d; Meersman et al., 2013).

Santos et al. (2015) analysed a scenario where the current terminal locations would be changeable, resulting in an increase of rail transport of about 3.5% and a total cost reduction of 0.26%. This indicates that the current localization of the intermodal terminals in Belgium is rather good.

In light of the earlier mentioned inflexibility of rail transport due to the incapacity of delivering door-to-door, the use of these intermodal platforms becomes of even greater importance. In order to drive the last mile, cooperation with the road transport sector is necessary, in order to obtain the most optimal and sustainable logistic chain (Buyse et al., 2014; Stojadinovic, 2015).

The Mobility Plan for Flanders by the Department of Mobility and Public Works defines the main bottlenecks for the intermodal terminal market and multimodal hubs in Belgium as follows:

- The maximum capacity of certain Flemish terminals is achieved, resulting in gate congestion.
- A lack of standardization of loading units.
- An imbalance between the supply and removal of containers.
- Fragmentation of efforts in the field of telecommunications systems.
- Inadequate monitoring and delays in reporting towards the customer.
- A limited focus on small volumes, short distances, fast delivery times and irregular transactions.
- The price is often not competitive with road transport.
- Limited cooperation with foreign terminals due to a lack of knowledge on the quality of service.

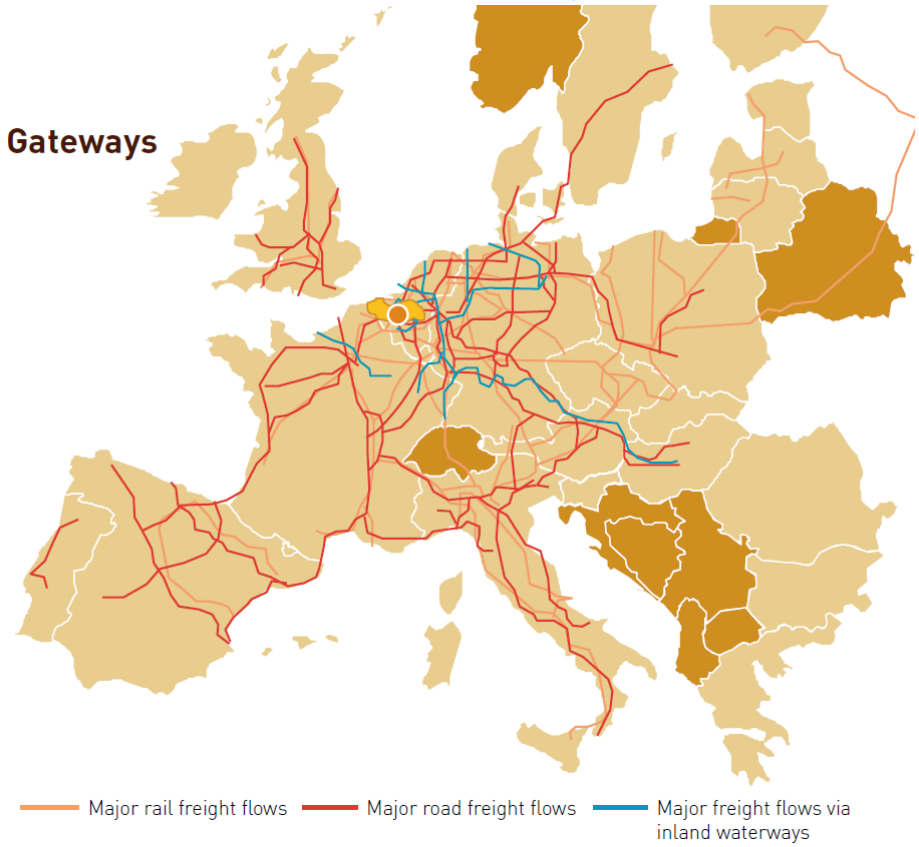
In terms of standardization in loading units, Cuypers (2014) mentions that only 20% of the different truck trailers are suitable to be loaded on a train. For IWW transport this share is even lower, making this specific subsector in special containerized units still a growth factor for intermodal rail transport.

As provided in regulation (EU) 913/2010 and as stated previously, the rail corridors aim to make the organization of traffic easier. The corridors bring great improvements to international freight services in terms of connectivity between key European logistics and industrial hubs. With this new development, the railway companies and operators can reach all the information concerning the corridors at one centralized location. The capacity of international freight trains becomes therefore transparent due to a catalogue of pre-arranged train routes. These routes can be ordered, booked and allocated in a single operation within a one-stop-shop. This ensures that applicants and also infrastructure managers are better informed. One of the conditions remains the efficient coordination of operations by the infrastructure managers along the corridors, and an increased flexibility to use these pre-arranged train paths (European Commission, 2014h; European Union, 2012; INFRABEL, 2014).

In accordance with regulation (EU) 1316/2013, the United Kingdom joined the North Sea Mediterranean rail freight corridor, Germany joined the Atlantic rail freight corridor and Czech Republic joined the North Sea Baltic rail freight corridor. These corridors show a good example of successful international cooperation in the development of rail freight. Moreover, the regulatory extensions illustrate the commitment of Member States to continue to promote sustainable transportation at European level (Federale Overheidsdienst Mobiliteit en Vervoer, 2014).

Flanders Investment & Trade (2008) claims that Flanders is in pole position for a strong logistics industry due to the Extended Gateway concept. In this way, companies can invest in locations in the Flemish hinterland, close to an inland multimodal terminal, keeping access to the international gateways such as the different ports or the airport. Figure 40 shows the unique position of Flanders, connected to the different rail, road and inland waterway flows. This opportunity should be continued by mapping out the different logistics hotspots, taking into account the multimodal access.

FIGURE 40: POSITION OF FLANDERS IN THE DIFFERENT MAJOR RAIL, ROAD AN INLAND WATERWAYS FLOWS



SOURCE: FLANDERS INVESTMENT & TRADE, 2008

Verslype (2014) indicates that Port of Ghent also wants to become an extended gateway, an intermodal hub within the port instead of in the hinterland, as it could be a strategic decongestion port for big volumes coming from typical container ports such as Antwerp or even Zeebrugge. The port would then become itself a strategic platform in the hinterland of these ports, consolidating the flows and preparing them for further transport. Ghent has the capacity and capabilities in terms of infrastructure and connections to transport these volumes for example with smaller barges towards France. In this way, the difficult bundling of flows could be optimized, which is a major benefit for intermodal transport.

Wolters (2014), Verslype (2014) and Buyse (2014) refer to the point that today the combination of cargo streams is not optimized, mainly due to organizational reasons, leaving the true potential of intermodal platforms and multimodal hubs untouched. As mentioned before, the mentality of looking for an individual solution should be changed to a cooperative behaviourism between the different terminal operators. A new trend that is recently rising might create a turn in events, as shippers are starting to organize by themselves these kind of bundling initiatives. These shippers are creating a network where cargo flows can be bundled, making the best use of the existing infrastructure. Piette (2015) indicates that this cooperation might be difficult to reach, as these platforms will remain in the hands of different shareholders, looking for their own benefits. Therefore the most important condition for this system to work is the quick establishment of a neutral external party to guide this process, as well as to show to the different terminal operators what could be gained when they work together. A second condition would be to avoid the further multiplication of these kind of platforms and hubs, as massification effects would be lost, which is the main driver of profitability. Hoornaert (2015) states that a European approach might trigger this process and guide the different shareholders towards more cooperation.

Regarding the need for bundling, Cuypers (2014) mentions that this process often includes additional charges, as more tkm are necessary to bring the cargo from different flows to a centralized point. In this respect, some subsidized initiatives in the past such as the Main hub terminal in Antwerp have been cancelled. At this terminal, trains and wagons from different destinations were combined in order to obtain full trains for a specific destination again. However, each move of a container brought a cost increase of 50 to 60 euros. In order to keep this system alive, subsidies needed to be given, which was no longer defendable. As soon as the subsidies were taken away, the terminal has lost its benefit and is now left unused. Nevertheless, new opportunities for the Port of Antwerp will lie in the upcoming shift of container handling from the right bank to the left bank in 2015. This will result in a strong concentration of the container activities in the port, which might result in an automatic bundling of flows without an additional cost increase (Cuypers, 2014; Vanfleteren, 2014).

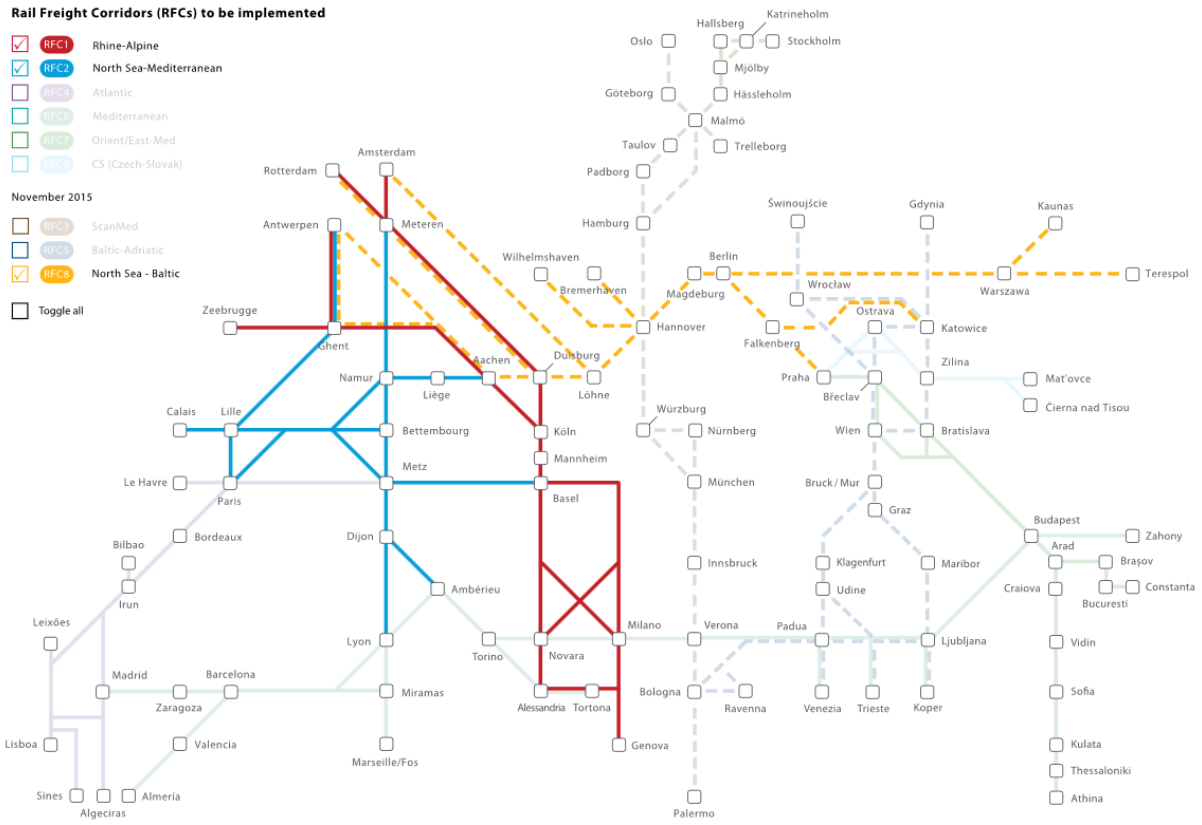
3.6 R&D investment (technology) has a positive effect on rail

It is clear from the sections above that operators must understand the importance of railway freight compared to other transport modes. Nevertheless this understanding needs to be complemented with the fact that industry needs to invest in research and development projects, in order to make railway transportation more efficient.

To improve the conditions for transporting goods by rail, cooperation between the final market and ports should be strengthened and the rail system needs to become more efficient. In order to do this, longer and more cost effective trains need to be introduced. Also transhipment of containers from ship to train needs to be improved by tackling time wasting and excessive bureaucracy. As it will be mentioned in the part on regulation policy, Europe is trying to create a single market for rail transport, making it incredibly important that standardization and interoperability are finally executed. Only when these technical barriers between the different European countries are taken away, a higher level of efficiency can be reached. All of these elements require a certain focus and effort on R&D investment (European Intermodal Association, 2013; Buyse, 2014).

Nevertheless, rail equipment has a long life-cycle (up to 40 years), slowing down the process of standardization. In addition, these changes are accompanied with a high cost of investment which should be returned. This is a main advantage of road transport where trailers are amortized and sold after 5 years, giving the opportunity to quickly adapt to the changing market needs. Nevertheless, caution should be adopted as it is not necessary to bring everything to the point of brand new material, as this is not necessary for example to perform the traction of a train. Therefore a balance must be found between the maximization of the use of the existing material and the investment in necessary new materials (Buyse, 2014; Cuypers, 2014; Houtman, 2014).

FIGURE 41: RAIL FREIGHT CORRIDORS



SOURCE: FLANDERS INVESTMENT & TRADE, 2008

This opportunity could also be linked to the effort put in the development of the nine different corridors in Europe as discussed earlier. This evolution also brings the opportunity to add more standardization to the network. Rail Net Europe (2014) is the service provider and expert support provider for the Rail Freight Corridor organisations in terms of methods and tools. The ultimate goal of the organization is to harmonize the different RFCs' implementation approaches. Figure 41 above is showing the three rail freight corridors passing Antwerp and Ghent, connecting the Belgium rail network to the future European single market network. Rail Freight Corridor 8, The North-Sea – Baltic route, is expected to be operational by November 2015. As this route will connect Western Europe with Eastern Europe, the importance of R&D can be linked to the earlier mentioned weak infrastructure and network interoperability in the different countries. These rail freight corridors can help strengthen the cooperation between infrastructure managers, create a right balance between freight and passenger traffic and continue the promotion of intermodality, only on condition that continuous investments in R&D is taking place, making sure that efficiency, standardization and interoperability are increasing as well (Rail Net Europe, 2014).

Also UNIFE (2013) points out that one of the ways for rail transport to compete with other modes of transport is through increased cost efficiency created by these R&D investments. The gradual introduction of the new global ERTMS and ETCS signalling and safety systems are a good and known example of these new developments. With these developments, more trains will be able to run at a shorter distance between each other, increasing the density of the rail network by 20 to 30%. The future of rail transport will therefore be mainly focused in the TEN-T corridors, where these systems are operational (Le Jeune, 2014; Piette, 2015).

A detailed inventory of the current investment projects by UNIFE (2013) can be found in Table 12.

TABLE 12: INVENTORY OF THE PROJECTS FUNDED BY UNIFE

Project name	Description and key deliverables	Website / contact
TECrec	Joint Technical Recommendations - Noise virtual simulation - Interior passive safety	
Refresco	Set the framework for the implementation of new materials in the railway sector through the evolution of certification processes for rolling stock.	www.refresco-project.eu
NGTC	Standardised train control systems for mainline and urban domains, whilst significantly reducing total cost of ownership and life cycle costs.	www.ngtc.eu
ERRAC – Foster rail	Working on implementation plans (roadmaps) which take into account the possible standardisation outputs coming from research projects.	www.errac.org
CAPACITY FOR RAIL	Aims to bring a system vision of the railways looking towards 2030/2050, by proposing guidelines for future deployments in the mid-term and recommendations for technologies to be developed and deployed in the long term in order to obtain an affordable, adaptable, automated, resilient and high-capacity railway. A step change in railway infrastructure and operations may be achieved within the constraints of the need to maintain railway services while work is being carried out.	www.capacity4rail.eu
Cleaner – D	The sector faced in complying with new emissions regulation that entered into force in 2012. In fact, rail diesel emissions represent only a minor share of total emissions from the transport sector.	
Dynotrain	DynoTRAIN was focussed on testing requirements for the certification of rail vehicles in terms of running dynamics (track and vehicle interaction).	www.triotrain.eu
Rivas	The project aims to reduce the environmental impact of ground-borne vibration while safeguarding the commercial competitiveness of the railway sector.	www.rivas-project.eu
TIGER DEMO	The TIGER DEMO Project was comprised of the following four demonstrators: 1. GENOA FAST CORRIDOR 2. MARIPLAT 3. INNOVATIVE PORT & HINTERLAND OPERATIONS 4. INTERMODAL NETWORK 2015	www.tigerdemo-project.eu
EURAXLES	The main concept of the EURAXLES project is to follow three complementary routes which innovatively consider the combined influence of axle design, production and maintenance standard parameters, whilst retaining a safe management of the life cycle.	www.euraxles.eu
ACOUTRAIN	Promoting the interoperability of rail traffic in Europe by dramatically reducing the time and cost of the TSI Noise conformity assessment procedure and harmonising the process for noise conformity assessment across Europe by developing standard procedures and procedures for acoustic virtual testing.	www.acoutrain.eu
EUREMCO	The main objective of EUREMCO is to harmonise and reduce the certification process of rail vehicles for Electromagnetic Compatibility (EMC).	www.euremco.eu
OSIRIS	During the first year, one of the major achievements of the project was the holistic strategy for integrated urban rail energy efficiency management. This is based on the use of a model methodology which provides manufacturers and operators with uniform information at the system level as well as new concepts for on-board Energy Storage and new technologies on auxiliary converter and transformer.	www.osirisrail.eu
Merlin	MERLIN will provide an integrated optimisation approach that includes multiple elements, dynamic forecasting, supply-demand scenarios and cost considerations to support operational decisions leading to a cost-effective intelligent management of energy and resources through: 1 Definition of the architecture for an intelligent Railway Energy Management System (REM-S) for both operational and strategic applications 2 Improved design of existing and new railway distribution networks and electrical systems as well as their interfaces with the public grid, while taking into consideration network interconnections 3 Better understanding of the influence on energy demand of operations and operational procedures of the different elements of the railway system	

	4 Identification of technologies and solutions capable of contributing further to the optimization of energy usage; 5 More efficient traction energy supply based on optimised use of resources 6 Understanding the cross-dependency between these different technological solutions to define optimum combinations for optimised energy usage 7 Improving cost effectiveness of the overall railway system	
Automain	To date, the project has delivered interesting results on: 1. Functional requirements, key performance indicators and evaluation criteria for more efficient track maintenance; 2. Process improvement tools for track maintenance	www.automain.eu
ECUC	It is a highly effective and applicable solution for increasing the braking capacity of new high-speed trains. Moreover it aims to solve the concerns raised by infrastructure managers by proposing concrete and realistic solutions to overcome any possible drawbacks that ECB have experienced on some lines.	www.ecucproject.eu
PROTECTRAIL	PROTECTRAIL (The Railway- Industry Partnership for Integrated Security of Rail Transport) is a European integration project with the objective of developing an interoperable and modular architectural framework for mainline rail security solutions. Eventually, this framework would allow the creation of a system architecture that makes plug-and-play for security solutions possible.	www.protectrail.eu
MARATHON	MARATHON (Make Rail The HOpe for protecting Nature) is an EU FP7 cofunded project that aims to increase network capacity and cost efficiency by the coupling of two classical trains, the two locomotives of the train are then connected via a radio link with a driver controlling the front and middle locomotive from the master locomotive (usually the front loco). MARATHON looks at deploying "longer, faster and heavier trains" on the existing infrastructure. A key technical solution to be developed by the project is a wireless communication device which can enable two locomotives and trains to be connected together with the middle locomotive operated remotely from the front locomotive.	www.marathon-project.eu
SUSTRAIL	The project aims to contribute to a new era in the rail freight sector by adopting a holistic approach, implementing a clear methodology and viable procedures for combined improvement in both freight vehicles and track components.	www.sustrail.eu
SECURED	S E C U R - E D (S e c u r e d - U r b a n Transportation – A European Demonstration) is a demonstration project with the objective to provide a set of tools and procedures to improve urban transport security.	www.secur-ed.eu

SOURCE: UNIFE, 2013

Looking at the different future innovations in transport, the SPECTRUM trains need to be mentioned. This project holds a radical and first principles approach to deliver a new rail freight offering that could compete with road and air transport. In the long run, SPECTRUM will develop a rail freight train that provides a higher speed service for high value, low density and time sensitive goods, with the performance characteristics of a passenger train. The SPECTRUM project commenced in 2011 and is due for completion in May 2015 (European Intermodal Association, 2013; Spectrum, 2011).

Another innovation in the railway industry is delivered by AAE, which has already built 100 so-called 'silent trains'. These pocket wagons are equipped with disc brakes, which help reduce the noise emission and maintenance costs. Therefore, railway transportation will become even more sustainable and less restrictive by the environmental law (European Intermodal Association, 2013).

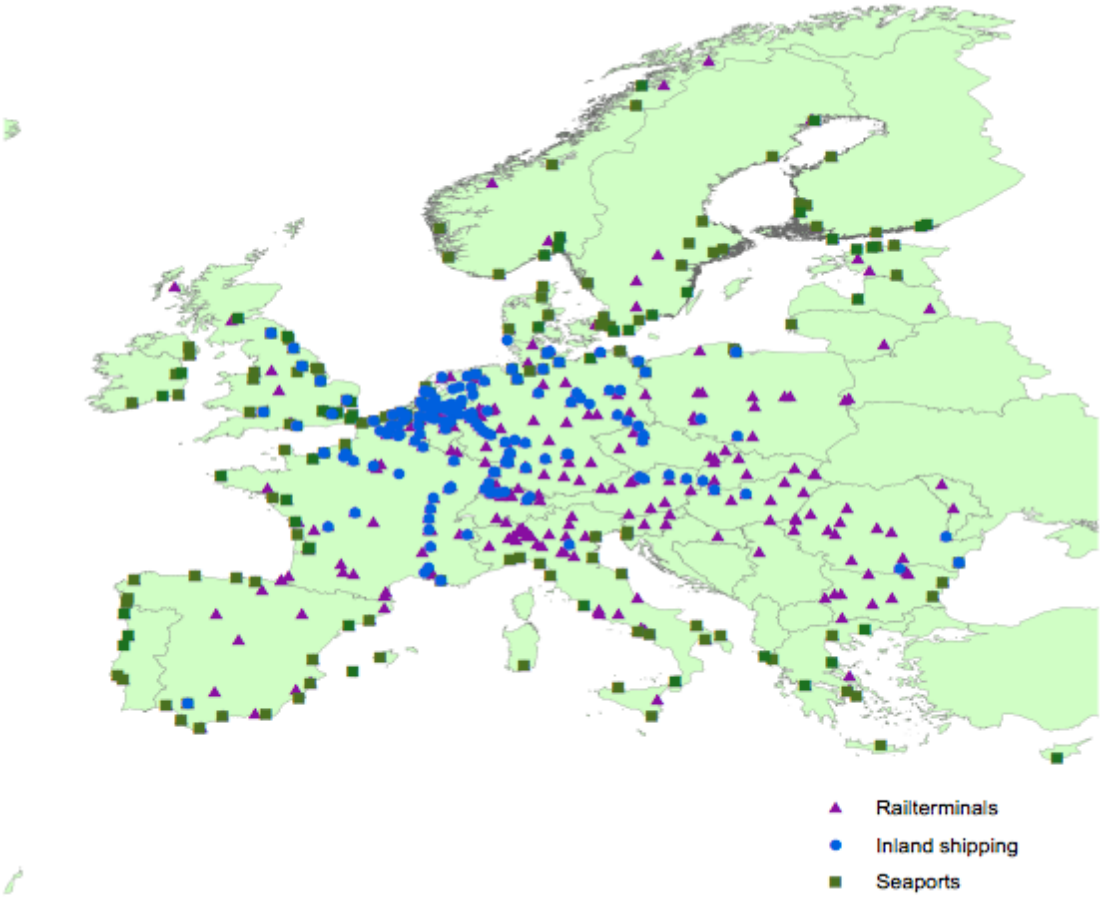
In the continuous globalization of the world, and the increasing need of faster just-in-time deliveries and track & tracing opportunities, customers require their shipments to be delivered by their wishes at a certain time and place. In order to continue the promotion of rail freight as a valuable, efficient and competitive option, the

meaning of IT could not be underestimated. Thys (2014) mentions the studies concerning the deployment of High Speed Trains for fruit and vegetables transport between Perpignan or the northern part of Italy and Brussels. This is linked to the creation of 'Schaarbeek vorming', a multimodal logistics platform, in an attempt to create a logistics centre for the European centre of fruit and vegetables in Brussels. Another significant R&D project in this respect is the 'Intermodal Links (IL) planner'. The system combines time schedules of rail, barge and short sea operators in Europe and selects the best intermodal connections. This project is becoming popular with a growing database of partners (European Intermodal Association, 2013).

A comparable project is BE LOGIC, which ran from September 2008 till January 2011. Within this European FP7 project, a European Intermodal Route Finder (EIRF) and a logistics benchmarking tool were created. The first tool allows companies to find different possibilities of shipping goods over Europe and choose the most suitable transportation mode and the second one is to review the reliability, costs, flexibility and sustainability of the chosen option (Bozuwa et al., 2012; Bozuwa, 2011).

As we can see from figure 42, many cities over Europe are presented with inland terminals or seaports. However, as the network is continuously reviewed and expanded, this might pose a challenge to keep both systems up-to-date in the future. It can be noted that in Eastern Europe, rail terminals are dominating the landscape, whereas in the Benelux and along the Rhine corridor, the network of inland waterway terminals seems to be overly dense (Bozuwa, 2011).

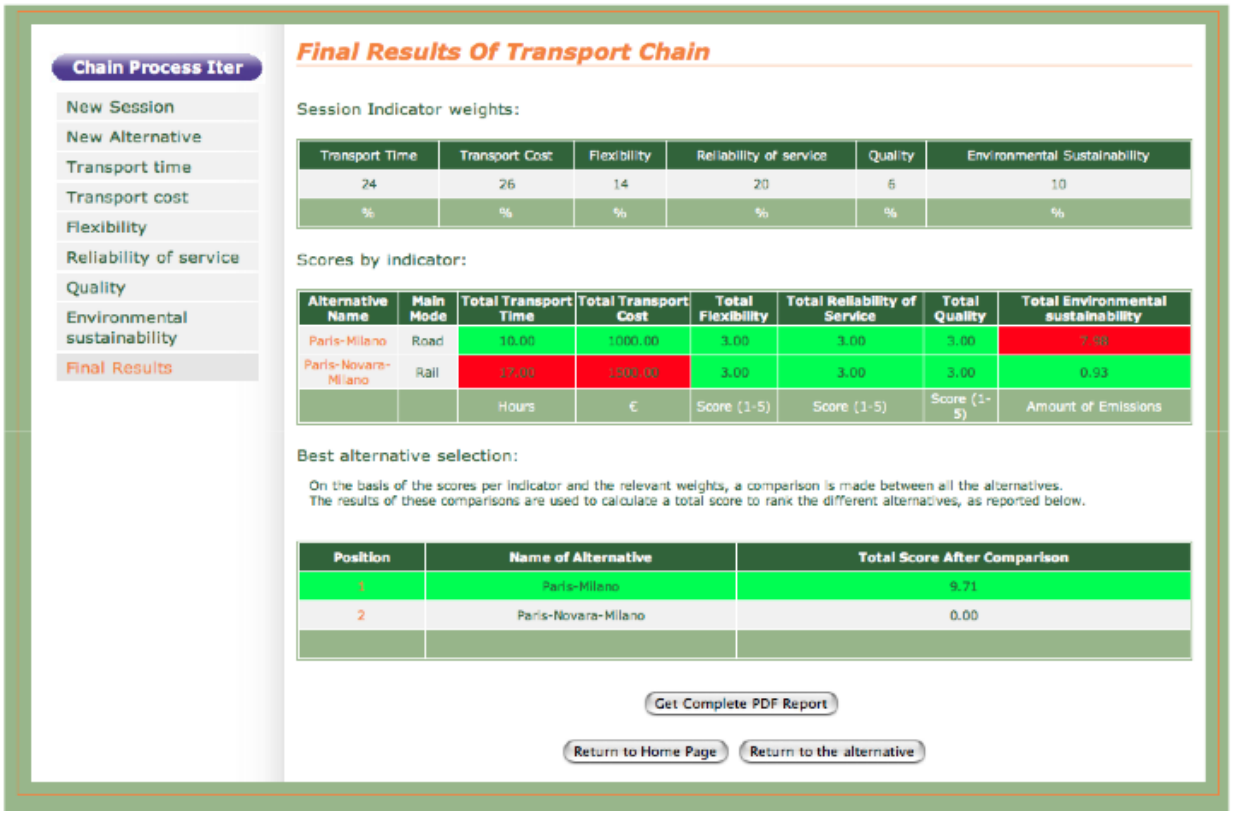
FIGURE 42: MULTIMODAL PLATFORMS AROUND EUROPE



SOURCE: BOZUWA, 2011

On the screenshot of figure 43, it can be seen how different options are evaluated by the different criteria in the benchmarking tool. The system automatically highlights the parameters which satisfy the chosen criteria. If such tool would work independently, it might increase the popularity of intermodal transportation, as SME's would have an opportunity to choose the most suitable mode of transport for their operations. Intermodal transport would receive much more connection and recognition within the business world, as these kinds of tools make it easier to understand and lower the access barrier to using of different modes of transport to optimize the logistical chain of a business (Bozuwa et al., 2012; Bozuwa, 2011).

FIGURE 43: COMPARING TWO ALTERNATIVES WITH EIRF AND LOGISTICS BENCHMARKING IN BE LOGIC



SOURCE: BOZUWA ET AL., 2012

Bozuwa et al. (2012) also made some recommendations on how to further develop these tools in the future in order to keep them alive and ready for commercial use in the future. In summary, the focus should lay on the development of a business plan, looking for a solution on keeping these systems up-to-date, as well as the search for funding in order to keep both systems alive.

Another example of R&D investment leading to a more efficient rail use comes with the Tiger Project. Within this study, all the necessary step changes for providing a solution to EU ports and road congestion are taken into account. The inter-port operations and transportation network map in Germany and Italy was analysed, resulting in a number of recommendations (Castagnetti, 2012):

- The creation of a fast corridor for Genoa port, creating a loop from the port to the Rivalta terminal which would allow smoothening out the loading operations.
- The 'Mariplat Y' concept, which creates a route across Italy avoiding the large cities and creating spare capacity for other high-speed trains.

- The Innovative Port and Hinterland Operations 'web concept'. Analysing the connection between the ports of Bremen and Hamburg, researchers came up with the optimized map of operations within and between those ports. This should help avoid bottlenecks and overcapacity issues in the future.
- The 'Intermodal network 2015 Spider' concept aims at making a further step change in the inland distribution by intermodal trains via the central hub extensive shuttle service network. The hub situates close to the German ports and its target is to centralize the transportation network in Germany.

The European Commission (2011a) also stated in their White Paper that technological innovation is necessary to obtain a more efficient and sustainable transport system within Europe, mainly due to a systems approach in order to reach:

- Vehicles' efficiency improvement.
- Better use of the network.
- Increased safety in operations.
- Improved communication systems.
- And synergies with other sustainability objectives.

According to Finger (2014), there is no specific R&D program for the rail sector as it exists for the airline sector, although this might still be developed in the distant future. One of the major reasons can be found in the fact that the rail freight sector is less innovative than the air freight sector. The best information can be found in the Horizon 2020 plan, running a budget of nearly 80 billion euros and containing a big number of projects and investments planned for the future, out of which some will certainly link with intermodal rail freight transport. An interesting point of view is that infrastructure investments which are needed, as stated earlier, are mainly to be financed by the national levels, whereas the innovative projects on research and development are mainly paid for by the European level.

Investments done in other countries could also increase the competition for rail traffic in Belgium, as well as enforce the competitive position of these countries. In addition, caution should be given to the fact that this principle on research and development also works both ways. Investments made in the rail sector in Belgium often also need to be taken in other countries in order to become valuable, as railway transport is often a cross-border activity. If a new technology is only taking place in one country, the positive effect might be neutralized. In this respect, the R&D opportunities also contain a certain threat. Certain investments might even increase the cost in the short term, as it is for example the case with the new safety systems. In the short run, all tracks and equipment must be equipped with all the different existing systems, and as such an additional system as ETCS is increasing the cost, even when this system is to become the general one in the future, aiming at a cost decrease in the long run (Cuypers; 2014; Buyse et al., 2014).

4. THREATS

4.1 Huge planned investments in the renewal of infrastructure in times of severe public savings are becoming uncertain

As mentioned in the previous chapters, railway infrastructure is sometimes outdated, network links are abandoned and it is limited in capacity as it is used by freight and passenger transport at the same time. A mixed network automatically leads to limitations in the capacity and impacts on the quality of service. Therefore there is need for a clear vision on the prioritization of the allocation of train paths between goods and passengers. This includes the times, routes and locations which receive priority mode (Mora, 2012).

Due to the currently restricted budgetary context, resulting in severe savings in many European countries, a number of projects from the previous investment term have been or are at the risk of being frozen or delayed (Mora, 2012).

Yet, despite positive developments in some markets, rail usage for freight purposes is stagnating or declining in many of the EU Member States, as it was shown in the figures above. The modal share of passenger rail in intra-EU transport has on average remained more or less constant since 2000, at around 6%, whereas the modal share of rail freight has decreased from 11.5% to 10.2% (European Commission, 2013a).

Faced with this reality, the European Commission has responded on three fronts with an amount of money equalling the highest investments in the transport industry so far, and in railways in particular (European Commission, 2013a):

> A major package of measures to restructure the European rail market (4th railway package).
> Tripling investment in European infrastructure from the current 8 billion 2007-2013 to 26 billion 2014-2020. Over 80% of this will be spent on rail (New EU infrastructure policy).
> Tripling investment in rail research and innovation, under the new Shift2Rail program.

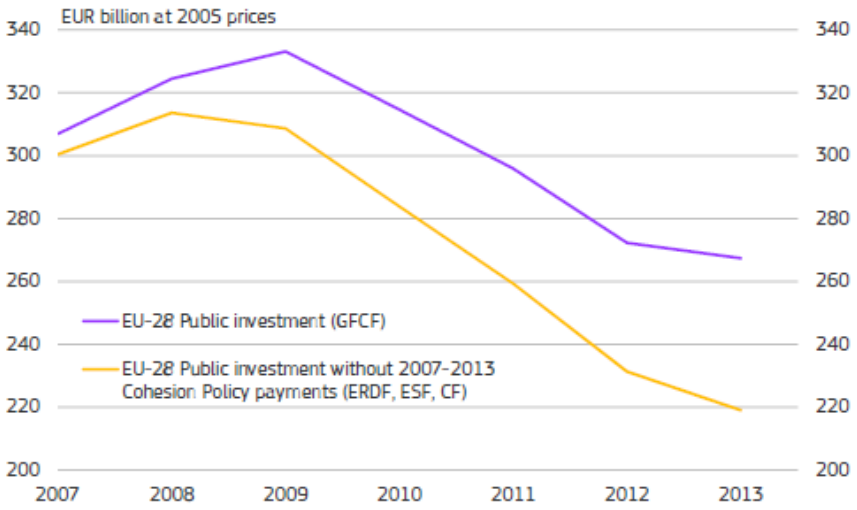
CLEPA (2014) states that "*Taken together, these innovations - the tripling of transport financing combined with the decision to tightly focus the funding along 9 major EU transport corridors - amounts to the most radical overhaul of EU transport infrastructure policy since its inception in the 1980's.*" The new core network, to be established by 2030, will connect (European Commission, 2015):

- 94 main European ports with rail and road links.
- 38 key airports with rail connections into major cities.
- 15,000 km of railway line upgraded to high speed.
- 35 cross border projects to reduce bottlenecks.

The cost of developing EU infrastructure to complete the TEN-T Core Network requires about €500 billion, of which €250 billion would be for the removal of the main bottlenecks up to 2020. Creating the Connecting Europe Facility and implementing the Core Network Corridors will accelerate the infrastructure development needed by the EU, its businesses and its citizens, to strengthen economic recovery in each and every one of our Member States. As rail is still carrying 10% of the freight traffic in Europe, equalling an estimated revenue of 13 billion euros, it is crucial for the efficient functioning of the European Union (European Commission, 2013b).

Nevertheless the impact of the economic and financial crisis on national, regional and European budgets is still noticeable, limiting the funding availability across all investment areas. Figure 44 shows a decline of 20% of the public investment in the period 2007-2013. Although the cohesion policy, with investments by European budgets for jobs and growth, did not fully stop during this period, they could not lift the effect of the decreased public investments.

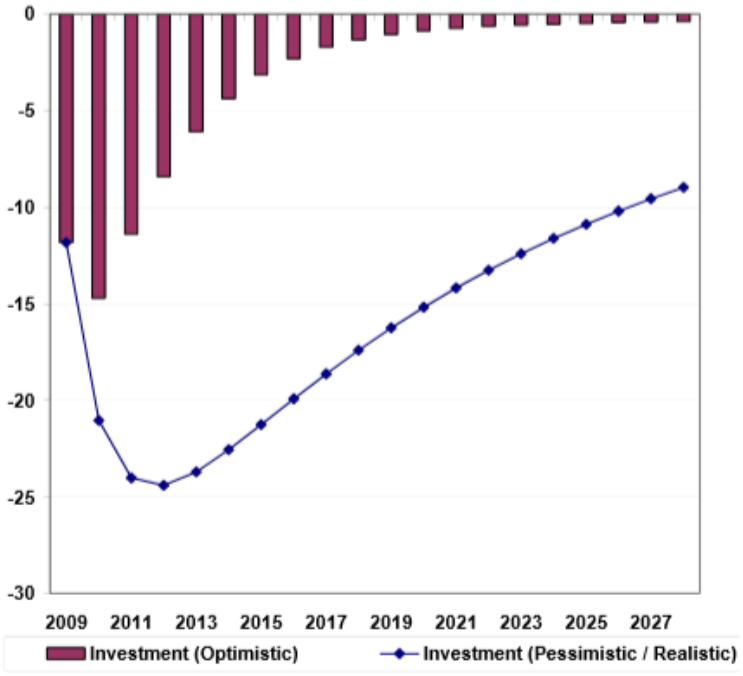
Figure 44: Impact of the crisis on public investments and cohesion policy, 2007-2013



Source: European Commission, 2014g

The economic crisis might leave a long lasting impact on the investment climate as it can be seen in figure 45. Especially governments should avoid to make the same mistakes as observed in the past, where severe budget savings have led to an even further decrease in output (European Commission, 2009b).

Figure 45: Scenarios for the EU: losses (cumulated) in potential investment in an "optimistic" and "pessimistic" scenario



Source: European Commission, 2009

Hoet (2014) and Stojadinovic (2015) support this statement for the specific case of Belgium, where current savings pose a threat to the planned investment in transport infrastructure. Transport infrastructure is very expensive, resulting in astonishing amounts announced in the past. Nevertheless, it is very difficult to predict where, when and how much these savings on infrastructure development budgets will be. In addition, also the subsidies to SNCB logistics will decline, mainly for single wagon transport, making the situation even more complex. In this respect also the recent developments concerning SNCB logistics can be mentioned, where the different ports in Flanders are looking for a sustainable solution for the future of SNCB logistics, with the increased competition from other European players. Nevertheless, the Port of Ghent also announced that the contribution should be limited and linked to a number of strict conditions guaranteeing the durable survival of the rail company, even when the competition becomes more fierce (Flows, 2015).

Verslype (2014) also indicates that for Port of Ghent it is important to invest in the rail tracks (length, electrification, etc.) as currently they have a length of 630 meters, where a length of 750 meters and full electrification is necessary in order to be recognized as a terminal within the European Rail Corridors. Currently these investments are discussed with Infrabel, as not all of the investments could be left to the private sector, especially in times of savings.

The Belgian Government decided that SNCB and Infrabel each need to cut back on costs and expenses with 1.5 billion euros, which equals 20% of the budget over the period 2015-2020. As investments are counted as expenses, it is clear that the investment plan for the upcoming years will have to be changed, although both companies received a degree of freedom to propose where these savings will occur. The safety systems however are out of scope of the budget cuts. (Houtman, 2014).

In conclusion, the Department of Mobility and Public Works in Flanders (2013) published the Flemish strategy for rail transport. Within this report, it is mentioned that investments in the safety of rail transport remain necessary, as well as the adjustment of the infrastructure capacity on the needs and demands of the market. For these investments, an important amount of regional and federal budgets will be used, with an agreed distribution of 60/40.

4.2 Funds and subsidies contain opportunities, but the decision making through a European fund/subsidy office can create a certain threat for specific projects or area developments

The European Union offers a number of different funding possibilities for a wide range of projects. In terms of infrastructure development for transport, the TEN-T program was already mentioned several times. The project to connect Europe has a subsidy budget of 26 billion euros up to 2020, although 11 billion euros is only available for members of the separate Cohesion Fund. Regarding investments in rolling stock, the EUROFIMA bank was established in 1956 in order to accelerate the modernization of the railway equipment. In addition there are also (European Commision, 2014f):

- The European Regional Development Fund for investments in innovation and research, as well as the stimulation of a low-carbon economy.
- The European Social Fund for stimulation of the employment and education opportunities;
- The different financial instruments in cohesion policy 2014-2020.
- And the Instrument for Pre-accession Assistance (IPA) in Eastern Europe.

It is clear that it might pose difficulties for private companies to find their way in the European web of subsidies and funding. Effort needs to be put into the continuous follow-up of these subsidies and funds. Selecting the wrong option might lead to increased application times, as the project might be turned down at first instance or referred to another fund structure for re-application, delaying the execution of the investment and the needed development (European Commission, 2014e; Eurofima, 2008; Stojadinovic, 2015; Verslype, 2014).

Buyse (2014) indicates that, due to the in-transparent system of subsidies, the cost difference within rail operations between the different countries is substantially high. Those players who know their way in the maze can benefit from it, leaving the others with a competitive disadvantage. An example could be found in the different handling charges. This leads to a shift of location choice by the shipper, resulting in a disequilibrium on the market. A harmonized European finance policy for infrastructure, taking into account the total logistic chain and how to incorporate it in the total supply chain, could help tackle this problem.

In addition, application to a European fund or subsidy does not mean it is automatically accepted, neither is it an eternal source of income. In this respect, the situation of single wagon transport in Belgium can be used to show the threat that lies within a financial supported activity. As the liberalization of the rail freight market was implemented, as it will be discussed in the chapter on regulation policy, rail freight operators are confronted with a decreased subsidy climate. In this respect, the importance of profitability of the three types of rail freight, namely block trains, single wagons and combined transport will rise. For the last two types, additional freights exist as more manual actions are inquired. As their cost structure makes it difficult to run profitably, these types of transport are almost solely executed by the original national operators, as a historical continuation as from when these types of transport were still subsidized. Nevertheless, SNCB logistics announced that it can no longer guarantee the continuation of the single wagon transport, although the service is crucial for the competitiveness of our ports. For example for certain products, rail transport is the only allowed mode due to their size or nature. In addition, the absence of single wagon transport possibilities, might lead to a further increase in road transport, with all its side effects (Brutsaert, 2013; Vlaanderen Departement Mobiliteit en Openbare Werken, 2013).

SNCB Logistics (2014) claims that they will continue to invest in the single wagon transport, by further reducing the costs, by increasing the reliability of the transport type and by creating services with added value such as a system for capacity bookings. The latter will need to be the game changer in the future to keep single wagonload alive. Nevertheless, SNCB logistics is counting on a mind change of the customer and the shipper.

During the European Rail Freight Days Conference (European Commission, 2014h), a study on single wagonload development in Europe has been presented. The study by DG MOVE and PwC indicates a set of actions that could be taken to improve the situation of single wagonload transport:

- The need to improve the efficiency and economic stability of the service, for instance by optimising the use of capacity.
- The importance of maximising the availability of rail infrastructure, and in particular private siding which are of crucial importance to single wagonload services.
- An increase in service quality, through a more extensive use of tracking and tracing solutions.
- The importance of bringing innovation to single wagonload, by taking existing and already mature innovations.

According to Stojadinovic (2015), the discussion on the profitability and existence of single wagonload transport in Belgium is proving the need for more focus on intermodal transport options, making the best use of the different intermodal platforms as they could pose to be a true friend for this mode of transport.

In conclusion, it is commonly agreed that artificial support to keep an activity alive is not healthy in the long run, although it is a difficult discussion if this activity is necessary to keep the desired market service level as mentioned by Brutsaert (2013). Subsidies should be used as a catalyst, and should be diminished after the line has reached profitability. Unfortunately they often have the perverse effect of slowing down the development of the initiative, becoming reliant on the subsidy to remain operational (Buyse et al., 2014; Hoet, 2014; Hoornaert, 2014; Le Jeune, 2014; Piette, 2015).

4.3 Increase in passenger rail traffic can take away the capacity from freight transport by rail

Total freight transportation has grown in the last decades by 2.35% on average per year as shown in table 13 below. For rail transport, this growth is limited to 0,90%, although when the different periods are observed, a rise is noted from 0,48% average growth in the nineties to 1,41% average growth in the period 2000-2009. As it was explained before, the development of freight mobility is strongly linked to economic development. This connection between economic growth and the mobility of goods is also not unusual for Belgium. Breaking this connection (decoupling) was in the last ten years the subject of numerous studies at European level, mainly for road transport as this could lead to a more sustainable transport economy. It is clearly stated however that limiting mobility itself (including passenger traffic) is not an option. Therefore, the focus will be on reducing the negative effects of mobility and further controlling the choice of transport mode (European Commission, 2011d; Meersman et al., 2013).

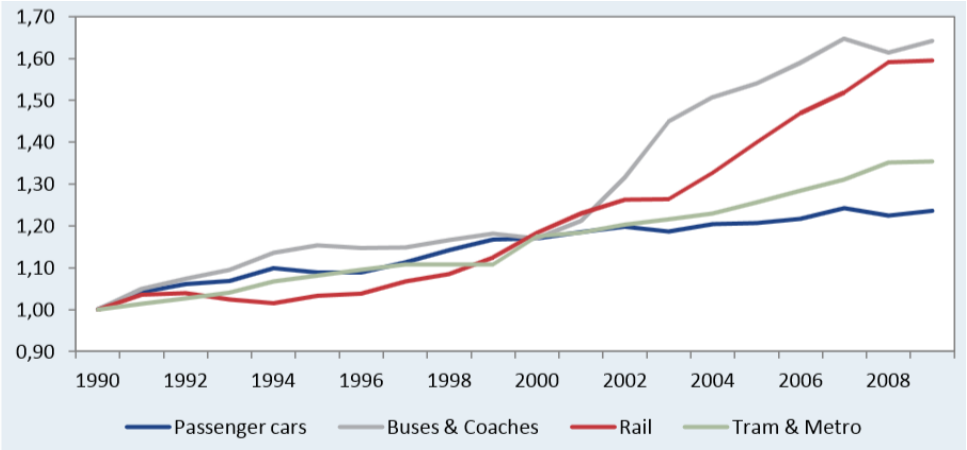
TABLE 13: % CHANGE OF FREIGHT TRAFFIC IN TKM IN FLANDERS (ROAD, RAIL, INLAND WATERWAYS)

Period	% tkm	Road	Rail	IWW	Total
2011-1990	Total change	64,91	13,13	65,07	58,44
	Average annual change	2,59	0,90	2,63	2,35
2011-2000	Total change	28,51	9,63	10,86	24,59
	Average annual change	2,00	1,41	2,41	1,93
2000-1990	Total change	28,32	3,19	48,90	27,17
	Average annual change	2,63	0,48	4,23	2,49

SOURCE: MEERSMAN ET AL., 2013

If the increase in rail transport continues, it is clear that the sector will be challenged by the limitations of its capacity. This point was raised already in the chapters above. More in particular, the passenger traffic could pose a threat to the further development of the rail freight traffic and the role of rail freight within the development of intermodal transport within Belgium. Looking at the volume of passenger traffic by rail in table 9 (Section 2.1 above) and figures 46 to 48, it is clear that trains are becoming a more popular means of transport for public transportation. Not only has the number of passengers increased from 144 million in 1997 to 224 million in 2010, also the total number of train kilometres, a more important measure in respect of impact on the network capacity, has increased from 73.2 million to 80.8 million kilometres. If both are taken together, as in figure 46, an increase from 6.5 billion passenger kilometres to 10.3 billion passenger kilometres can be noted in the period 1990-2012. Also the use of high-speed rail traffic has increased, enlarging the impact on the network.

FIGURE 46: PASSENGER TRANSPORT TRENDS IN BELGIUM (INDEX BASED ON PKM, 1990 = 100)



SOURCE: DEVILLE & VERDUN, 2012

FIGURE 47: PERFORMANCE OF PASSENGER TRANSPORT EXPRESSED IN PASSENGER KILOMETRES

	billion pkm							% UNDER PSO (*) 2012	% CHANGE '11/'12
	1990	1995	2000	2005	2010	2011	2012		
EU-28	404.1	351.7	372.0	379.9	406.8	415.3	418.4	65.2	0.7
BE	6.5	6.8	7.7	9.2	10.6	10.4	10.3	87.7	– 1.3
BG	7.8	4.7	3.5	2.4	2.1	2.1	1.9	84.0	– 9.2
CZ	13.3	8.0	7.3	6.7	6.6	6.7	7.3	98.3	8.2
DK	5.1	4.9	5.5	6.0	6.3	6.6	6.8	96.1	2.1
DE	61.0	71.0	75.4	76.8	83.9	85.1	88.4	58.9	3.9
EE	1.5	0.4	0.3	0.2	0.2	0.2	0.2	92.8	– 3.3
IE	1.2	1.3	1.4	1.8	1.7	1.6	1.6	100.0	– 3.7
EL	2.0	1.6	1.9	1.9	1.3	1.0	0.8	100.0	– 13.2
ES	15.5	16.6	20.1	21.6	22.4	22.8	22.5	50.7	– 1.4
FR	63.7	55.6	69.9	76.2	85.9	89.0	89.1	38.5	0.1
HR	3.4	1.1	1.3	1.3	1.7	1.5	1.1		– 25.7
IT	44.7	46.7	49.6	50.1	47.2	46.8	44.6	52.6	– 4.8
CY	-	-	-	-	-	-	-	-	-
LV	5.4	1.4	0.7	0.9	0.7	0.7	0.7	88.3	– 1.6
LT	3.6	1.1	0.6	0.4	0.4	0.4	0.4	63.0	3.6
LU	0.2	0.3	0.3	0.3	0.3	0.3	0.4	100.0	7.2
HU	11.4	8.4	9.7	9.9	7.7	7.8	7.8	94.7	0.0
MT	-	-	-	-	-	-	-	-	-
NL	11.1	16.4	14.7	15.2	15.4	16.8	17.1	94.8	1.7
AT	8.9	10.1	8.7	9.5	10.7	10.9	11.3	66.0	4.1
PL	50.4	26.6	24.1	18.2	17.9	18.2	17.8	84.7	– 1.9
PT	5.7	4.8	4.0	3.8	4.1	4.1	3.8	78.4	– 8.2
RO	30.6	18.9	11.6	8.0	5.4	5.1	4.6	94.6	– 10.1
SI	1.4	0.6	0.7	0.8	0.8	0.8	0.7	98.2	– 4.0
SK	6.4	4.2	2.9	2.2	2.3	2.4	2.5	92.3	1.2
FI	3.3	3.2	3.4	3.5	4.0	3.9	4.0	43.8	3.9
SE	6.6	6.8	8.2	8.9	11.2	11.4	11.8	46.5	3.6
UK	33.4	30.3	38.4	44.4	55.8	58.6	61.0	96.2	4.0

SOURCE: EUROPEAN COMMISSION, 2014D

FIGURE 48: PERFORMANCE OF HIGH-SPEED RAIL TRANSPORT

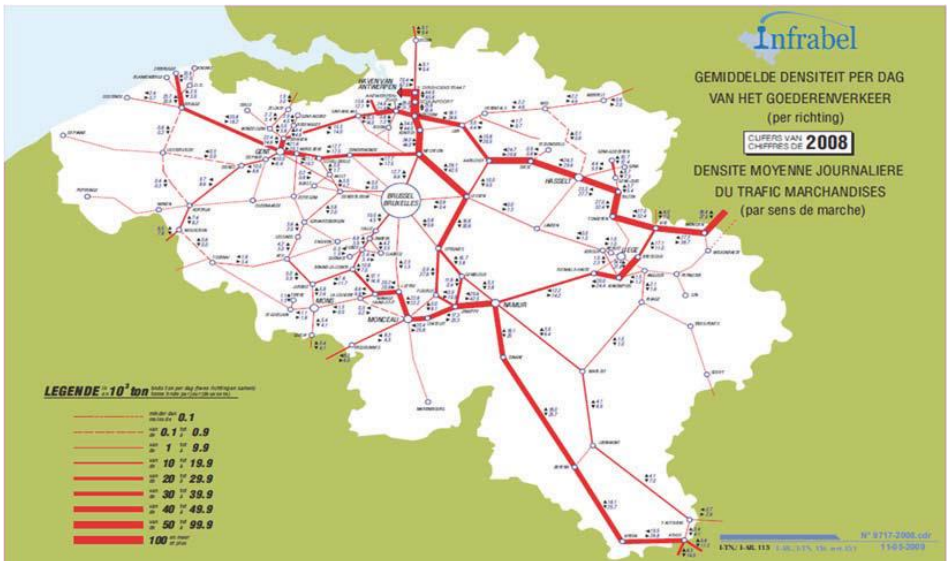
HIGH-SPEED RAIL TRANSPORT (*)

	billion pkm													%
	BE	CZ	DE	ES	FR	IT	NL	PT	SI	FI	SE	UK	EU-28	CHANGE
1990	-	-	-	-	14.92	0.30	-	-	-	-	0.01	-	15.23	
1992	-	-	5.20	0.40	18.96	0.40	-	-	-	-	0.15	-	25.11	23.3
1993	-	-	7.00	0.90	18.93	0.50	-	-	-	-	0.27	-	27.60	9.9
1994	-	-	8.20	0.90	20.51	0.80	-	-	-	-	0.31		30.72	11.3
1995	-	-	8.70	1.29	21.43	1.10	-	-	-	-	0.42		32.94	7.2
1996	0.32	-	8.85	1.10	24.79	1.30	0.03	-	-	0.02	1.10		37.52	13.9
1997	0.56	-	10.07	1.30	27.58	2.40	0.07	-	-	0.05	1.33		43.36	15.6
1998	0.79	-	10.16	1.52	29.98	3.64	0.09	-	-	0.06	1.61		47.83	10.3
1999	0.80	-	11.59	1.67	32.36	4.46	0.10	-	-	0.05	1.81		52.86	10.5
2000	0.87	-	13.93	1.94	34.75	5.09	0.11	-	-	0.07	2.05		58.80	11.2
2001	0.89	-	15.52	2.08	37.40	6.76	0.19	-	-	0.06	2.23		65.13	10.8
2002	0.91	-	15.26	2.18	39.86	7.08	0.20	-	-	0.14	2.39		68.01	4.4
2003	0.88	-	17.46	2.03	39.60	7.43	0.66	-	-	0.20	2.40		70.66	3.9
2004	0.94	0.00	19.60	2.09	41.44	7.93	0.66	0.44	-	0.16	2.42	0.44	76.11	7.7
2005	0.98	0.01	20.85	2.32	43.13	8.55	0.69	0.49	-	0.31	2.33	0.45	80.11	5.3
2006	1.00	0.15	21.64	2.70	44.85	8.91	0.73	0.51	-	0.44	2.49	0.90	84.32	5.2
2007	1.02	0.33	21.92	2.59	47.97	8.82	0.80	0.51	-	0.58	2.78	1.39	88.70	5.2
2008	1.08	0.25	23.33	5.48	52.56	8.88	0.87	0.53	0.01	0.62	2.99	0.99	97.60	10.0
2009	1.06	0.24	22.56	11.51	51.86	10.75	0.92	0.53	0.02	0.60	3.05	1.01	104.10	6.7
2010	1.06	0.27	23.90	11.72	51.89	11.61	0.29	0.52	0.02	0.65	2.94	1.01	105.87	1.7
2011	0.91	0.29	23.31	11.23	52.04	12.28	0.31	0.47	0.01	0.71	2.83	5.98	110.35	4.2
2012	0.91	0.27	24.75	11.18	51.09	12.79	0.32	0.46	0.01	0.71	2.95	4.36	109.80	-0.5

SOURCE: EUROPEAN COMMISSION, 2014D

It must also be mentioned that this threat is also working the other way around. As the economy is recovering, GDP is expected to rise and the freight market will continue to grow with it. Therefore, the effect of rail freight traffic, and the opportunities of an increased role of rail freight in intermodal transport in Belgium, might have an impact on passenger traffic as well. This might result in even bigger delays and network failures, impacting again the rail freight sector itself. As an illustration, a graphical indication of the traffic on the rail network in Belgium is given in figure 49 (Stojadinovic, 2015).

FIGURE 49: PERFORMANCE OF HIGH-SPEED RAIL TRANSPORT



SOURCE: EUROPEAN COMMISSION, 2009

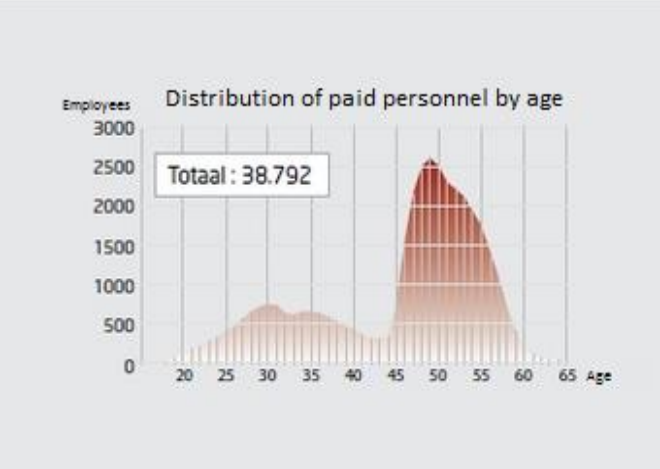
In conclusion, Hoet (2014), Buyse (2014) and Thys (2014) also indicate the threat that passenger trains in Belgium always receive priority over freight trains, impacting the efficiency of the cargo transport by rail. Passenger trains running in delay can even claim a capacity slot on a rail track from a freight train running in time. Therefore, a clear political choice has to be made and policy measures have to be taken in order to structure both markets in a more balanced way. This once again decreases the flexibility of rail transport, lowering the attractiveness for certain businesses to use, or even start using this mode of transport as this is a major issue within their risk analysis when studying their logistic chain options (Crozet et al., 2014; De Rocker, 2014).

4.4 Shortage of capable personnel and ageing of existing personnel

One of the other threats for rail transport and intermodality is the possible future lack of train drivers. This shortage could be explained due to good employment terms at the historical national rail companies in combination with the need for more train drivers after the liberalization. Therefore, the newcomers and private operators and traction companies are faced with troubles attracting competent train drivers. As a result, Crossrail among others started to train the machinists themselves in their training centre. Nevertheless this process is taking a lot of time and could prove to be cost-inefficient as the educated train driver could leave the company at any time, not bringing the expected added value after training (Le Jeune, 2014; Mobiliteitsplan Vlaanderen, 2010).

In this respect, Buyse (2014) points out that the education of new personnel should become more flexible. Le Jeune (2014) also indicates that Europe should apply one language within the intermodal rail transport, as a part of the earlier mentioned standardization to reach a single European transport network. Drivers on a specific rail path should also be trained on the most common and necessary procedures, but the question is raised whether it would be really necessary for each train driver to know all the different details and procedures of each possible rail path. This is enforced by Cuypers (2014), giving the example of the comparison between the routes Rotterdam-Munich and Hamburg-Munich. These rail paths have the same distance, although the former one is 20% more expensive. As it has been discussed earlier, the different standards when a border is crossed result in the need for different equipment. But even more, the train drivers for this rail path will need additional certificates and need to know three languages (Dutch, French, German) instead of only the national German language on the Hamburg-Munich route.

FIGURE 50: AGE PYRAMID OF THE SNCB PERSONNEL GROUP



SOURCE: VAN GYES, 2012

In a more general way, also recruitment remains a big challenge within the rail sector. Especially the SNCB group has a very biased age pyramid, with a majority of the personnel between 45 and 60 years old as shown in figure 50. These people have an increased wage cost due to seniority compensations. In the past, periods of hiring were combined with periods of a stop in recruitment. This results in the situation that in the coming years almost 40% of the personnel will retire. The group therefore has to hire every year between 1,800 to 2,200 new people. Also for them, finding the necessary skilled technical personnel is a major challenge, as the image of the rail sector is not always as positive making it less attractive to young employees. Engineers and electro-mechanics are the most wanted. In the recruitment of train drivers, the biggest problem remains the long hiring period, since training and internship are required. In addition, this recruitment is accompanied by a substantial fall-out: In 2009, 336 people started the hiring process to become a train driver, however only 255 of them could obtain the needed certificate (European Commission, 2013b; Finger, 2014; SNCB, 2008; Piette, 2015; Van Gyes, 2012).

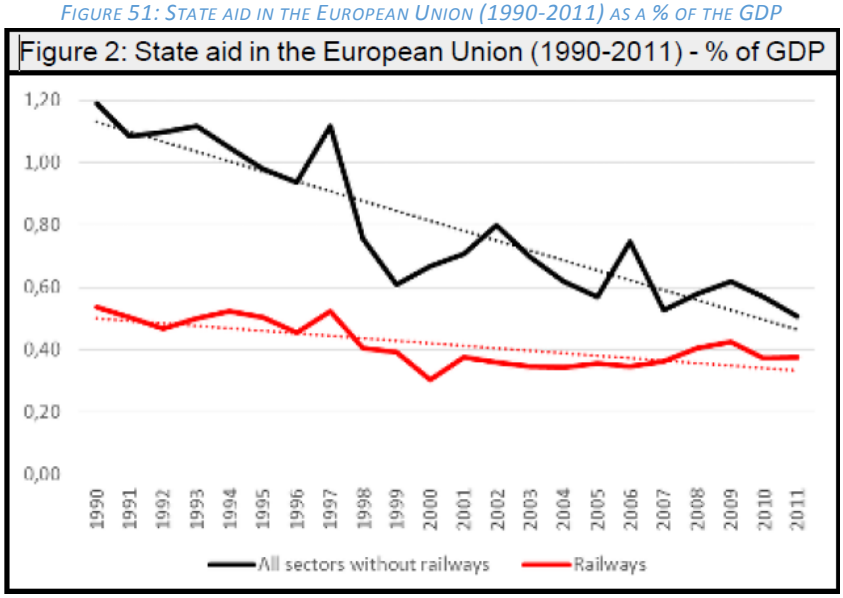
4.5 Shortage of (operational) subsidies

In the past, the Belgian Federal government provided financial aid for combined transport (approximately 4.5 million euro per year) and single wagonload transport (approximately 10.5 million euro per year) in Belgium. In section 4.2, the decrease of subsidies to the single wagon transport has already been quoted. In addition, the operational subsidy for combined rail transport is only applicable to intermodal transport units on the national connections. This policy started in 2009 and was aimed at increasing the rail freight share because of environmental concerns. The beneficiaries of the combined transport subsidy are the operators who are taking the contractual responsibility for intermodal transport, mainly the rail transport companies who are in charge of the traction of the wagons. The amount of funding depends on the amount of transported kilometres (FOD Mobility and Transport, 2013).

As shown in figure 51, the state aid for railways in the European Union has decreased over the last decades. Belgium however still has one of the greatest government expenditures for the railways per line km railway as it can be seen in figure 52. The graph should be interpreted as each km of the railway network being publicly subsidized with an amount of over 700,000 euros. If this would fall out under the current savings climate, this could pose a serious threat for the sector.

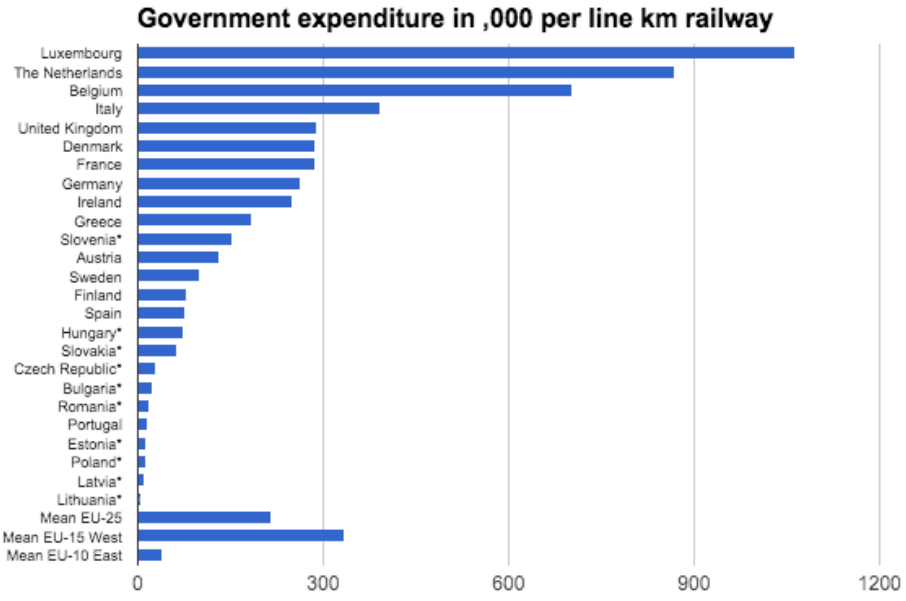
Concerning intermodal freight traffic in Belgium, Santos et al. (2015) state that the importance in Belgium could not be underestimated. Therefore the Belgian Government provided some substantial subsidies for this type of transportation, although this financial support has been halved over the past 7 years, from 30 million euros in 2007 to only 15 million euros in 2014. Within their study, a scenario was analysed where all government subsidies would be revoked. The outcome of this action would be a small rise of road transport flows (1%) and a reduction by almost 9% in total rail transport flows and by 40% in intermodal terminal flows.

FIGURE 51: STATE AID IN THE EUROPEAN UNION (1990-2011) AS A % OF THE GDP



SOURCE: ARRIGO & DI FOGGIA, 2013

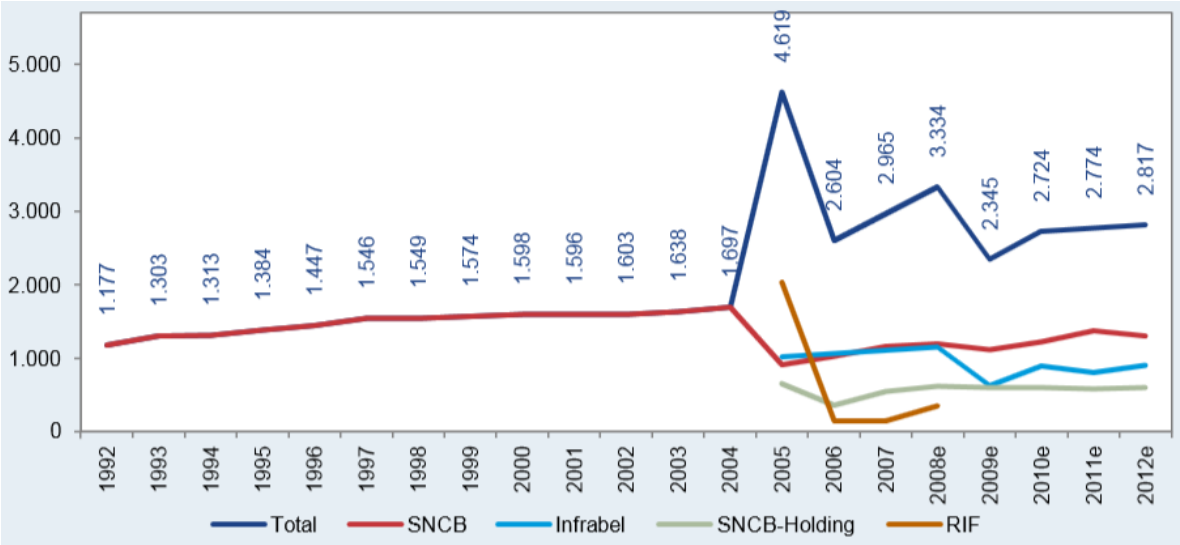
FIGURE 52: GOVERNMENT EXPENDITURE IN THOUSANDS PER LINE KM RAILWAY



SOURCE: CRÖSSEMAN & MAUSE, 2014

Following the statistics from Deville & Verduyn (2012) in the working paper of NBB on the implementation of EU legislation on rail liberalization in Belgium, France, Germany and The Netherlands, the change in the division of the state subsidies to the national Belgian railway group can be analysed. Figure 53 shows that before the reorganization of the institutions, 1.5 billion euros of subsidies were received. After the change in the structure of the group, this amount raised significantly to an average of 3 billion euros per year.

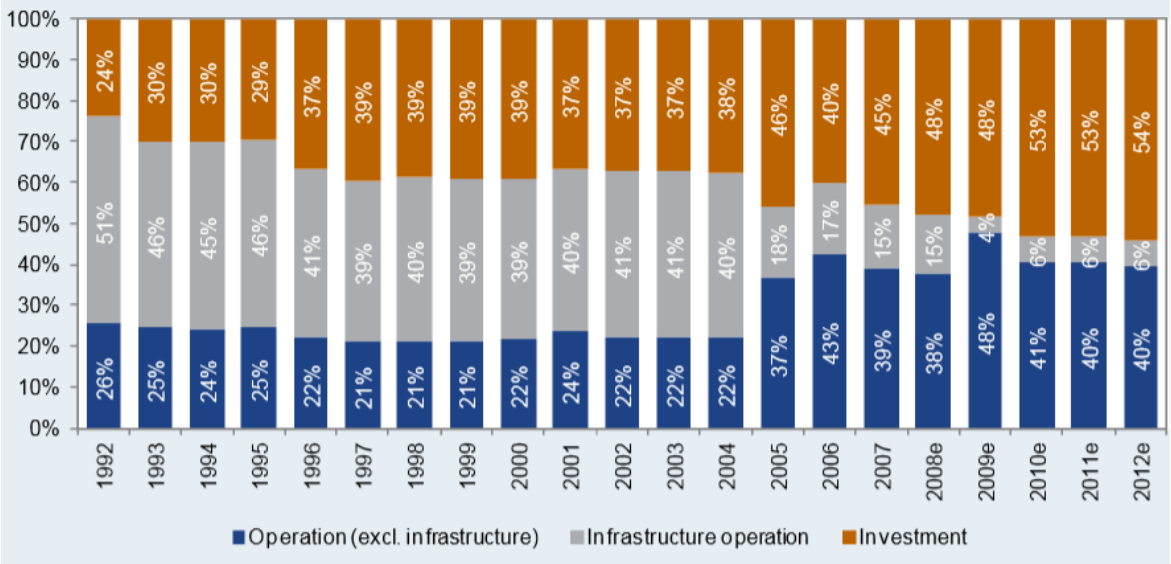
FIGURE 53: STATE SUBSIDIES TO THE SNCB GROUP AND RAILWAY INFRASTRUCTURE FUND (IN MILLIONS OF EURO)



SOURCE: DEVILLE & VERDUYN, 2012

Analysing more into detail the split of the subsidies, it can be noticed that operating subsidies for infrastructure have decreased compared to subsidies for investment and other operations (figure 54). The main reason can be found in the fact that Infrabel receives income from the different rail operators using the existing network, which constitutes their principal source of income. In addition, the organizational and structural change of the SNCB group in 2005 needs to be taken into account (Van Gastel, 2014).

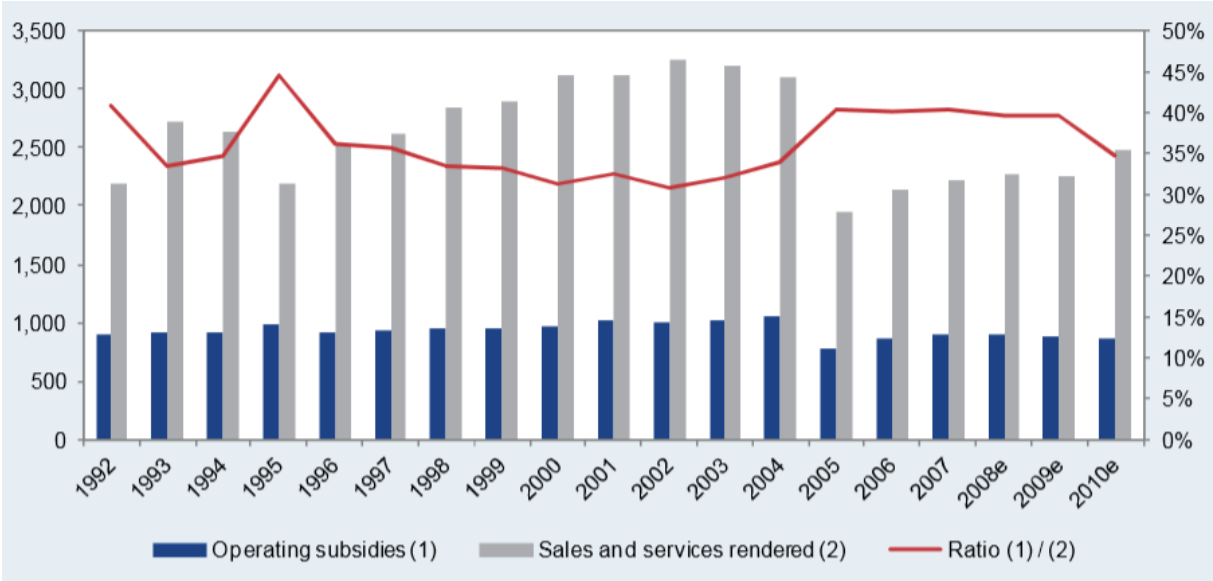
FIGURE 54: STATE SUBSIDIES TO THE SNCB GROUP BY CATEGORY



SOURCE: DEVILLE & VERDUYN, 2012

Figure 55 shows that the operating subsidies of the SNCB-holding, mainly used for training, security, e-ticketing, the equipment of the regional express network and the deficit of high speed trains, has remained stable over the years, though a drop can be noticed after the reorganization of 2005.

FIGURE 55: OPERATING SUBSIDIES AND REVENUES OF SNCB-HOLDING (MILLION EUROS)



SOURCE: DEVILLE & VERDUYN, 2012

The fact that a lack of proper operational funding or subsidies could hold a serious threat was also demonstrated in the past according to Houtman (2014). When the Belgian Government decided to cut back on public funding in the eighties, a backlog in terms of network and infrastructure maintenance was build up. This has as a consequence that currently a big part of the network and infrastructure needs maintenance and modernization at the same time. In order to do so, Infrabel created the renewal program 2015-2025. This program is based on the hypothesis that the proper funding from the government would be obtained. It is still unclear with the new government if these subsidies, and as such the renewal plan, will be able to continue as planned or which parts will be changed.

In conclusion, Buyse (2014) has some interesting remarks on the threat of lower subsidies for the rail sector, and more specifically for the development of intermodal transport using the rail opportunities:

- It can be questionable to defend the need for subsidies on standardization and increased interoperability measures, when at the same time the sector is arguing that this improvement could bring a cost decrease of 20%.
- Financial support is needed to avoid structural barriers or a disturbance in the market, such as the priority of delayed passenger trains over freight trains running on time as mentioned in chapter 4.3. These should be time-limited measures used as a general policy for the start-up of intermodal transport.
- The same applies for support to optimization of the sector, such as direct investments in longer and heavier trains, which can be the catalyst of improved intermodal transport. Cuypers (2014) supports this statement and indicates that operational subsidies do not create the necessary stability within the market as they can always be cancelled at some point in time, bringing some unwanted effects and shifts in transport mode.
- Financial support should also only cover the additional costs that rail transport has to carry for its infrastructure and terminal handling costs. This can be done either directly or with a financing model.

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DELIVERABLE 1.1 - 1.2 E: Sustainability impact of intermodality

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The SWOT matrix allows us to analyse the internal strengths and weaknesses and the external opportunities and threats, permitting us to consolidate our strengths, develop strategies to act directly on the weaknesses, take advantage of opportunities and reduce threats. (Table 1)

To analyse the sustainability impact of intermodality, the Life Cycle Assessment (LCA) methodology will be used. LCA methodology provides a system perspective analysis that allows to assess environmental impacts through all the stages of rail freight system (rail operation, rail equipment and rail infrastructure), from raw material extraction, through material's use to disposal. The LCA methodology allows us to study complex systems like intermodal transport, and to model as good as possible the environmental impacts of several pollutants in numerous categories of the railway freight intermodality.

The SWOT matrix is mainly built around the characteristics, disadvantages and advantages on LCA methodology, rather than the SWOT elements of sustainability of intermodal transport itself.

TABLE 1: SWOT – SUSTAINABILITY IMPACT OF INTERMODALITY

Strengths	***Weaknesses***
1. International reputation of Life Cycle Assessment methodology as environmental tool 2. Existing literature about transportation in several countries 3. Available software and accessible commercial databases relative to generic transportation impacts 4. Possibilities of developing specific countries and/or scenarios databases 5. Network of international scientific experts in the transportation field	1. Development of a new methodology taking into account accidents damages, noise impact and land use planning for impact assessment 2. Difficulties to regionalize impacts 3. Difficulties to divide impacts of infrastructure between passengers and freight transportation 4. Freight transportation is a new field of knowledge in the LCA field in general 5. Commercial transportation databases are non-specific to Belgium and should be improved and updated
Opportunities	***Threats***
1. Interest of stakeholders to provide needed information and to use results 2. Improvement of transport databases and improvement of transportation impacts on environment and associated costs relative to air pollution 3. Development of a transportation plan including environmental aspects for the future and then allowing the reduction of GHG emissions or other pollutants 4. Willingness of Europe to promote intermodal transportation (internalization of external costs)	1. Lack of data concerning emissions for the assessment of transportation impacts and data concerning building infrastructure 2. Lack of specific Belgian data for freight transportation (machine type, roads, capacity, energy supply, etc.) 3. Existence of 13 rail freight operators, leading to some difficulties in getting consolidated results 4. Difficulties to get an overall view of the Belgian situation due to regionalization of data for freight transport (fluvial navigation)

TABLE 1: SWOT – SUSTAINABILITY IMPACT OF INTERMODALITY
SOURCE: CHAPTER SUMMARY (OWN CREATION)

1. STRENGTHS

1.1 International reputation of Life Cycle Assessment methodology as environmental tool

The Life Cycle Assessment methodology, developed in 1970 and improved continuously through the years, is known as a reference to assess in a quantitative and multi-criteria way environmental impacts. This methodology is also standardised by ISO Standards 14040 and 14044 (International Standardization Organization, 2006), and the ILCD Handbook (European Commission, 2010; European Commission, 2011) developed by the European Commission launched in 2010. It became the reference in Europe to perform an LCA. The continuous development of this methodology allows it to be up-to-date and to model as good as possible the environmental impacts of several pollutants in numerous categories.

1.2 Existing literature about transportation in several countries

An initial search of scientific literature, allowed us to identify several articles dealing with transport in several countries (Facanha, 2006; Fries & Hellweg, 2014; Spielmann & Scholz, 2005). The existing literature will allow us guide future data collection and to compare the results obtained.

Environmental impact studies on intermodality transport show that rail freight transport is the land-based transport that has a higher environmental performance (more fuel-efficient shipping alternative (Hendrikson, 2006)) compared to intermodal road-rail and all-road transport (Fries & Hellweg, 2014; Facanha, 2006). This is especially the case when electrified railway is used (Spielmann & Scholz, 2005). But there is not always a direct rail link, so the intermodal road-rail transport is generally shown as the best alternative.

The increased demand for rail transportation raises the need for the expansion of the railroad system and the environmental effects that infrastructure construction entails should be taken into account (Spielmann, 2007).

LCA studies demonstrate the importance of all life-cycle phases (infrastructure, vehicle production, and pre-combustion processes) and not only the modelling of fuel combustion for the assessment of transport. They will become even more important than direct emission due to the introduction of new engines and emission reduction technologies (Facanha, 2006; Spielmann & Scholz, 2005).

1.3 Available software and accessible commercial databases relative to generic transportation impacts

Commercial software has been developed to allow an easier use of LCA methodology (e.g. SimaPro software). They allow calculating of environmental impacts using specific impact assessment methods. They also provide commercial databases as Ecoinvent (Weidema, 2013) giving the inventory of numerous processes (e.g. transportation of one ton over one km by lorry).

The provided datasets allow a preliminary screening of the importance of transport processes within a product life cycle (Spielmann & Scholz, 2005). This information allows an easy comparison with specific results and will give clues to improve environmental impacts in the transportation field.

1.4 Possibilities of developing specific countries and/or scenarios databases

Even if generic commercial databases are available, there are possibilities to build specific databases relative to a specific process and/or country. It allows a better modelling of the obtained environmental impacts and improves then the specificity of the results.

The UNEP/SETAC Life Cycle Initiative "*Global Guidance Principles for Life Cycle Assessment Databases*" (UNEP/SETAC, 2011) and the general guidance and data collection sheets in ISO 14040 and ISO 14044 (International Standardization Organization, 2006) as starting points provide guidance for developers and users on how to develop a unit process dataset and how to document the procedures in a structured way.

1.5 Network of international scientific experts in the transportation field

Information relative to the transportation field and needed for the LCA study is accessible and available through a network of scientific experts who will give the most accurate values for the Belgian inventory. These experts have been already identified and contacted and will be interviewed to get as many data as possible to model our Belgian inventory.

2. WEAKNESSES

2.1 Development of a new methodology taking into account accidents damages, noise impact and land use planning for impact assessment

To achieve the objectives of the study, it is required to improve the current methodology with the development of new impact categories relative to accidents damages (Fries & Hellweg, 2014), noise impact (Althaus, 2009 and Cucurachi, 2012) and land use planning (Koellner, 2013) for impact assessment.

The use of LCA method in the transport sector shows its methodological limitations. Indeed, significant and relevant environmental impacts such as those related to accidents damages, noise impact and land use planning, are not adequately measured using the current LCA methodology. Therefore, the development and harmonization of new indicators in the LCA methodology such as accidents damages, noise impact and land use planning are required.

2.2 Difficulties to regionalize impacts

Currently, life cycle impact methods give environmental impacts in terms of "*European*" or "*Global*" burdens. The regionalization of the impacts (e.g. the production of steel in China with the associated emissions and its implementation and end-of-life in Europe) is difficult to take into account. The location where the pollutant emission appears is not taken into account in current methodologies, but the regionalization begins to be developed and implemented. This aspect will be important especially concerning railway systems, where pollution can appear in urban or non-urban locations and the environmental impacts can vary.

2.3 Difficulties to divide impacts of infrastructure between passengers and freight transportation

Common use of infrastructure between passengers and freight transportation entails the difficulty of the distribution of each impact between each type of transport. For rail infrastructure, allocation between passenger and goods transportation is unavoidable (Spielmann & Scholz, 2005).

2.4 Freight transportation is a new field of knowledge in the LCA field in general

Compared to other fields of research, the freight transportation topic is a less-studied field in Life Cycle Assessment. That can lead to data gaps on some boundaries of the system, or the need for relevant impact categories as already mentioned above. An extensive search and reading of literature has been made (see annexe I-II-III):

- 26 papers or reports about freight and intermodal transport;
- 12 papers or reports about Life Cycle Assessment freight rail;
- 16 papers or reports about noise impacts in Life Cycle Assessment;
- 13 papers or reports about Land Use impacts in Life Cycle assessment;
- 6 reports about external cost of transport.

2.5 Commercial transportation databases are non-specific to Belgium and should be improved and updated

Up to now, there are no Belgian specific commercial transportation databases and current databases should be improved and updated. One aim of the study is to develop a transportation database specific to Belgium. We will take as a model the Swiss transport database included in Ecoinvent database, which is the most comprehensive transport database available. One thing to take into consideration is that the rail freight transport in Switzerland is mainly done with electric traction which is not the case in Belgium where a combination with diesel traction appears (Spielmann, 2007).

To model the Belgian database, the existing literature will be also taken into account, as well as the valid Product Category Rules (PCR) for railways (The International EPD® System, 2014) and the available Environmental Product Declarations (EPD).

3. OPPORTUNITIES

3.1 Interest of stakeholders to provide needed information and to use results

The application of the results of the study, promotes the interest of the stakeholders (transport sector members, freight operators …) to provide needed information. Thanks to their interest, the accessibility to accurate and relevant data will be easier and will reflect the current and future situation in Belgium.

Obtained results could be used as criteria to help deciding on the development of intermodal transportation in Belgium. Up to now, it is difficult to precise what kind of policy effect study could have, but it could be a help in decision for a regulation relative to an intermodal transportation network.

3.2 Improvement of transport databases and improvement of transportation impacts on environment and associated costs relative to air pollution

These results will improve the accuracy of transport databases and potentially improve the environmental impact of transport. Results will highlight clues of improvement in terms of rail transportation for several impact categories in e.g. climate change, ecotoxicity, acidification or human toxicity (cancer and non-cancer related).

Based on these results, associated costs could also be reduced or improved based on the well-managed pollution. Furthermore, these results could help in making optimised policy decisions relative to intermodal transportation that allows pollution reduction.

3.3 Development of a transportation plan including environmental aspects for the future and then allowing the reduction of GHG emissions or other pollutants

Development of a transportation plan including environmental aspects for the future and allowing the reduction of GHG emissions or other pollutants is another major opportunity. Based on developed scenarios, environmental impacts (including effects on human health and ecosystems) will be a criterion to help in decision-making concerning future developments for rail transportation.

3.4 Willingness of Europe to promote intermodal transportation (internalization of external costs)

Willingness of Europe to promote intermodal transportation by internalization of external costs is the last opportunity addressed in this field. The combination between the LCA approach and monetization of impacts will allow obtaining a precise analysis of external costs of rail transport (Ricardo-AEA, 2014), and then provide information to promote this intermodal transportation.

4. THREATS

4.1 Lack of data concerning emissions for the assessment of transportation impacts and data concerning building infrastructure

Currently, there is a lack of data concerning direct emissions (mainly in air: CO_2, NOx, SOx, NMVOC, particles...) for the assessment of transportation impacts and concerning building infrastructure. For data collection, more reliable sources of information will be identified and we will proceed to the drafting of questionnaires for the collection of information through interviews with different stakeholders (transport sector members, vehicle manufacturers, freight operators and project partners).

4.2 Lack of specific Belgian data for freight transportation (machine type, roads, capacity, energy supply, etc.)

There is no publication relative to the state-of-the-art for Belgian freight transportation and technical data. To collect needed data of the rail transport system in Belgium, several interviews with stakeholders have been concluded (e.g. Infrabel).

The inventory phase (data collection) for the Life Cycle Assessment of the railway infrastructure has already begun. Moreover, questionnaires have also been developed to obtain information from the stakeholders (mainly Infrabel) to analyse the environmental impacts from the railway infrastructure (track, bridges, tunnels and electric installations).

4.3 Existence of 13 rail freight operators, leading to some difficulties in getting consolidated results

There are currently 13 rail freight operators and traction companies in Belgium (CFL cargo, Captrain Belgium, Crossrail Benelux, DB Schenker Rail Nederland, ERS Railways, Euro Cargo Rail, Europorte France, SNCB Logistics, Railtraxx, Rotterdam Rail Feeding, SNCF Fret, Trainsport and PKP Cargo). This will lead to some difficulties to obtain consolidated data regarding rail operation and equipment.

A first round of contacts will be made to identify rail operation and equipment used by the companies to proceed with a second stage in which we delve into the analysis of rail operation and equipment identified as most representative.

4.4 Difficulties to get an overall view of the Belgian situation due to regionalization of data for freight transport (fluvial navigation)

Difficulties arise to get an overall view of the Belgian situation due to regionalization of data for freight transport, especially fluvial navigation. Flemish and Walloon situations should be studied separately and afterwards combined and compared in order to get an overall view of the current Belgian situation and to develop future scenarios.

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DELIVERABLE 1.1 - 1.2 F: Regulation policy

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Analysing the historical details of regulation and market analysis in Belgium, it is clear that the rail market is moving towards a certain extent of liberalization. During the last years, the rail freight market has been opened for new companies to enter. This is expected to lead to an increase in cost-efficiency and higher competitiveness on the market. However, the percentage of the incumbent rail company in Belgium is still much higher compared to the neighbouring countries. Therefore, concerns are rising about the abuse of the dominant position of the incumbent companies, not only in Belgium but throughout the European continent. Currently, there are different normative acts over the different EU countries, while the European Commission can only issue directives regarding the future targets or necessary acts. As a result, there is a common belief that the transport regulations on different technical and administrative aspects in the EU states should be harmonized. In this manner, a standardization in the policies concerning technical specifications and other adjacent legislation (safety, labour, signalling, etc.) can be accomplished. This will help in dealing with the increasing demand and promoting the trans-European and international railway logistics and its opportunities within the intermodal sector.

In this chapter, the impact of regulation policy on intermodal transport will be investigated. It can be considered as a set of measures and rules that are taken, in order to obtain a result that might otherwise not be produced, to prevent events from happening or to manage the timeframe in which the events will take place, and to which extent they will occur. Regulation policy can take into account a wide range of effects, going from market entries, to price discrimination, obtaining industrial standards, lifting employment barriers and taking into account pollution effects. In order to develop intermodal transport, different governmental levels and the transport sector itself, have already taken a number of actions that could be classified under regulation policy. They will be investigated together with some expected opportunities and threats in this field.

TABLE 1: SWOT – REGULATION POLICY

Strengths	**Weaknesses**
1. Liberalization of the market: less monopoly, which leads to cost-efficiency, higher competitiveness 2. Less governmental involvement: less ownership and management by the government	1. High CAPEX investments to enter the market 2. Network access is weaker comparing to road transport 3. Not completely fair competition because of existing power of the major market players, which leads to discrimination in path allocation and discriminatory or excessive charges
Opportunities	**Threats**
1. Creating a single European Market can simplify the freight transport along the European corridors, bringing further standardization of the technical specifications and national legislations	1. Different legislations throughout the European Union 2. Evolution to a limited number of European widespread multinational companies, instead of many different competing companies 3. The danger of overregulation

SOURCE: CHAPTER SUMMARY (OWN CREATION)

LIST OF FIGURES AND TABLES

1. STRENGTHS

1.1 Liberalization of the market: less monopoly, which leads to cost-efficiency and higher competitiveness

During the past decades, the road freight share has increased substantially. This rise occurred under the development and innovations of the industry, the increased opportunities in Eastern Europe as described in the chapter on macro-economic influences, as well as the increase in logistics efficiency and the open competition due to liberalisation of the sector. On the other hand, for railway freight it can be seen that the market has been stagnating and remained almost at the same number of tkm during the last decades, whereby the market share decreased. The European Union therefore came up with directives on the promotion of railway freight logistics concerning its sustainability, traffic efficiency and other advantages compared to road transportation (European Commission, 2013).

Due to European obligatory regulation, transportation of railway freight in Belgium has been liberalised as from 2005. This process of liberalisation has been finished in 2007, leaving the market open for competition. The action resulted in the entrance of new railway operators on the Belgian railway network. In section 4.3 of the part on the sustainability impact of intermodality, the 14 players are listed who are currently holding the required licenses and permits to be active on the network. Nevertheless, not all of these players are also currently using the Belgian rail network. It is also worth mentioning that in 2010 the international passenger transportation by rail was also liberalized in Belgium. Nevertheless this has not lead to a major increase in international passenger operators on the Belgian network, leaving Eurostar and SNCB Europe as the only two players in this field (INFRABEL, 2011).

Within Europe, the liberalization of the national freight markets has increased the cross-border competition, aiding the creation of the desired EU internal market for rail. In order to achieve the reduction of emissions and the desired modal shift, as it was discussed in the macro-economic influence of rail transport, the European Commission sees a more competitive and efficient rail industry as a first necessary step. With the rise of standardization, barriers are broken and a more competitive rail sector could be obtained. In this respect, liberalization of the market leads to the fact that each European railway company with the needed licenses and safety certifications can apply for capacity on each national and international freight service desired. In order to maintain non-discriminatory access to the network infrastructure, liberalization has also foreseen to separate the infrastructure manager, Infrabel in the case of Belgium, from the railway companies (European Commission, 2013; Paardenkoper, 2009).

During the interviews performed with the panel of experts involved in this project (Buyse et al., 2014), two strong opinions were noted. One side is claiming that liberalization has not led to a free market as such, and is therefore still very limited. They fear that in Belgium the existing big players will eventually consume the smaller players, leaving only certain niche markets open for competition. At the European level, the same process might take place, leaving only a number of European Rail operators left in the field. This will be discussed in section 4.2.

Although the liberalization has been completed, and should have made the market more dynamic, the group believes this has not come true and that liberalization therefore has not been fulfilled. The difficult access market, high investments for entering the market and safety and certificate requirements are some main reasons why it is difficult for new players to enter the market and start increasing the competition. This will be discussed during the weaknesses of this chapter. Liberalization in its full extent might also have the perverse

effect that pure private operators would only operate the profitable block trains, leaving the single wagon market untouched and vulnerable for disappearing. This would decrease the service to the market.

In addition, the panel of experts claims that the earlier mentioned competition, supposed to be created due to liberalization of the market, is only artificial but necessary to create the transition of railway operations from a national level to a European level.

The other side of the expert panel is claiming that liberalization has not shown its true potential yet, and would need some time to become more established within the rail sector. It can be seen that, although limited, new players are continuing to enter the market. The main problem for liberalization to reach its full potential might be the fact that there is a lack of cooperation. If this would be introduced, an increased bundling effect, necessary for intermodal transport, would mean an uplifting effect for the free market to capture these new opportunities.

Figure 1 is showing the degree of market opening in terms of rail freight, as a percentage of tkm in total market share from the private principal undertaking. For Belgium, we can see that there is a steady increase of this share between 2006, when the liberalization process was in development and a share of only 0.02% was reached, and 2012, with a considerable share of 13.39%. Compared to the neighbouring countries however, this is still a rather low number.

Regarding the situation on the Belgian rail freight market, figures 2 and 3 give a more detailed overview on the development of the freight traffic and market share trends of the national operator, compared to some early new player on the liberalized market. It is clear that the national operator has lost part of its market share, but clearly remains the dominant player in the field. Captrain, a subsidiary of SNCF, and Crossrail are the greatest contributors to an increased competition with a market share of respectively 4.3% and 6.3% in 2010. It needs to be mentioned that Crossrail is not a full operator, but a traction company. The difference exists in the fact that for example Crossrail as a traction company is not responsible for the commercial completion of a train, but only for the traction on the destined path. One interesting trend to watch is the battle between the new operators and the national player in terms of recapturing the traffic which was lost due to the crisis in 2009. As the economy is gradually recovering and policy is tending towards a more sustainable split, it is expected that the rail freight share will rise again, leaving opportunities for the new operators to capture these once again to be allocated flows (Deville & Verduyn, 2012; Le Jeune, 2014).

FIGURE 1: DEGREE OF MARKET OPENING IN RAIL FREIGHT

Rail:
DEGREE OF MARKET OPENING – FREIGHT

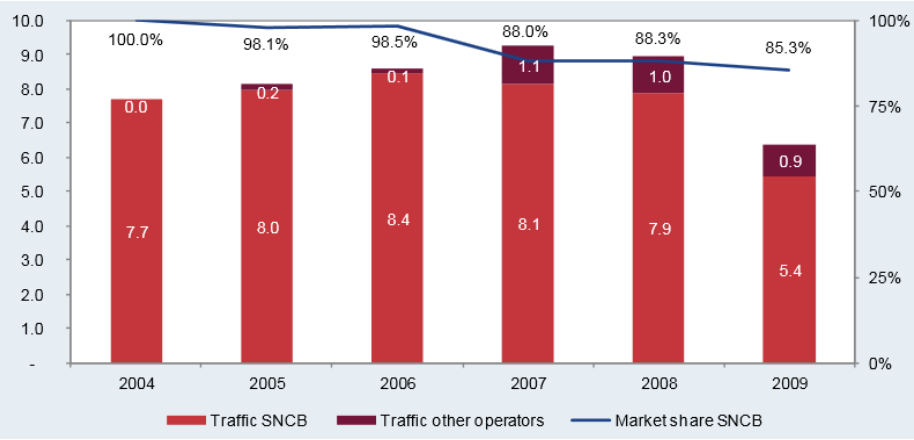
SHARE OF ALL BUT THE PRINCIPAL UNDERTAKINGS

%

	2006	2008	2010	2012
BE	0.03	6.10	11.82	13.39
BG	3.18	14.32	21.60	36.50
CZ			13.16	13.66
DK			25.00	27.00
DE	16.40	22.00	25.00	28.60
EE	30.60	49.00	45.00	30.00
IE	0.00	0.00	0.00	0.00
EL	0.00	0.00		
ES	4.90	5.00	8.08	16.75
FR	0.60	10.00	20.00	32.00
HR				
IT	11.50		24.10	24.10
CY	-	-	-	-
LV	10.60	9.57	23.30	22.60
LT	0.00	0.00	0.00	0.00
LU	0.00		0.00	0.00
HU	9.00	14.40	19.47	31.80
MT	-	-	-	-
NL	14.00	25.00	40.00	36.00
AT	10.00	14.00	14.60	17.60
PL	16.90	23.97	35.82	32.93
PT	0.00		9.00	
RO	26.70	40.99	54.70	53.68
SI	0.00	0.00	0.00	9.50
SK	2.90	2.00	2.03	11.76
FI	0.00	0.00	0.00	0.00
SE	32.50		40.00	
UK		44.20	51.40	53.60
NO		21.00	25.00	38.00

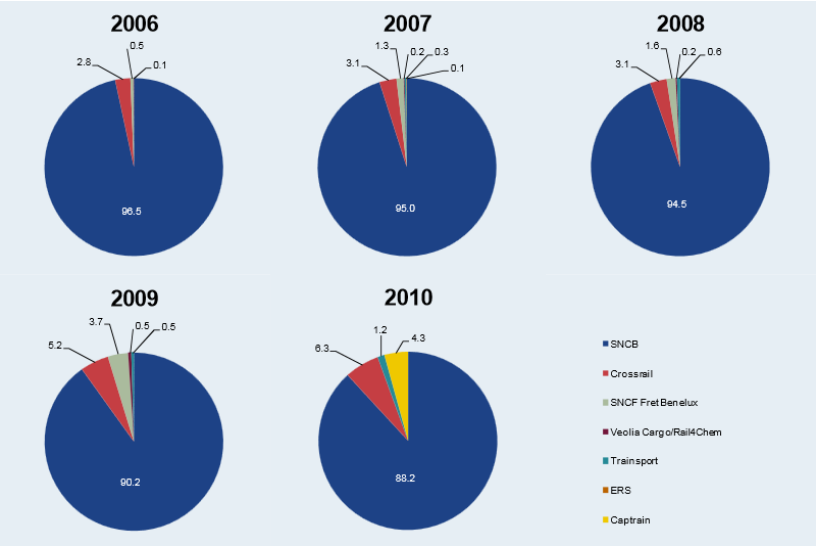
SOURCE: EUROPEAN COMMISSION, 2014

FIGURE 2: SNCB FREIGHT TRAFFIC (TKM BN) AND MARKET SHARE TRENDS



SOURCE: DEVILLE & VERDUYN, 2012

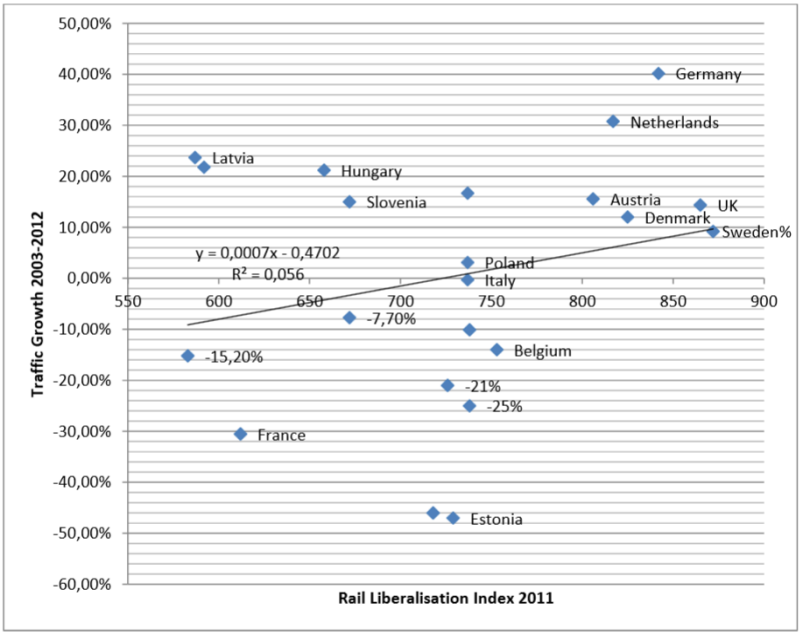
FIGURE 3: RAILWAY FREIGHT MARKET SHARE IN BELGIUM



SOURCE: DEVILLE & VERDUYN, 2012

In conclusion, Crozet et al. (2014) show that the degree of liberalization, measured by the Rail Liberation Index, does not necessarily correlate with the traffic growth. As shown in figure 4, Belgium is scoring in the middle concerning freight liberalization, although traffic growth has declined by 14% in the period 2003-2012. On the other hand, countries as Latvia and Hungary are scoring less in terms of liberalization, but did reach a traffic growth of above 20% in the same period. Therefore the focus should be more on obtaining a higher efficiency and affordable prices as a result of a free market, rather than taking liberalization as a goal in itself.

FIGURE 4: RLI AND RAIL FREIGHT TRAFFIC GROWTH (2003 – 2012)



SOURCE: CROZET ET AL., 2014

1.2 Less ownership, and as such management, by the government

Crozet et al. (2014) mention that the presence of the government within a sector is not a weakness in itself, but often this could lead to unnecessary organizational redesigns. Often these do not include the opportunities to optimize the production processes. In this way, a more efficient rail transportation could not be reached. Nevertheless, it often proves not to be easy for governments to leave sectors with great economical interest, such as rail transportation, to the self-regulation of the market. Therefore they will always try to have some degree of regulation or control within these activities (Deville & Verduyn, 2012).

As it was mentioned in the first section of this chapter, liberalization of the market is expected to lead to a more competitive environment for the operators, both existing and newcomers. It is estimated that a competitive environment also leads towards a more efficient organization of the operating companies. As the market will tend to regulate itself through this competition, the role of the government will fade away after the liberalization, containing the potential to grow towards a lean administrative force (European Commission, 2013).

Finger (2014) points out that governments can intervene in two different ways. First of all by ownership, which greatly depends on the political culture of a country, as well as the role of the trade unions that are active. This management of the government might decrease or become less under the influence of the liberalization of the rail freight market. A second way of intervening is through regulation. In this respect the role of the government will become even bigger in the future, as they believe more guidelines will be necessary to regulate the open market. In this point of view, the government will intervene more with the rail sector instead of less, which might lead to a threat of overregulation (Paardenkooper, 2009).

FIGURE 5: MAIN ROLES OF GOVERNMENT IN THE TRANSPORT SECTOR

1. Setting national transport strategy	The overall policy aims and framework that govern how railways and other modes of transport will be developed and operated.
2. Creating railway sector structures	Primary industry institutions, balance of public and private sector roles, and the competitive framework for railways .
3. Purchasing transport services	Methods by which governments specify and purchase railway services or special fare concessions on behalf of the community.
4. Regulating the industry	Institutions and methods of administering economic, technical, environmental or safety regulations.
5. Facilitating international railway integation	Inter-governmental frameworks that promote interoperability and seamless service across borders.
6. Establishing the administrative apparatus	The organization of ministries to perform the above roles generally including supervision of state-owned railways.

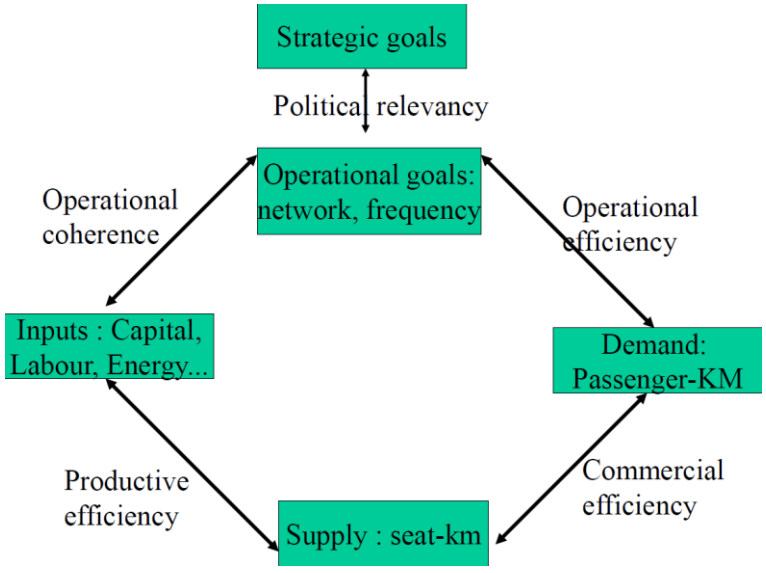
SOURCE: THE WORLD BANK, 2011

The World Bank (2011) has created an overview of the 6 mail roles governments play in the transport sector (figure 5). Within these roles, they state that the governments should guard "*primary industry institutions, a balance between public and private sector roles and the competitive framework for railways*". It is clear that governments need to take structural decisions in order to increase railway performance. In addition, the role of the state and the railway functions need to be clearly separated and specified, while a legal and regulatory framework should create a balanced environment for the market where state-owned and private railway companies can compete on equal terms without any market distortions. This statement is supported by Piette (2015), indicating that the current structure of the railway company in Belgium is blocking any improvement.

For the specific case of Belgium, there is no dedicated independent or governmental instance or administration focussing on the development of intermodal rail transport as such. The main part of the authority still remains with SNCB, or SNCB-logistics in the case of rail freight, defining the policy for rail transport. In The Netherlands, the decisions such as the yearly definition of the rail schedule, are made by the Rijkswaterstaat from the Ministry of Infrastructure and Environment. Due to this shift in authority, a more integrated approach can be reached, bringing an increase in results and efficiency. Also according to Infrabel, a lack of cooperation between the different governmental levels in Belgium can be noted, resulting in the absence of a unified vision for rail transport development (Cuypers, 2014; Houtman, 2014; Vancauwenberghe, 2014).

In conclusion, Crozet (2014) shows the importance of less governmental involvement in figure 6 below. Companies defining their operational goals are taking into account the forecast supply and demand, reaching commercial and operational efficiency. Based on these outcomes, productive efficiency is reached by estimating the necessary inputs. By doing so, the company can have an operational coherence with the operational goals that are set in the strategy. Nevertheless, when strategic goals from the government are imposed, depending on the political relevancy in the country, all efficiencies are put at risk as these strategic goals might not match the execution of the operational goals of the operating company itself (Stojadinovic, 2015).

FIGURE 6: INFLUENCE OF STRATEGIC GOALS, IMPOSED BY GOVERNMENTS, ON EFFICIENCIES AND OPERATIONS OF RAILWAY COMPANIES



SOURCE: CROZET, 2014

2. WEAKNESSES

2.1 High CAPEX investments to enter the market

One of the biggest barriers for the railways freight transporters to enter the foreign market lays in the large capital expenditures required to start up operations. Different types of investments are needed in the field of connections to the existing infrastructure, administration and service operations. Being a company with a national origin contains an advantage, SNCB Logistics had the opportunity to build their own network as well as the benefit of experience due to their historical operations. When the railway network is operated by a single monopolistic state-owned company, network infrastructure construction and management and network services are all controlled by the same instance. After liberalization, new entrants trying to use the already fixed infrastructure level, might need to take into account large sunk costs for building additional tracks and connections, creating a barrier to boost competition (Pham, 2013).

Following to the report of Pham (2013): "*this barrier to entry at the base level is usually referred to as a monopolistic bottleneck: the track owner is the sole upstream supplier of infrastructure access to train service operators. When the track owner also runs train services, they would obviously give prioritized infrastructure access to their own operations. As a result, unbundling this vertical tie between track management and train services is a vital move to increase market competition in network sectors.*"

Although the 4th railway package is supposed to take away all legal barriers for entering the railway market, even indicating that the owner of the existing infrastructure would be forced to provide a non-discriminatory access to competitors, it is clear that the high investments needed to enter the market will remain a weakness in the future to reach a higher level of competition within the rail freight market (Finger et al., 2014).

2.2 Network access is weaker compared to road transport

Network access is another obstacle that is keeping back the expansion of rail freight transport. Compared to road traffic, where deregulation started some decades ago and has led to an increased competition and efficiency, rail traffic is faced with a number of difficulties lowering the possibility to access the network (Crozet et al., 2014):

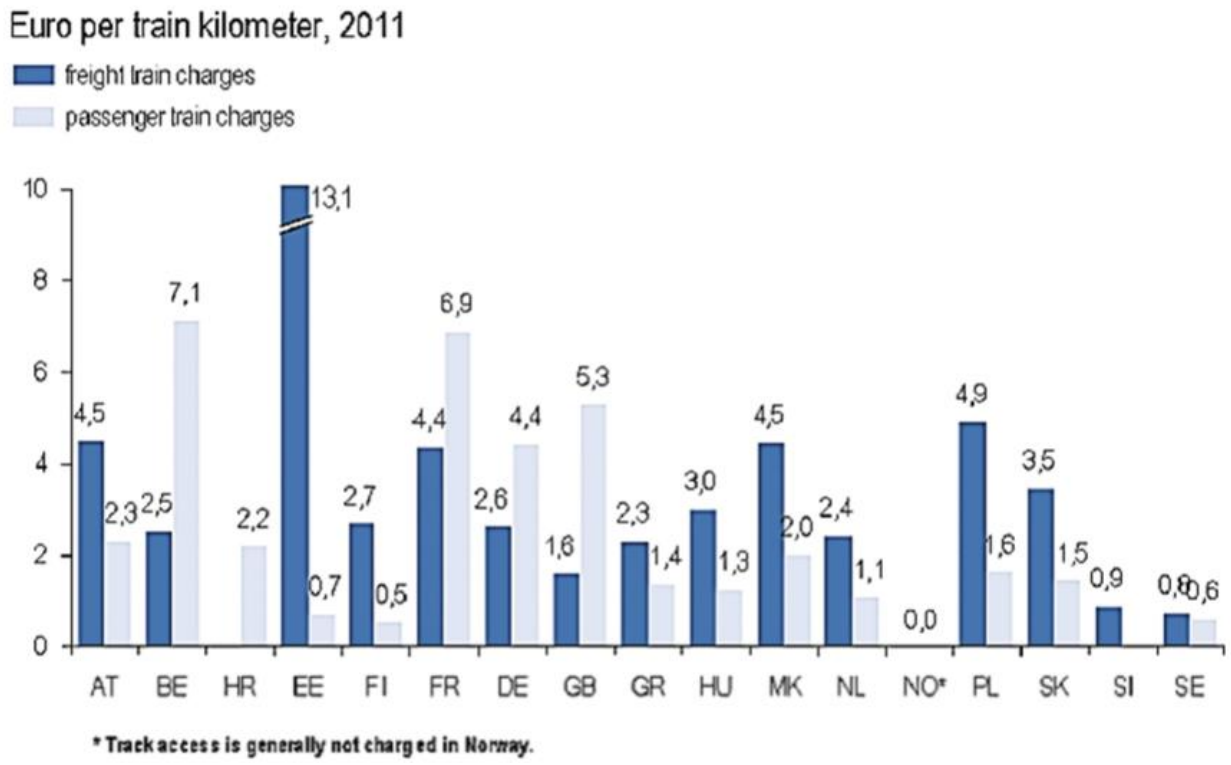
- A long planning procedure, often several months in advance.
- Freight wagons are not as common and more expensive compared to road vehicles.
- The rail network is only a fraction of the road network.
- The capital intensity which is typical for the rail freight sector, making it difficult for a lot of small players to operate in a profitable way on the market.

According to Finger (2014), the weakness of network access is mainly driven by regulatory obstacles, monopolistic positions, insufficient bundling opportunities and unfair competition. Therefore it is the regulators' work to follow up and prevent or stop these things from happening, as there are many ways to discriminate companies, preventing them from entering the market.

Figure 7 shows an overview of the different railway access charges in Europe. These charges did not exist before the liberalization, as infrastructure managers were mainly integrated within the state-owned railway company. The question remains whether these charges reflect the actual cost incurred by the infrastructure

managers. From the figure it is clear that great differences exist between the different European countries. Depending on strategic reasons, these access charges might be used to lower or increase the barrier for other players to enter the market (Crozet et al., 2014).

FIGURE 7: RAILWAY ACCESS CHARGES IN EUROPE

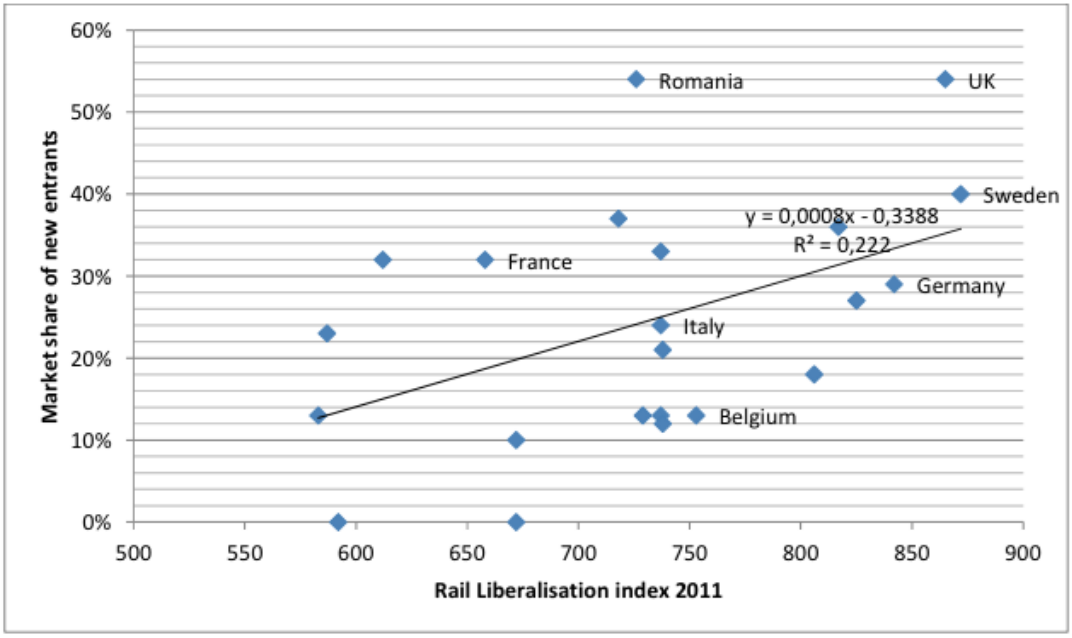


SOURCE: CROZET ET AL., 2014

2.3 Not completely fair competition because of existing power of the major market players, which leads to discrimination in path allocation and discriminatory or excessive charges

This weakness has been brought up already in the previous sections. According to the Rail Liberalization Index Report, Belgium has promoted liberalization of rail at about European Union average score. Though, measuring the market share of new entrance, Belgium is one of the laggard states. This can be seen in figure 8 where the distance between the Belgian score and the average line is considerably high in a negative direction, while other countries such as France obtain a market share of above 30% for new entrants, with a rail liberalization index which is much lower compared to the main part of the European Union. This implies that there are also other barriers, such as economic attractiveness, dominant historical national players or other obstacles, preventing other companies from entering the domestic market, or gaining market share. (Crozet et al., 2014).

FIGURE 8: RAIL LIBERALIZATION INDEX AND MARKET SHARE OF NEW ENTRANTS IN 2011



Source: EU, RMMS, working documents, 2014

SOURCE: CROZET ET AL., 2014

Presence of such a large market player creates an opportunity for discrimination due to the use of its dominant power, being the biggest stakeholder. There is no need for creating cartels as bargaining power for such companies is already high enough. In this case, there are possibilities to win tenders in an unfair way, being able to pay a higher price or use your resources to show benefits for choosing one's company. Another example may be connected with slot times or path distribution between different companies, where incumbent companies could get the most popular path directions or time slots. All these reasons could lead to unfair competition and as such the expected increase in cost-efficiency and positive promotion of railways freight due to liberalization might not come true.

Focusing on the different cases of price dumping, it is clear that they are often difficult to verify as they happen when the incumbent company is working in their own interests and is not letting to share their knowledge with other companies. Crozet et al. (2014) give two clear examples on this fact.

"A first example is about sharing the train paths and allowing competitors to use one's facilities or network. Of course, from an economic point of view, there are no advantages for the domestic rail freight company to share the confident information or share their own facilities with a company who is trying to compete with them and cut down their market share. That is what SNCF was found guilty of by the French competition authority - the case is currently being challenged in the courts-. It is for this reason that the fourth Railway Package requires real compartmentalization, calling for proverbial "Chinese walls" to be built between the Infrastructure Manager and the other entities of the holding company. But how can the absence of any information leaks between the different entities be ensured and monitored? As long as their subsidiaries are not fully separated into independent entities, holding-type companies should expect to undergo regular checks and evaluations. This is the quid pro quo for maintaining vertical integration and avoiding separation of ownership."

"The second point is referring to the fairness in the financial game play. All companies should provide transparent transactions within the holding. In Germany, in fact, the railway reform has led to the Federal Government taking over the railway system's long-standing debt. For this reason the Infrastructure Manager, DB Netz, has little debt. As it has also obtained significant productivity gains, and it makes a profit on the railway access charges, which contributes to better operating results for DB. The incumbent operator can thereby benefit in principle in terms of cost of capital and financing compared to its competitors. This type of flow should therefore be monitored closely. In France, by contrast, the Infrastructure Manager is highly indebted (33 billion euros by the end of 2013). It is for this reason that in the current draft of the railway reform, it cannot simply be merged with SNCF into a single entity, because the income statement of such a merged company would be permanently affected by the debt service burden (more than 1 billion euros per year)."

According to De Rocker (2014) it is often also easier for companies to work with the same operator in terms of equipment management. Combining different operators would mean that a continuous internal follow up of the used equipment, such as the wagons, decreases time efficiency. In this respect, the historical or main operators have a natural advantage over smaller players, as they have an increase equipment availability and are therefore better placed to convince the business to operate the biggest flows on the market.

3. OPPORTUNITIES

3.1 Creating a single European Market can simplify the freight transport along the European corridors, binging further standardization of the technical specifications and national legislations

Currently there is no European-level regulator within the rail sector. All actions resulting in standardisation and harmonisation of the standards are currently taken from within the market and the non-independent national regulators, with no or limited guidance of an overall independent neutral instance. Crozet et al. (2014) propose that the European Rail Agency (ERA) could take up this role in the near future (Finger, 2014).

In terms of standardization, the part on macro-economic influences has already focussed on the impact and importance of this trend, as it could bring a lot of opportunities on the European level for intermodal freight transport. The upgrade of the European fleet and rail network should obtain a bigger interoperability, compatibility and an increasing efficiency and flexibility, making intermodal rail transport a more attractive option as a mode of transport on the European continent. The main upgrades should take place in the automatic central couplings, the use of similar wheel brakes and coherent chassis and superstructures (Mitusch et al., 2014).

The White Paper on a roadmap to a single European transport area by the European Commission (2011) also indicates that the creation of a unified European market can reduce costs, increase the sustainability of the transport within Europe, increase the number of quality jobs and working conditions and set up a framework for safer transport. In order to make it possible to enter the different national railway markets, the Commission is well aware that technical, administrative and legal obstacles need to be overcome.

It is clear that with the development of an effective and standardized European rail infrastructure network, the creation of a liberalised rail market and the removal of administrative barriers, a level playing field can be generated compared to other transport modes, yielding a lot of opportunities for the rail sector and its role within intermodal transport in Europe. However, in order to obtain this end result it is important that the currently established political approach is changed by a more technical approach in order to be able to overcome these barriers (Finger, 2014).

4. THREATS

4.1 Different legislations throughout European Union

There are different legislation acts and technical standards in place for each EU member state. This is creating some tension on the logistics providers and it does not allow promoting competition and international trade. Necessary certification, freight restriction or any other restrictions may also be different in some member states and require a lot of preparation and monitoring actions for the small logistics providers increasing the barriers to enter the rail market and increase competitiveness.

In several member states, there are even different gauge standards, as in Spain, Portugal, or some Baltic countries, making it almost impossible to ship the necessary goods in a short period of time. Therefore it is difficult to compete with the road transportation network, although this sector is also faced with problems regarding road infrastructure and traffic congestion.

Therefore, one of the biggest promotional moves for EU railway logistics would be the harmonization and standardization between all the Member States. In this way, the market would be similarly restricted, which would allow small providers to use the entire rail network more efficiently.

The earlier mentioned differences in the legislation areas are connected with labour laws, regulations for the hazardous materials, fire hazard regulations, signalling regulation, governmental incentives, safety certifications, technical restrictions, cross-subsidizing and predatory pricing and finally access to services for maintenance and shunting yards. They have a significant impact on the internal European trade balance, as it is creating the need to make detailed research for newcomers to enter the market, but also to maintain the operations on the network. In addition it might be difficult to obtain the historical parties' information out of experience. All these factors increase administrative expenses and result in different business processes increasing the non-transparent situation on the European railway market.

These differences can also be easily noticed in the trade balance levels before and after creating a customs union throughout Europe. The customs clearance operations reduced the SME's profit and created complex administrative procedures. The solution has been found in the introduction of the customs union. However, there is a further need to continue the harmonization processes in the different legislation and regulation areas.

In conclusion, Finger (2014) states that although signals might indicate differently, the European Union has a clear vision on the future of a harmonized intermodal rail freight regulation. In this sense, no different regulations over the different member countries will persist in the future. Nevertheless, Europe allowed different speeds of implementation to the member states, leading to temporary seemingly unaligned policies.

4.2 Evolution to a limited number of European widespread multinational companies, instead of a competitive market with many different field players

As we have seen earlier, Belgium is performing moderately in terms of liberalization with an average rail liberalization index score and a low market share of new entrants compared to neighbouring countries. If the situation in Belgium would remain unchanged and other European markets move towards further liberalization, there might be some negative effects on market competitiveness as a whole.

It is already clear from recent media appearances that the way seems to be paved for a number of well-established European players, such as DB Schenker (Germany), SNCF (France) and Trenitalia (Italy) to sweep the European market. As liberalization and the creation of a single European are is in place, these players are becoming more and more interested in taking over the existing smaller companies, strengthening their own competitive position within Europe. This trend is already going on as many European countries such as The Netherlands, Denmark and Switzerland do no longer have national railway companies operating in the rail freight sector, but left these services to those main operators. If the trend towards consolidation continues, small countries like Belgium will have little possibilities to avoid the same fate (Crozet et al., 2014; Finger, 2014).

Nevertheless, it is not commonly agreed that it would be a bad development if only two or three companies would exist on the European market as a whole. This is being stated on the condition that they are well regulated in order to avoid the perverse effects of monopolistic or oligopolistic situations such as unacceptable price increases and an abolishment of necessary but hardly profitable services. Even with a small number of European players, competition can arise between them at the European level, as they will continue to be challenged by the other modes of transport, increasing the efficiency and stimulating the service towards the customers which is, in the end, the most important factor to users of the intermodal rail freight network. Caution should be given however to some specific niche markets, where the nature of the product only allows rail transportation, as intolerable price increases might occur there. (Crozet et al., 2014; Finger, 2014; Hoornaert, 2015; Piette, 2015).

It is clear that, if this evolution continues, it will be difficult for Europe to stop it as the current legitimacy of the European level is unclear and assumed to be insufficient to put a hold to this trend. Nevertheless, control on the different price mechanisms should be maintained in order to avoid unfair competition. Crozet et al. (2014) investigated three different scenarios for Belgium, where in the first scenario the current market remains as it is, in the second DB Schenker Rail increases its competitive position and a third where a duopoly between DB Schenker Rail and Fret SNCF is studied. It was concluded that in the case of maintenance of the current situation, many obstacles will need to be overcome in order to reach the long run equilibrium in terms of market competition. For the case of DB Schenker Rail strengthening its competitive position, a de facto monopoly is reached. This brings the advantage that an equal service is continuously provided, but the risk of losing control over the sector. The last scenario includes a de facto duopoly with room for some small railway operators that will not have influence of any on the decisions to be taken. This scenario seems to be most likely for Belgium, as both companies have been buying already different private and public rail companies in Europe.

In conclusion, Finger (2014) and Crozet et al. (2014) also point to the comparison with the air transport sector, where liberalization also lead to the entrance of a number of new market players, only to gradually evolve in three global alliances and a number of low-cost corporations, still integrating their smaller competitors.

4.3 The danger of overregulation

Besides the need for harmonized regulation and the revision of existing restrictions, there is always a threat that those boundaries would threaten the competition by their over regulative and restrictive character. According to directive 2012/34/EU, the European Commission has the possibility to define which railway companies could become active on the European market. This evaluation on third party access is limiting the liberalization in its true form (Knieps, 2014).

Finger (2014) however points out that in the current situation, danger of overregulation is merely a theoretical threat. A statement that is contradicted by Stojadinovic (2015) who believes that overregulation is already reached at the level of some national governments and might become a true threat in the short term on the European level as well. This could be supported by the example of the Italian government, imposing the use of a very specific and expensive fire extinguisher on each train leaving or entering the Italian borders. In addition, rail transport is characterized by very extensive technical recommendations. Therefore, European regulation should be aware that, in their attempt for further standardization of these rules, caution should be given to the level of complexity as otherwise it might become very difficult for new or even existing players to be continuously in line with the active laws.

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DELIVERABLE 1.1 - 1.2 G: Effective policy-making for a well-functioning intermodality

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This SWOT-analysis summarizes the findings of the case analysis that is central in Deliverable 1.1-1.2G. The SWOT is useful for comparing the findings of the different parts of WP1 with each other and distil factors that can be considered for the modelling of the scenarios. For a more detailed description of the case, the case discussion and the 10 critical conditions that were drawn from the analysis, we refer to the rest of the Deliverable 1.1-1.2G document. In the appendix of Deliverable 1.1-1.2G the results of a literature study on the critical success factors for the process of policy implementation can be found. We will go into more detail on these abstract factors in WP6 of the project by linking them to conditions and mechanisms of coordination.

Table 1: SWOT – Effective policy-making for a well-functioning intermodality

Strengths	Weaknesses
1. Each administration has concrete plans with targeted objectives on what they want to achieve in relation to freight transport. 2. The governmental actors are aware of the growing European influence in the transport domain and have structurally aligned their strategic plans with the EU policies. 3. There are various committees where the regional and Federal departments can deliberate on transport policies that transcend the governmental boundaries. 4. There is much interaction between involved departments at the Federal level with regard to transport policies. 5. The involved government actors all agree on the fact that the modal share of road transport has to be reduced. 6. At the Federal level the involved ministries managed to agree on a compromise related to smart green freight transport. 7. The FOD M&V has undertaken various attempts to integrate the governmental strategies of the Federal and regional administrations. 8. The strategic plans of the regional and Federal administrations have gotten some kind of 'shared' language as they are infused with aspects of 'globalization' and 'environmental affairs' due to the EU policies. 9. Both the Federal and regional administrations have a say in the resource allocation of INFRABEL and SNCB. 10. There are discussions on the transposal and preparation of EU transport policies between the Federal and regional administrations. 11. There are various, issue-specific partnership agreements between the Federal government and the regional administrations.	1. Competences are spread across a multitude of departments and organizations from different levels of government and various policy sectors. 2. No holistic strategy on intermodality or sustainable transport has emerged. Instead there is a scattered landscape of policy initiatives. 3. Not all actors are included in the inter-sectorial and intergovernmental deliberations on the transport policies. 4. Federal initiatives that aim to boost the entire transport sector often follow strict guidelines and demand quick wins which in consequence stifle integration of activities between involved actors. 5. Little contact exists between regional administrations on strategic issues, only on operational affairs. 6. Involved actors are aware of the fact that the different administrations have to work across the organizational and governmental boundaries in order to change the transport sector in an integral and sustainable way; however, the actors have the reflex to only focus on the width of their own competences and accept little interference from 'outside parties', meaning 'little cross-boundary spanning'. 7. There are different policy priorities among the involved administrations. 8. The policymaking processes in the different modes of transport have developed very independently of each other up to the point that waterborne transport and rail freight transport have become competitors of each other rather than attractive alternatives for road transport

12. There are a number of studies on the execution and drafting of transport policies irrespective of the mode of transport.	
Opportunities 1. Sectorial developments and demands in the aftermath of the financial and economic crises have spurred interaction and collaboration among the federal and regional administrations. 2. Europeanization more and more demands Member States to speak with an unambiguous voice when dealing with the transposal and implementation of EU policies. 3. Growing influence of transnational institutions, like e.g.: the CCR or Danube Commission stimulates governmental actors to create unison in focus and orientation.	**Threats** 1. Due to austerity measures choices have to be made on how to invest the decreasing amount of money that is available for governmental action in the transport domain. 2. The ongoing discussion on the regionalization of competences can put more pressure on the fragile collaboration between the regional and federal administrations with regard to the transport policies. 3. A new government or minister can radically alter the priorities of the involved governmental organizations.

SOURCE: CHAPTER SUMMARY (OWN CREATION)

LIST OF FIGURES AND TABLES

1. INTRODUCTION

BRAIN-TRAINS deals with rail freight intermodality and the extent to which it can be made successful, under market, society and policy-making challenges. Starting point of the research project is the relatively weak usage of this type of freight transport. The project aims to build on existing knowledge and intends to approach the problem from an interdisciplinary perspective. In the first stage the research analyses the current status of rail freight intermodality, including success factors and barriers. This part of Deliverable 1 more specifically focuses on the role of the political and administrative actors within the Belgian Federal state that are involved in the transport sector. We decided to take a broader approach than only focusing on issues of rail freight intermodality, and instead examine the attempts of the Federal Department of Transport and Mobility (hereafter referred to as FOD M&V) to establish a holistic government strategy[2] regarding sustainable freight transport across multiple levels of government and different policy sectors. We made this decision for one particular reason; to better grasp the dynamics in which governmental decisions in the field of transport are made in the Belgian federal state.

To elucidate, government action towards rail intermodality has mainly been confined to setting up a funding scheme for intermodal rail freight operators (Belgische Staatsblad, 2009[b]). This measure was an initiative of the FOD M&V and barely involved other policy actors. However, competences concerning freight transport and infrastructure in the Belgian Federal state, are spread over a multitude of departments and agencies at various levels[3] of government (i.e.: EU, Federal, regional, provincial and local) and across different policy domains[4]. The regions are on their territory competent for most issues regarding inland waterways and roads, while the Federal government has most authority over matters of rail transportation (ICDO, 1998). The Federal and regional competences are exclusive, equivalent material competences, without any hierarchy. This means that a Federal or regional legal norm have the same value. As such, to really understand the 'policy-making challenges', we figured it was necessary to look at a 'case' that affects all involved political actors. Only then, genuine context-specific generalizations could be made on the policy-making challenges related to rail freight intermodality.

The reasons to focus on the attempts of the Federal government - or more in particular the FOD M&V - are: (1) the initiative for trying to pursue a holistic government strategy was a Federal initiative laid down in the 1997 Federal Act on Sustainable Development, (2) the FOD M&V is responsible for defining transversal strategies for transport and mobility of both passengers and goods and, in this way, looks at the modes of transport in a more integral manner and (3) the FOD M&V is a central actor in the field of transport as it has contact with the regional administrations, the SNCB, Infrabel and the DG's of the European Union (EU).

[2] Holistic governance or a holistic government strategy is a concept introduced in the public administration literature by Perri 6 (1997) in his book 'Holistic Government'. On page 39 of the book, the author defines the concept as: "horizontal integration and linkage between fields and functions". Perri 6 exemplified the concept by stating, "holism is crucial because the fragmented structure of separate health, law and order, education, housing, child protection and social services has consistently failed to make real inroads on the problems of crime, unemployment, poor educational achievement and ill health." Perri 6 rather looked at the efforts of the central government, therewith forgetting the *vertical* integration of tasks when applied to fields in which competences are spread over multiple levels of government. Therefore we define the concept 'holistic government strategy' as 'a government strategy that encompasses the different levels of government and policy domains in the pursuit of realizing shared goals, and in which involved actors integrate their tasks and in their organizational strategies take into account the *actions*, *priorities* and *wishes* of the other involved organizations'. Link to the text of Perri 6 – http://www.demos.co.uk/files/holisticgovernment.pdf?1240939425.

[3] We only look at the interaction of political actors between the EU, Federal and regional level.

[4] E.g.: transport and mobility, environment, economic policy, finance, justice and spatial planning.

For our information we draw on a detailed process-tracing, based on an analysis of parliamentary and policy documents and a series of interviews with government officials. In the appendix a list of the respondents that were interviewed can be retrieved. We promised anonymity to our respondents, so in the text we used phrases as ‘respondent 6’ to put their statements into context. The working paper starts with an extensive in-depth description of the case which covered the period 1997 to 2014. Based on these case insights, we will discuss the barriers and enablers that affected the non- emergence of the holistic government strategy. We end the working paper with an outline of 10 critical conditions on the contemporary policymaking challenges in the domain of freight transport based on the insights of the case.

2. A CALL FOR A HOLISTIC GOVERNMENT STRATEGY

The Belgian transport sector has from the early seventies onwards, like many other Western European countries, experienced a continued growth in demand (ICDO, 2000; FOD M&V, 2000). This increase was particularly met with an expansion of road freight transport. In 1995, more than 76% of the goods entering Belgium were transported across the mainland by trucks and lorries (Eurostat[5], 2014). Despite the substantial (and beneficial) rise, the development also brought along various negative consequences that to some extent threatened the position of Belgium as European transport hub, polluted the environment and harmed the public health - the most important negative consequences being: congested roads, the increase in greenhouse gas emissions and the rise in the number of road accidents (ICDO, 2000). Simultaneously, there were increased European and international pressures[6] to green the domestic transport sectors (ICDO, 2000).

Federal officials soon realized that their business-as-usual policy strategies were not compatible anymore with the renewed sectorial and political context (ICDO, 2000). As a result, the Federal Act of 1997 on Sustainable Development[7] inter alia urged the FOD M&V 'to bolster a sustainable transition in the transport sector'. Enabling such a transition required a holistic government strategy as it would affect the practices of a large number of departments and agencies. Looking at the Federal level, the FOD M&V is responsible for defining transversal strategies for transport and mobility for both passengers and goods (ICDO, 1998). Other Federal ministries either have an interest in the development of transport policies (Ibidem), like e.g.: Ministry of Economic Affairs (FOD EKME[8]) and the Ministry of Environment and Spatial Planning (FOD VVL[9]), or are necessary for the execution of policies (Ibidem), such as the Ministry of Finance (FOD FIN[10]) and the Ministry of Justice (FOD JUS[11]). The regions hold a rather similar division of competences (see table 2), though there are some structural differences between the regional administrations.

[5] We used the table 'modal split of freight transport', Set the time at '1995', the geo at 'Belgium' and the TRA_MODE on 'Roads'.

[6] At the **European level**, organizations like e.g.: the EU, the Central Commission for the Navigation of the Rhine, the Danube Commission and the Economic Commission of Europe from Genève – see documents: the Bergen Ministerial Declaration on Sustainable Development in the ECE region of 16 may 1990, the Commission Communication 'Europe 2000' of 7 November 1991, the 145.075/1991 resolution of the European Parliament of September 1991, the report of the Group Transport 2000 titled 'Transport in a Fast Changing Europe' published in December 1990, the 1992-Green Paper on Sustainable Mobility, the 1993-White Paper on Growth, Competitiveness and Employment and the 1996-White Paper on Revitalizing the Community's Railways. At the international level, organizations like e.g.: World Commission on Environment and Development and the UNCFCC – see documents: the Brundtland Report, the Montreal Protocol in 1987, the Rio Protocol of 1992 and the Kyoto Protocol of 1997.

[7] The 1997 Federal Act of Sustainable Development formed the basis of a much broader strategy of the Federal government to integrate the concept of 'sustainability' in domestic policies. The call for a sustainable transport sector is a part of this broader strategy.

[8] The FOD EKME writes in its mission statement: "in a fast changing Belgium and international economic context it is our task to create the conditions necessary for a competitive and balanced functioning of the Belgian market of goods and services."

[9] The FOD VVL wants to be involved "to make sure that environmental objectives are incorporated in Federal policies."

[10] The cooperation of the FOD FIN is essential for fiscal matters, such as subsidies and budgets.

[11] The FOD JUS holds responsibility for the legal framework and additional penalties.

TABLE 2: TASK DIVISION IN THE REGIONAL ADMINISTRATIONS

Authority on matters of:	Brussels Community	Flemish administration	Walloon administration
Mobility/Transport	Brussel Mobiliteit - **Br.M**	Ministerie van Mobiliteit en Openbare Werken - **V.M.MOW**	DG de la Mobilité et des Voies hydrauliques - **W.DG.MOB**
Spatial Planning	Brussel Stedelijke Ontwikkeling - **Br.SO**	Ministerie van Ruimtelijke Ordening, Woonbeleid en Ontroerend Erfgoed - **V.M.RWO**	DG de l'Aménagement du territoire, du Logement, du Patrimoine et de l'Énergie - **W.DG.SP**
Environment	Brussel Stedelijke Ontwikkeling - **Br.SO**	Ministerie van Leefmilieu, Natuur en Energie - **V.M.LNE**	DG de l'Agriculture, des Resources naturelles et de l'Environnement - **W.DG.ENV**
Economic policy	Brussel Economie en Werkgelegenheid - **Br.EW**	Vlaams Ministerie van Economie, Wetenschap en Innovatie - **V.M.EWI**	DG de l'Économie, de l'Emploi et de la Recherche - **W.DG.ECO**
Finance	Brussel Financiën en Begroting - **Br.FB**, Brussel Fiscaliteit - **Br.F**	Vlaams Ministerie van Financiën en Begroting - **V.M.FB**	DG de la Fiscalité - **W.DG.F**

SOURCE: OWN CREATION

These administrative differences mainly exist in the manner in which the Regional Departments of Transport and Mobility (hereafter referred to as 'regional departments') have organized their activities regarding the exploitation and maintenance of the roads, inland waterways and ports. In Wallonia, these tasks are assigned to divisions within the W.DG.MOB and structured per region (Namur, Liège, Charleroi, Mons, Tournai, Luxembourg, Verviers, Hainaut and Brabant Walloon). In contrast, the Flemish and Brussels Community administrations have delegated some authority for the maintenance of the inland waterways to the agencies NV De Scheepvaart and Waterwegen en Zeekanaal NV. Within the Flemish administration, more tasks have been agentified; the Ports of Ostend, Antwerp, Zeebrugge and Ghent have a privileged position and are responsible for the development and execution of their strategic plans, and the agency Wegen en Verkeer is in control of the structural maintenance of the Flemish roads. Within the policy field of rail transport, several actors such as SNCB-group[12], SNCB Holding and Infrabel, have fixed competences or are seen as necessary partners as they possess production resources (e.g.: tracks, train stations, technical equipment, e-freight systems, informatics, etc.), budgetary resources, personnel and implicit knowledge of the transport sector.

Pursuant to this task and constitutional division, the Federal Act of 1997 installed a policy cycle that provided the FOD M&V with 'sufficient' time to vertically and horizontally integrate the practices of the involved actors. More concretely, the FOD M&V had to draft a plan for the holistic government strategy with an outlook for the next decade (including: policy actions, allocation of resources, coordination mechanisms and measurable objectives) by the year 2000 (Idem: Art. 2/1, Art.7). This plan would be published in the 2000-Federal Plan for Sustainable Development (hereafter referred to as 2000-Plan) (Idem: Art. 7). After four years, the department had to make an assessment of the progress made and of the flaws in the implementation (Ibidem). Based on these assessments the holistic government strategy had to be renewed so it could serve as basis for another four years (Ibidem). As an extra 'safety measure', the Federal Commission on Sustainable Development (FRDO) was established to monitor the entire sustainability strategy of the Federal administration and, in this role, give the FOD M&V asked and unasked advice (Idem: Art. 10-15).

[12] Up and until 1st of January, 2004, the SNCB-group, Infrabel and the SNCB-Holding were a part of one company called the SNCB.

3. DETERMINING THE PRIORITIES FOR A HOLISTIC STRATEGY

In accordance with the 1997 Federal Act, the FOD M&V started with an inventory on the priorities for a holistic government strategy in the autumn of 1997. Since it was a Federal initiative, it was the procedure that first the governmental actors at the Federal level would reach 'consensus' before the regional departments[13] were to be 'consulted on' the content of the document (ICDO, 1997-1998; ICDO, 2000). At the Federal level, the concept of sustainability was relatively new. Many public officials were unfamiliar with the term and did not quite understand how it related to their daily practices (ICDO, 1997- 1998). In addition, there was an absence of information on the state of affairs, the long-term plans of the involved departments and the established partnerships (Ibidem). These issues made it hard to compromise on, let alone draft, an outlook for the next ten years.

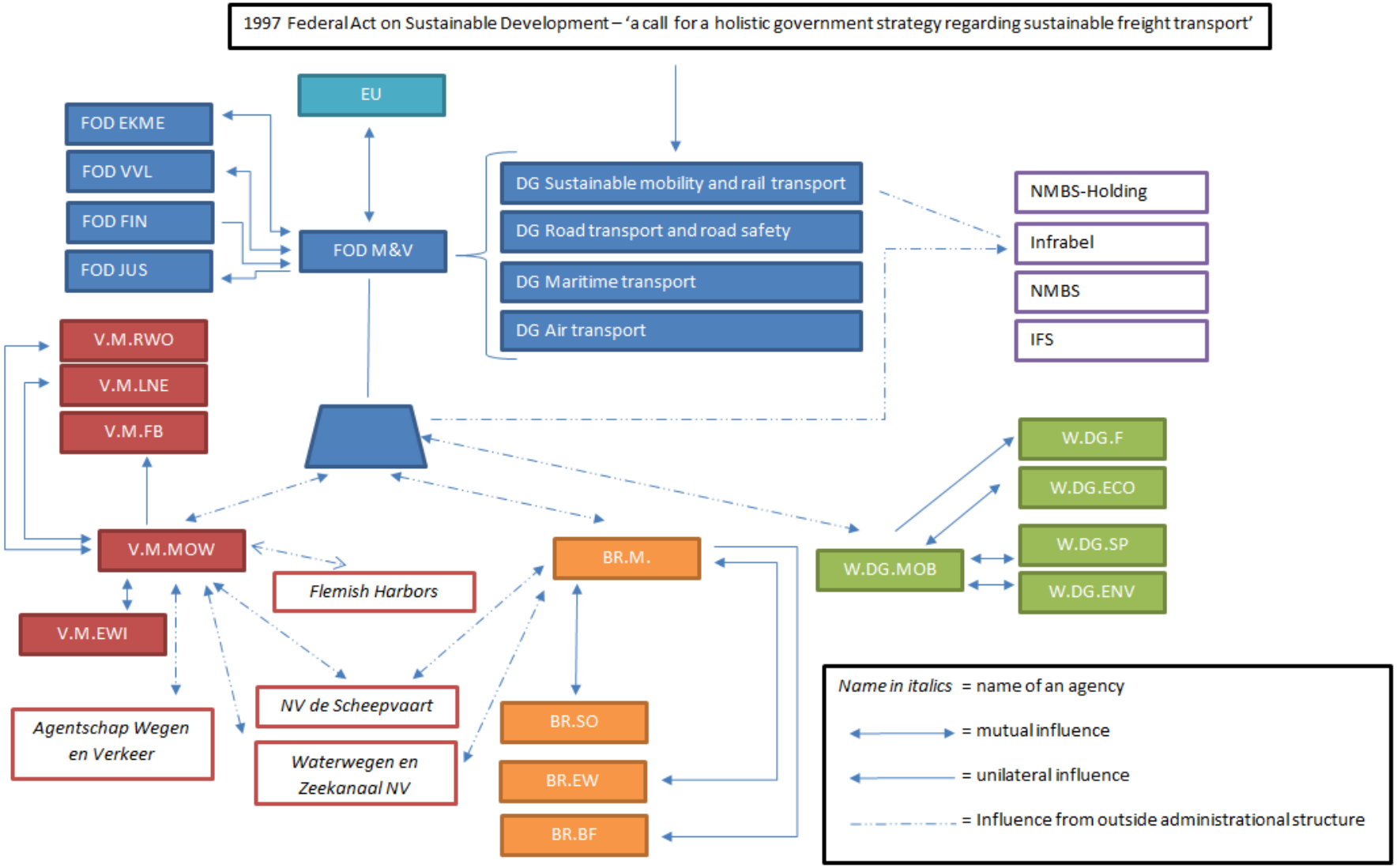
To help the decision-making, Michel Daerden (former Minister of Transport and Mobility) assigned Professor B. Thiry (University of Luik) and professor G. Blauwens (University of Antwerp) with the task of operationalizing the concept of sustainable mobility, and make a study on possible measures and policy directions (ICDO, 1998). The study had to take into account the existing competence division, the policy objectives of the Federal actors and already operational policies. The results of the study were published in November 1998 (Blauwens and Thiry, 1998).

The study made it clear that a successful transition towards a more sustainable transport sector was not a simple matter of building new infrastructure. Instead, modes other than road transport (to mention: waterborne and rail freight transport) had to be stimulated as these were more environmental-friendly and within them underused capacity existed (Blauwens and Thiry, 1998). By encouraging these alternative transport solutions and make them more (economically) attractive, it was expected that the transport sector would be optimized in terms of energy use and emissions, minimizing environmental impact, limit congestion, lower operating and administrative costs and less road accidents (Ibidem). The best way to achieve this modal shift was according to the professors to apply the 'polluter-pays-principle' to the road haulage system (Ibidem). As they explained:

> *"It is clear that road freight transport yields enormous economic and social benefits. Against these benefits, however, must be set a range of costs, many of which are borne by the community at large rather than the companies operating freight vehicles. These costs are associated with the emission of air pollutants and greenhouse gasses, traffic noise, accidents, congestion and road wear. A fair pricing of these costs – meaning that polluters are obliged to pay the marginal cost of their activities – must ensure that all external damage caused by road traffic in fully internalized in the price of transport, make users more aware of the negative effects of their transport activities and stimulate the use of other modes of transportation."*

[13] If other regional departments are included in policy actions, like the Flemish Department of Science and Innovation, than these are specifically mentioned by their abbreviation.

FIGURE 1: TASK DIVISION IN THE REGIONAL ADMINISTRATIONS



SOURCE: OWN CREATION

The results of the study were 'warmly' welcomed by the departments at the Federal level, "as the outcomes of the study were able to find a right balance between ecological, social and economic values." Following the procedure, a draft of the study was discussed with the regional departments during the months January and February 1999 in five roundtable meetings (ICDO, 1998). Remarkably, the final version of the 2000 Federal Plan on Sustainable Development (2000-Plan) did not include the proposal for internalizing the external costs of road freight transport. The policy directions[14] in the 2000-plan were also formulated at a rather high level of abstraction and did not go into detail on exact policy actions, the mobilization of resources and the coordination mechanisms of the holistic government strategy. This was a deliberate choice of the Federal government as there were some 'nuanced' differences compared to the regional departments with regard to the priorities and the execution of policies (FPDO, 2000).

According to respondent 6, the V.M. MOW had during the consultations pleaded for a rigorous revision of the draft document. The Flemish department opposed the idea for fiscal measures directed at burdening the road haulage system. As the respondent continued to explain:

> *"The ports are important for the Flemish economy. Companies that are located in the ports want to get their products as quickly as possible to the hinterland. The fastest way to do so is to transport the goods by lorries and trucks over the road. To transport them by inland navigation or rails is not a real solution as only minimum infrastructure capacity exists. Internalizing the external costs of road freight transport will in that respect harm the economic position of the ports. For more than 30 years there has been a discussion to invest in an extra railway track from the port of Antwerp to the hinterland; the Liefkenshoektunnel. That is something in which the Federal government should invest in if they really want to green freight transport."*

The V.M. MOW was further of the opinion that sustainable freight transport could only be achieved by decentralizing the competences of rail freight transport to the regional level (Vlaamse Regering, 1996). That would create a situation where only one authority decided on the integration and development of all modes of transportation.

To buy some time and not to disrupt the fragile collaboration, the FOD M&V added a line to the 2000-Plan which compelled the involved parties to make sure that by August 2001 a coherent National Plan for Sustainable Mobility (NPSM) was drafted with an exhaustive section on concrete measures regarding sustainable freight transport (ICDO, 2000). The FOD M&V reinforced the ambition for a holistic government strategy by pronouncing (ICDO, 2001), "that by the year 2010 the modal share of waterborne and rail freight transport both had to increase with at least 15%."

[14] The following policy directions were proposed that had to contribute to a *modal shift* to inland navigation and rail freight transport: a control on the supply of transport, a control of the demand of transport, stimulate technological developments, introduce concrete product measures and invest in sensibility campaigns.

4. A NEGLECTED MOMENTUM FOR GOING THE EXTRA MILE

Notwithstanding the appeal for the NPSM, the document was not yet adopted by the beginning of 2002. In fact, the promise to agree on a holistic government strategy for sustainable freight transport remained for long time dead letter. Nonetheless, the FOD M&V continued under the directions of Minister Isabelle Durant with their ambition to green the transport sector and search for greater coherence among the involved actors. Isabelle Durant (Écolo) had become Minister of Mobility and Transport after the Federal elections of 1999 (respondent 3). Those elections were a breakthrough for the Walloon Green Party (Écolo). They formed the Federal government with the Socialists (PS) and the Liberals (PRL, later merged into MR). With the Greens in the Federal coalition, the concept of sustainable freight transport fully made its entrance in the political discourse (Ibidem). In the years prior to the Durant-office, freight transport surfaced at irregular intervals in Federal plans and was mainly seen as an economic stimulus (Ibidem). According to respondent 3, "Minister Durant wanted to have a clean break with the past as she had no confidence in the regime of her predecessor and instead insisted to go an extra mile for sustainable transport."

Durant's first initiative was to draft a White Paper on Sustainable Transport with a time horizon of twenty years (FOD M&V, 2000; FRDO, 2004). The White Paper had to serve as basis for the Federal policies, but also break open the debate on a holistic government strategy. She declared in her inauguration speech (Ibidem):

> *"that in an era of post-industrialization, Belgium must come up with an integrated and sustainable policy plan for transport and mobility – a plan that compromises on ecological, social and economic aspects of transport and is supported by actors at the different levels of government."*

The White Paper was published in the winter of 2000 (FRDO, 2004). The White Paper operationalized the proposed policy directions of the 2000-Federal plan into concrete policy actions. The document additionally recommended a new working method for the FOD M&V. For several years there had been regular contact between the Federal and regional administrations, but compromised measures were rarely implemented (ICDO, 2000). According to the authors of the document (quoted in FRDO, 2004), "it was time to break out of the paralyzing rationales that so far obstructed the progress of the policy field." To support the planned modal shift of freight transport, the proposed working method opted for a reconfiguration of the communication and interaction between involved divisions within the FOD M&V, the Federal departments and the different levels of government (ICDO, 2002).

This reconfiguration became known as the 'Mobilit-project' and was launched in the early years of 2002 (Ibidem). The Mobilit-project was not least inspired by the Copernicus-reform[15] (Ibidem). Under the Mobilit-project, three stakeholders networks were established: (1) an intra-ministerial network for the coordination at the Federal level, (2) an external-governmental network to assure communication and cooperation between administrations across the different levels of government – better known as the ICMIT[16] and ICVV[17] – and (3) an expert network consisting of universities and research institutes that could help the Ministry with scientific input for future policies (Ibidem). Minister Durant also installed a division (division of Mobility and Intermodality) that had the task to align the strategies of the divisions within the FOD M&V in a transversal way (Ibidem). Noticeable successes of these networks were the framework

[15] This reform was initiated by Prime Minister Guy Verhofstadt and the Minister for the Civil Service and Modernization of Public Administration Luc Van den Bossche in February 2000 and intended to modernize the Federal administration (Fiers and Deweerdt, 2000). The Federal departments had to get rid of the negative image of a malfunctioning machinery and become more efficient, flexible and, most importantly, trustworthy in the eyes of the citizenry.

[16] Interministerial Conference for Mobility, Infrastructure and Technology.

[17] Interministerial Conference for Road Safety.

agreement between the FOD M&V and the Federal Planning Institute on statistical assistance for policy development[18] over the period 2004-2007 (signed in 2003) and the partnership-agreement between the FOD M&V, the SNCB and the regional departments regarding the 2001-2012 multiannual investment plan for the SNCB (signed on 11 October 2001).

The latter was a unique collaboration that took a lot of effort before it was arranged. Prior to the agreement, it was accustomed that the regional administrations annually paid a contribution to the SNCB but they did not have a say in the allocation of the financial resources (Vlaamse Regering, 1996). This created a situation wherein there was often a misfit between the investment plans of the SNCB and the territorial strategies of the regions (Ibidem). During the consultations on the new state reform in 2000 and 2001 the regional administrations made a strong case for delegating competences of rail transport to the regional level. In the end, no competences were transferred but the regional departments did attain a seat in the discussions on the multiannual investment plan of the SNCB (respondent 3).

The influence of the regional departments was immediately visible in the final text of the multiannual investment plan. Apart from clear objectives targeted at greening rail transportation by the year 2012, the document consisted of agreements between the involved actors to set up specific funds for priority projects on the territories of the regions (like e.g.: Diabolo-project, Liefkenshoektunnel, railway-installations in Zeebrugge, the Walloon project 'Lijn 130' and a track between Brussels and Luxemburg, investments in the Ports of Zeebrugge and Antwerp). To monitor the progress of the multiannual investment plan the Executive Commission of the Ministers of Mobility (E.C.M.M.) was established (Belgische Staatsblad, 2001). The secretary and the position of chairman of the E.C.M.M. were in hands of the FOD M&V, but all involved parties had the right to call for a meeting (Ibidem).

The negotiations on the NPSM remained less successful. In the period 2001-2004, the departmental reports of the FOD M&V annually acknowledged that 'little progress was made regarding the NPSM'. In the deliberations, there was not so much disagreement between the Federal departments but rather between the FOD M&V and the regional departments. The regions had their own policy priorities and "did not want to have a Federal stepmother that told them what to do" (respondent 2).

Looking at Wallonia, the structurally poor economic performance of the region from the mid-20th century onwards made the regional government, since the creation of the regions in 1993, focus on economic revival. For example, the Future Contract of Wallonia (*Contrat d'Avenir pour la Wallonie*) launched in 1999 was an economic strategy with a dominant focus on the jobs and entrepreneurship (Accaputo et. al., 2000). The document was superseded by the Marshall Plan 1 for Wallonia after the Future Contract appeared to propose too many disparate actions without a clear vision and financial support behind it (Bayenet and Vandendorpe, 2006). The Marshall Plan 1 was an idea of the Walloon Socialist Party (PS) and former Walloon president Elio di Rupo, as a major effort to curve the dire economic situation. In none of these documents the phrase 'sustainable mobility' was mentioned nor was it a part of the political discourse (Happearts, 2011). As a consequence thereof, the Walloon government was not really interested in investing political capital in greening freight transport; it would only uphold the possibility to maintain an economic focus in relation to transport and infrastructure.

Flanders and the Brussels Community had over the years drawn up their own mobility plans (Flemish Mobility Plan 2001-2010 and the Iris Plan 1 of the Brussels Community). This made the NPSM superfluous (respondent 2 and 5). There was no need for "an extra layer of policy documents", according to respondent 2. Especially in Flanders, the 'meddling' of the FOD M&V gave rise to a lot of frustration. As respondent 2 continued to explain:

[18] http://www.mobilit.belgium.be/nl/mobiliteit/samenwerking/.

"The Federal government paternalistically assumed that the regions could not handle their own businesses. Yet, they did not realize how much effort the Flemish administration had put in drafting the mobility plan. For your understanding, in the late 1990s the Flemish government was committed to getting a more comprehensive vision on spatial planning, environment, transport and mobility. Previously, there was no real integration of the plans, leading to a scattered landscape of roads, neighbourhoods, rural activity and forestry areas. The effort incited the publishing of the Flemish Plan on Spatial Planning in 1998. The document served as a basis for future plans as it made clear choices on where and what kind of future development (in areas of spatial planning, environment, infrastructure and mobility) was allowed. The Flemish Mobility Plan 2001-2010 evolved from this Spatial Planning vision."

Due to the 'trench-fighting' in the negotiations, the FOD M&V decided to call for a stalemate and for the time being stop the deliberations on the NPSM (ICDO, 2004). Within the parameters of its competency, the FOD M&V aimed to stimulate the modal shift by implementing the actions of the 2000-White Paper (Ibidem). With the removal of Minister Durant from office and the withdrawal of Écolo from government in the autumn of 2003, the momentum for going the extra mile for sustainable freight transport was gone.

5. DIVERGENCE AND THE NON-DEVELOPMENT OF A HOLISTIC GOVERNMENT STRATEGY

After the 2003 elections, the Federal support for implementing a holistic government strategy eroded (respondent 3). Bert Anciaux (sp.a.), the new Federal Minister of Transport, Mobility and Social Economy, did not have a great interest in issues of freight transport (Ibidem). The same was true for Renaat Landuyt (sp.a) who replaced[19] Bert Anciaux within a year (Ibidem). The focus of the department was rather on passenger transportation (respondent 6). Only a few policy actions of the 2000-White Paper, which were already operational, were continued but nor time nor effort was put in re-launching the debate on the NPSM. As respondent 6 denounced:

> *"The political course of the FOD M&V changed with 180 degrees compared to the previous legislation. This is common in the Belgian political system. A minister is entitled to a 'ministerial cabinet' consisting of a staff of personal advisors whom the minister appoints personally but who are no part of the administrative hierarchy. The role of the cabinet members is to act as the eyes and ears of the minister, to define and push through the minister's program and to look after the minister's parliamentary and constituency work. They practically co-ordinate the policies and services of the FOD M&V. Additionally, new ministers often have the strong desire to show their political dissatisfaction with their predecessors by setting new priorities. This creates a dynamic in which it is difficult to make a long-term planning for policies and where the civil servants simply have to follow the directions of the new minister."*

At the regional level, the departments neither felt the need to revive the debate on the NPSM. They proceeded with the development and implementation of freight policies relevant for their own territory. Flanders, for example, initiated a financial program to reduce the most prominent bottlenecks on the inland waterways, like e.g.: locks on the Leie (Sluis Harelbeke, Sluis St. Baafs Vijfe), the ring canal of Bruges, the railway bridges across Zeekanaal Brussel-Schelde and the headway under the bridges of the Albertkanaal (Ministerie van de Vlaamse Gemeenschap, 2001). This financial program coexisted with another funding scheme called the 'Kaaimuren-programma' that was launched by the Flemish government in 1998 with the aim of modernizing the wharves along the inland waterways[20]. Similar funding schemes were initiated in the Brussels Community and Wallonia after approval from the EU (respondent 1).

Only occasionally, there was contact between the FOD M&V and the regional departments, mainly for adjustments of operational policies. An example is the debate on the 2004-2007 investment plan of the SNCB. The SNCB had admitted that they were unable to comply with the deadlines and objectives set in the multiannual investment plan 2001-2012 (Belgische Staatsblad, 2003). The organization faced huge debts due to mismanagement in earlier years. The debts had risen to the 'enormous' amount of 9.4 billion euros, implying that the SNCB was unable to do the necessary maintenance works and investments (respondent 6). The SNCB wanted to renegotiate the terms, by making a new schedule and a new distribution of the scarce resource for the 'priority-projects' (Belgische Staatsblad, 2003). This led to the signing of the 2004-2007 investment plan on the 28th of November 2003.

[19] Minister Bert Anciaux decided to become the Minister of Culture, Youth and Sports in the new Flemish government after the regional elections of 2004.

[20] http://www.mobiliteitsraad.be/mora/book-6759/kaaimurenprogramma.

6. A NEW IMPULSE FOR COLLABORATION DUE TO EUROPEAN PRESSURES

A new impulse for pursuing a holistic government strategy came after the publication of an advisory report by the FRDO in February 2004. In the report the FRDO was very sceptical about the activities of the FOD M&V. The document dedicated 8 long paragraphs to the political impediments that had disturbed implementation of the holistic government strategy. Most importantly, 'the actors seemed to be unaware of the urgency of the situation' (FRDO, 2004). So far, 'the involved actors lacked the political courage to draft a comprehensive and integrated vision on sustainable freight transport' (Ibidem). According to the FRDO, such a vision was more necessary than ever, "now the European Union (EU) has taken steps to harmonize regulations, procedures and processes in the trans-European Transport Network." A development that required an adequate response of the Belgian Federal state.

The FRDO referred to the 'growing influence of the EU' after the publication of the 2001-White Paper 'European transport policy for 2010: time to decide'. Over the years, the activities of the EU were mainly concerned with building new infrastructure and open up markets[21]. But due to an unequal growth in the different modes of transport, an increase in demand for transport, congestion on the main road and rail routes and the harmful effects on the environment and public health, "the European Union was of the opinion that they no longer could sit silently at the side-line – "they had to come up with a new policy response (European Commission, 2001)."

The 2001-White Paper proposed a series of measures ranging from pricing to revitalizing alternative modes of transport (i.e.: modes other than road transport) and targeted investments in the trans-European network. By implementing 60 measures, the Commission (2001) expected 'there to be a much slower growth in road haulage thanks to a better use of other means of transport – an increase of 38% rather than 50% between 1998 and 2020 at the European level'. The 2001-White Paper further addressed the need for a 'comprehensive strategy' going beyond the European transport policy (Ibidem). The program of transport policy measures did not stand on its own; for its execution and success it depended on the support of the national and local decision makers, but also on policy developments in other domains[22] (Ibidem). Therefore, the Commission 'encouraged' the Member States to take consistent measures at the Federal, regional and local level (Ibidem).

Bearing in mind the wake-up-call of the FRDO and the policy developments at the European level, the FOD M&V redefined its ambitions concerning the holistic strategy. The revised ambitions were published in the 2004-2008 Federal Plan for Sustainable Development (hereafter referred to as the 2004-Plan). The 2004-Plan acknowledged that the change in course of the EU would leave an even greater mark on the domestic policy process (ICDO, 2004). The FOD M&V strived to continue its practices along the lines of the 2000-Federal plan, while simultaneously complying to the demands of the European level (Ibidem). To accomplish this, a better collaboration with the regional administrations was – once again – seen as absolutely essential; not only to convert European directives in Belgian law but also to 'speak with an unambiguous voice' when advocating the Belgian interests in the European arenas (Ibidem). The FOD M&V added to have learned from past interactions with the regional departments and wanted to reconcile with them by respecting the width and boundaries of their competences (Ibidem). According to respondent 6, the document characterized a change of culture that was not only visible on paper but also in practice.

[21] Examples of these practices are: the liberalization of the pan-European inland waterway network in 1996 (Regulation 96/75/EC) and the so-called 'railway-package zero' (regulations 91/440/EEC, 95/18/EC and 95/19/EC).

[22] Like e.g.: economic policy that takes into account certain factors that contribute to the increasing demand for transport services, particularly factors connected with the just-in-time production model and stock rotation, urban and land-use planning policy to avoid unnecessary increase in the need for transport caused by unbalanced planning of the distances between infrastructure and businesses, budget and fiscal policy to achieve full-internalization of external costs and competition policy to ensure that the opening-up of the markets is not held back by dominant companies already operating on the market.

> *"Normally, I discussed the Belgian position with the Federal Minister before I went to European meetings. With regard to implementation, we informed the regions about what was discussed and we decided for ourselves what we wanted to implement and what not. This led to a lot of infringement procedures, which we simply took for granted. Suddenly, it became custom at the Federal level to include regional officials and officials of different Federal departments in the discussions on the transposal and preparation of European directives related to issues of transport – and we strived to implement them as fast and as good as possible."*

The amount of meetings between the different officials increased even more after the publication of the 2006 midterm review of the 2001-White Paper and the 2007 Logistics Action Plan (Commission of the European Communities, 2006[b]; Commission of the European Communities, 2007). These documents came up with new policy measures as it was concluded that the measures envisaged by the Commission in 2001 would not be sufficient to continue achieving the fundamental objectives of EU transport policy.

The meetings in the policy domain of rail transport were mere 'functional meetings'. The EU policy plans (better known as the 'rail packages[23]') did not so much impact the practices of the regional departments. However, the FOD M&V 'continuously searched for plain agreement' to avoid later conflict (respondent 6). An example of such a meeting is the deliberation on the implementation of Directive 91/440/EC that came into force on the 1st of January 2005. The directive intended to get a more efficient rail network by creating greater competition (Council of the European Communities, 1991). The Member States were required to ensure that organizations operating the infrastructure and those operating the freight services were separated and ran on commercial basis (Ibidem). For Belgium, the implementation of the directive meant that the former SNCB-company was split into four different organizations: the SNCB-holding, the SNCB, Infrabel and the Fund for Rail Investments (FRI) (respondent 6). Infrabel became the infrastructure manager of the Belgian railway network and was in its role responsible for the optimum performance of the equipment (railways, catenaries, switches, signals, crossing, etc.) and the execution of the investment programs laid down in the 2004-2007 Investment Plan of the SNCB (Ibidem). In order to safeguard the progress of the investment programs and make sure that Infrabel incorporated the earlier agreements in its strategic plan, a new investment plan was signed between the FOD M&V, the regional departments and Infrabel for the period 2005-2007 (Belgische Staatsblad, 2005). Similar agreements were signed with the SNCB-Holding, the SNCB and FRI related to issues of passenger's mobility.

In the field of inland navigation, the developments in the European political realm lead to the re-establishment of an old committee - the Inland Shipping Committee (ISC) (respondent 4). The ISC consisted of representatives from the FOD M&V, the regional departments and the agencies NV de Scheepvaart and Zeekanaal en Waterweg NV. Formerly, the ISC was set up in the early months of 1998 to manage the liberalization of the inland waterways in Belgium (Belgische Staatsblad, 1998). The liberalization was a 'ground-breaking moment' (respondent 4). Before the liberalization, inland navigation was a closed mode of transport and cargo was assigned by rotation on a so-called 'shipping exchange'; better known as the 'tour de rôle system' (Ibidem). This system guaranteed a regular job and minimum transport prices, but also slowed down the development of inland navigation (Ibidem). 'Tour de rôle' was abolished as from 1 December 1998 in The Netherlands and Belgium and in the other EU Member States by 1 January 2000 – and the new market competition demanded a revision of the Belgian legislative framework (Ibidem).

[23] The first railway package, that was adopted by the European Council on the 26th of February 2001 and included three directives, came into force on the 12th of March 2003. The directives enabled rail operators to have access to the trans-European network on a non-discriminatory basis. Quickly following the first package, the second package of measures was implemented in the Belgian law on the 19th of December 2006 and the 16th of January 2007. The package focused on the safety and interoperability of the railways. It also accelerated the liberalization of the rail freight services by fully opening the rail freight market to competition as from 1 January 2007. In addition, the European Railway Agency was established for providing technical support for the safety and interoperability work. The third railway package adopted by the Council in October 2007 amongst other things introduced a European driver license allowing train drivers to circulate on the entire European network.

A similar revision was necessary with the implementation of the EU NAIADES 1 program. The program, covering the time frame 2006 to 2013, proposed actions and legislative packages that focused on five strategic areas which were seen as 'basic' for the development of inland waterway transport in the EU; to mention, improving the market conditions, modernizing the fleet, developing human resources, raising image and awareness as well as enhancing infrastructure (Commission of the European Communities, 2006). The situation was even made more complex with the actions and measures drafted by the Central Commission for Navigation on the Rhine (CCR) that had the legitimacy to 'promote the development of the transport policy in countries surrounding the river the Rhine' (respondent 4). Most noticeable document of the CCR[24] was the CMNI-agreement ratified by Belgium on the 1st of January 2005 that assured on the river Rhine and the Rhine Delta freedom of navigation of ships from all countries of the world, equality treatment of domestic and foreign vessels, uniform administration and the elimination of all tolls or other fiscal exactions levied solely on the right to navigate (CCR-ZKR, 2000).

Both transnational documents were discussed in the ISC. It was decided that with regard to the proposed actions, the regional departments, which were for most part responsible for inland navigation, could voluntarily incorporate aspects of the transnational documents in their strategic plans (respondent 4). Regarding the legislative framework, the sections of law concerning the crew requirements (Belgische Staatsblad, 2007), police regulations of the inland waterways (Belgische Staatsblad, 2006) and the collection, deposit and reception of waste produced during navigation were altered (Belgische Staatsblad, 2009). The latter law amendment even evolved into a partnership-agreement signed on the 1st of January 2009 between the FOD M&V and the regional departments were each declared to work within the parameter of their competency to achieve a prevention of inland navigation vessels emitting pollutant fumes, a reduction in emissions from vessel engines, the gradual elimination of degassing (VOC) and the prevention of emissions of MTBE (Ibidem). The partnership agreement literally introduced the concept of ecological navigable waterways in the Belgian political discourse (Ibidem).

[24] The CCR is actually the oldest international organization in modern history. Its origin dates back to the Congress of Vienna (1815).

7. GETTING THE STRATEGIC PLANS ON THE SAME WAVELENGTH AS THE EU POLICIES

Even though the developments at the European level triggered more communication between governmental actors involved in the Belgian transport sector, it did not lead to more collaboration or closer coherence (respondent 6). Independent of each other, the Federal and regional governments drafted new strategic plans that better fitted the new political reality. A common feature in all of these strategic plans was the ambition to get the policy priorities 'on the same wavelength' as the EU plans. Unintentionally, this created a 'shared language' among the Federal and regional officials as each administration tried to incorporate aspects of 'Europeanization', 'globalization' and 'environment' in the policy plans. Examples are numerous, to mention four:

> *In December 2009 the Walloon administration published the Marshall Plan 2.Vert close after the regional elections (Waalse Regering, 2009). The document served as a new political orientation. It was a continuation and reinforcement of the first Marshall plan with up-to-date priorities, "as a means to comply with the EU priorities of the Lisbon Strategy and Europe 2020 strategy." The Marshall Plan 2.Vert consisted of 6 priority axis: human capital, competitiveness and business networks, scientific research as an engine for future development, a favourable framework for creating businesses and quality jobs, employment-environment alliances and a mixing-up of employment and social welfare. With regard to freight transport, the Marshall Plan 2.Vert opted for a 'new strategy for the future' by setting up a multi-sectorial alliance to stimulate 'the demand and supply of goods and service' in an 'environmental-friendly manner'.*
>
> *By the end of 2008, the Flemish agencies NV de Scheepvaart and Waterwegen en Zeekanaal NV drafted a infrastructure Master Plan for the Flemish Waterways (Horizon 2014), with the intention to influence the policy process after the Regional elections (Waterwegen en Zeekanaal NV and NV de Scheepvaart, 2009). The document presented and explained the unavoidable and recommended investments in the transport related infrastructure of the waterways up to 2014, including measures to limit their environmental impact. The proposed investments of the Master Plan fully 'took into consideration the European guidelines, recommendations and objectives, such as the European Parliament's RIS-guidelines or the Commission's integrated action program NAIADES' (Ibidem).*
>
> *The FOD M&V presented on the 25th of November 2009 their annual policy plan (FOD M&V, 2009). This was the second policy plan of Melchior Wathelet who became the new Federal State Secretary after the Federal elections of 2007. In the document that consisted of 54 pages, the last 10 pages were dedicated to how the measures fit the European context. In the introduction, it was stated that "each measure that is mentioned in the chapters of this document functions as a building block for our quest to achieve sustainable mobility" (Ibidem).*
>
> *On the 20th of January 2009, a group of stakeholders consisting of social partners, 'captains of society', government officials and businesses signed the Flemish 'Pact 2020' in Hasselt (Vlaamse Regering, 2009). The Pact contained twenty ambitious objectives with a clear delineation of the target figures. The signatories wanted to book progress in five principal domains: greater prosperity and welfare, a competitive and sustainable economy, more workers gainfully employed, a high quality standard of living and an*

efficient and effective administration. The document prophesized that "in terms of its entrepreneurial culture, Flanders will rank among the top five European regions," But to achieve this, "Flanders must be easily accessible by road and rail, via the waterways and the air". Developments in the transport sector would, "nevertheless take into account European commitments already concluded, like e.g.: lowering carbon dioxide emissions and greening the transport sector."

In this way, the different administrations hoped to experience 'less pain and more gain' from the EU (respondent 6). Or stated differently, each level of government aimed to prepare itself for future developments at the European level while simultaneously profiting from the implementation and support programs introduced by the Commission.

The latter came in all sorts and sizes. Most known is the MARCO-POLO program which initially ran from 2003-2006 but due to its success was prolonged with another 6 years. The MARCO-POLO program annually granted 30 million euros of financial assistance to Member States to improve the environmental performance of their freight transport system (European Parliament, 2003). Other, more specific, funding programs were PLATINA, RISING, ECONET, SOCRATES, TEN-T priority projects, LEONARDO, RTD programs, INTERREG, RIS, ISPA, PHARE, CARDS and the European IWT Reserve Fund. The PLATINA program, for instance, brought together 22 partners (representatives of the Member States, river commissions, industry representatives, transport stakeholders, etc.) from 9 European countries to allocate 8.35 million euros to the inland navigation sector (Commission of the European Communities, 2008).

An example of the 'strategic adaptation' of the Belgian administrations is the 'funding' for a new lock at Evergem (Besien, 2010). A new lock was necessary as there were long waiting times for the traffic to pass, there was a need for structural maintenance as the last maintenance works dated back to the year 1965 and larger vessels had problems entering the lock (Ibidem). The whole project was expected to cost 32 million euros; a sum of money that was not immediately available. Therefore, the Flemish agency Waterwegen en Zeekanaal NV framed the project in such a way that the European officials interpreted the project as a 'bottleneck' for the larger TEN-T priority project 'Seine-Schelde connection' for which 300 million euros was earmarked by the Commission. Eventually, more than 70% of the project costs were sponsored by the Commission (Ibidem).

8. THE END OF THE HOLISTIC GOVERNMENT STRATEGY BUT A CALL FOR LINKING THE MODES

In keeping with the policy cycle of the 1997 Federal Act, the FOD M&V had to publish an assessment and revision of their strategy for bolstering a sustainable transition in the transport sector before the end of 2008. Where the department adopted the 2000-Plan and the 2004-Plan at the pace fixed by the Federal Act, the functioning of the policy cycle was interrupted between the consultations and the decision on this third Federal Plan. The negotiations within the FOD M&V on the revision of the attempts to pursue a holistic government strategy were accompanied by a non-adoption of the 2008-2012 Federal Plan for Sustainable Development (hereafter referred to as the 2008-Plan). It was communicated that the cause of this interruption was the risk that the adoption of the 2008-Plan would go against the actions and activities of the earlier Federal Plans where the department was still working on (Federaal Planning Bureau, 2011). At a later stage the revised strategy would be drafted. Looking past this political message, the FOD M&V realized that a new focal strategy would not change the status quo. The department had to find new ways to (re)engage with the political actors if they wanted to get more coherence between the different policy strategies.

A new opportunity for collaboration came sooner than expected in the shape of the financial and economic crisis that started in 2007. The crises heavily obstructed the growth development of inland waterway transport. Whereas transported volumes on the Belgian waterways still increased by nearly 1.1% in 2007[25], they fell in 2008 by -3,3%[26] and in 2009 by -17%[27]. These percentages were relatively higher than in most European regions. On the Rhine volumes decreased in 2009 by -18%, on the Austrian Danube by -14%, on the Elbe by -6% and on the French waterways by -4%. Although the demand for transport started to recover from the beginning of 2010 onwards, the crises clearly revealed some urgent problems in the field of inland navigation that threatened the economic position of the regions – particularly that of the Walloon region (respondent 4).

The biggest problem was that most waterborne transport enterprises in Belgium were single ship-owners (close to 80% of the vessels) that in the wake of the crises either went bankrupt, operated at negative margins or lived from their capital reserves (respondent 4). This made that among the ship-owners there was low propensity to invest in their enterprises. They simply did not have the money (Ibidem). The situation even worsened with the prospect that nearly 50% of the ship-owners was at the age to retire soon, while the amount of youngsters to take over the (family) businesses did not increase (Ibidem). In addition, the funding schemes of the Federal government for intermodal rail freight operators 'stole', according to the regional departments, traffic from the inland waterways (respondent 1).

Against this background, the Walloon government demanded that the problems in the inland navigation field were tackled 'integrally'; meaning that all departments at the different levels of government would work together on a solution taking into account the benefits and limitations of the separate modes of transport (Ibidem). For too long, the modes had developed independently of each other, not considering the possibility that measures impinge in intricate ways on other modes. The inconsistency in measures had made inland waterway transportation and rail freight transport each other's competitors rather than attractive alternatives for road transportation (respondent 3). Also within the policy domain of inland navigation the various regional measures caused that some transport routes shipped more cargo than other trajectories (respondent 4). The call of the Walloon government was supported by the other administrations, what created some 'policy space' to undertake constructive action and create a bigger

[25] Calculation based on statistics from Eurostat.
[26] Calculation based on statistics from Eurostat.
[27] Calculation based on statistics from Eurostat.

picture on the future development of the transport sector; a transport sector that best suited the interests of all involved parties. In an interministerial conference, the actors agreed to set up an interministerial working group that had the assignment to make a provisional sketch on issues that required a solution (Ibidem). For the moment, this compromise meant the end of the execution of the 1997 Federal Act (Federaal Planning Bureau, 2011). Though, the FOD M&V did not completely do away with their commitments to the Federal Act as they realized the delicacy of the breakthrough[28] (Ibidem).

[28] The deliberations soon bogged down due to ordinary 'trench-fighting' between the regional and Federal administrations. To save the progress of the process a consultancy firm was assigned with the task to make a study on possible governmental actions and integration of tasks. The research started in 2013 and is so far either not yet finished or the results have not yet been published. In the meantime, the Federal government adopted in the winter of 2013 a long-term vision up to 2050 with regard to sustainable development, including a part on transport and mobility, with targeted objectives.

9. DISCUSSION OF THE CASE

The case study shows that the attempt to establish a holistic government strategy in the transport domain has been nothing more than a 'mission impossible'. After 17 years, the involved actors did not succeed in aligning the governmental and organizational strategies in the pursuit for one common goal – 'making the sector more sustainable'. There is not a single actor to blame nor can the failure be fully explained by the simple fact that competences were spread over a range of organizations in different policy domains and at various levels of government. The outcome is rather a result of the interplay of factors that together determined the course of the process. Some of these factors had only a temporary influence, whereas other factors had a more enduring impact.

One of the big hindrances in the process were the strict 'guidelines' of the 1997 Federal Act. As the analysis has demonstrated, the 1997-Federal Act was not just a law text. It was an elaborate framework that clearly outlined a policy cycle, a system of accountability, procedures and deadlines that the FOD M&V had to follow. In principle, the framework safeguarded the continuity of the Federal ambitions for a holistic government strategy. However, the framework 'constrained' the development of the holistic government strategy as it demanded 'quick wins' and organized problems, actors and cleavages in such a way that there was limited room to address issues, goals and alternatives other than those of the Federal administration. Within two years, the FOD M&V was expected to outline the whole-of-government strategy. According to the 1997-Federal Act, this was 'more than enough' time to vertically and horizontally integrate tasks and activities, and define shared goals. As it was a Federal initiative, the Federal ministries were the first to 'compromise' on the holistic government strategy. The regional departments – which were believed to function as 'carrier pigeons' of the regional administrations – were only to be 'consulted' on the content of the document and were barely included in the deliberations. They simply had to 'obey' the imposed strategy. Every four years the FOD M&V had to revise the holistic strategy so it could serve as a basis for another period.

We have seen that these fixed procedures gave rise to a lot of frustrations among the regional officials. The regions were unwilling to collaborate if the 'Federal government' did not change their 'paternalistic' style of policymaking, as it was labelled by some regional respondents, and provide the regional administrations with a bigger say in the drafting process. The FOD M&V tried to mitigate the conflict by reconfiguring the way in which the parties interacted. Or stated differently, the response of the FOD M&V to overcome these feelings of exclusion and adherent 'bottlenecks' in the deliberations was to establish new discussion fora (like e.g.: ICMIT and ICVV) with the aim of stimulating dialogue between the policy partners and get more actors involved in the deliberations on the holistic government strategy. Paradoxically, most negotiations on the holistic government strategy remained between the FOD M&V, other Federal ministries, the V.M.MOW, W.DG.MOB and BR.M. A large number of regional partners stayed absent from the development process. Also between the different regional administrations there was hardly any communication. On top of that, an agreement on holistic working did not evolve. Ever since, the FOD M&V has struggled with how to adhere to the 1997-Federal Act while simultaneously get the regional administrations on board for a holistic government strategy. Eventually, the policy cycle of the 1997-Federal Act was interrupted with a non-adoption of the 2008-plan as the FOD M&V realized that the procedural demands of the 1997-Federal Act only burdened the attempts to create more coherence.

Apart from structural and procedural determinants that troubled the emergence of the holistic government strategy, the conceptual differences between involved actors were other determinants that negatively influenced the efforts of the FOD M&V. The Federal department rather quickly managed to dissolve most tensions between involved Federal partners. As we have seen, most conflicts at the Federal level dealt with questions of how the new concept of 'sustainable mobility' related to the daily practices of the other ministries, how the new focal strategy should be incorporated in already operational policies and how the

ambitions of the FOD M&V fitted in the different long-terms plans of the Federal actors. The FOD M&V had to assure that the holistic government strategy found a proper balance between economic, ecological and social values.

With regard to the regional partners the FOD M&V dealt with much more fierce problems. The regions had their own policy orientations and compromised policy plans, and did not so much feel the *need* to tackle the problem of sustainable mobility in an integral way. The 'general logic' of the Walloon government, for example, was that all policy actions had to be directed at the economic revival of the region, which has been the number one problem for Wallonia the past four decades, instead of investing political capital in greening freight transport. What's more, the regions did not recognize the authority of the Federal government in the transport domain. In their opinion, the best solution to further develop the transport sector was to regionalize the competences of rail transport as this would create the situation that one authority was responsible for all modes of transport on a specific territory.

The FOD M&V undertook various endeavours to act on the persistence of the regions. In the first instance, the Federal department tried to break open the debate on a holistic government strategy by partly doing away with the demands of the 1997 Federal Act and instead come up with a National Plan for Sustainable Mobility that would also take into account the wishes, demands and dynamics of the regional administrations. When it became clear that this did not lead to more collaboration between the regional departments and the FOD M&V, it was decided to honour the width of the competences of the regional administrations and for the time being only find plain agreement when the administrative boundaries were challenged.

At around the same time that the latter decision was made, the growing influence of the EU started to rigorously alter the political playing field. The European agenda soon determined the priorities of the domestic policies. The FOD M&V strived to continue its practices along the lines of the 2000-White Paper while simultaneously comply with the demands of the European level. The FOD M&V realized that a closer collaboration with the regional level was absolutely essential as a means to properly convert the EU directives into Belgian law but also to speak with an 'unambiguous voice' when advocating the Belgian interests in the European polity. In this way, it became accustomed that the regional and Federal administrations deliberated on the transposal and preparation of the EU policies. Unintentionally, the strategic plans of the Federal and regional administrations got some kind of shared 'language' and a rather similar orientation, as the European initiatives infused the regional and Federal policies with aspects of 'globalization' and 'environmental affairs'.

Nonetheless, the increased focus on the EU policies did not encourage the domestic actors to find some 'common ground' and agree on a holistic government strategy. As the analysis shows, the Federal and regional administrations got their strategic plans rather separately 'on the same wavelength as the EU'. This is not only a spin-off of the delicate relationship between the Federal government and the regional administrations but also an outcome of the manner in which the EU policies were implemented. Where the 2001-White Paper and adherent EU plans outlined a transport vision irrespective of the mode of transport, the proposed policy measures did not link the different modes of transport. They instead focused on the development of the single transport modes. This made that the dichotomy between waterborne transport and rail transport remained to exist in the Belgian political context.

In like manner, three other 'external forces' that were out of the control of the FOD M&V impacted in different ways and at different stages the attempts to holistically green the transport sector. The first was the discussion on the new state reforms and therewith the call of the regional administrations to regionalize the competences of rail transport. In the end, no competences were transferred, though the regions attainted a seat on the deliberations of the multiannual investment plan of the SNCB. The second was the request of the SNCB to change the objectives and planning of the multiannual investment plan. The SNCB admitted that they were unable to comply with the set deadlines as they faced huge debts due to

problems in management in the earlier years. In consequence, the ambitions for making the rail sector more sustainable had to be 'downgraded' to assure that the SNCB was better able to manage their business. The third and more conspicuous forces were the financial and economic crisis. The crises heavily obstructed the growth in the field of inland navigation and threatened to economic position of the regions – particularly the economic position of the Walloon region. The crises made clear that for too long the different modes of transport had developed separately of each other, up to the point that rail transport and waterborne transport had become each other's competitors rather than attractive alternatives for road transport. The situation could only be turned if the regional and Federal administrations agreed on an all-comprehensive policy approach; continuing in a non-holistic manner was disadvantageous for all involved parties and the transport sector as a whole. As a consequence, the debate on a holistic government strategy revived for a short period of time.

On top of everything, the analysis gives evidence that the FOD M&V did not act as an 'empty vessel' that simply responded to barriers and external forces with the aim to overcome bottlenecks. The Federal department, like other involved organizations, had its own internal dynamics that in different ways impacted the development of holistic working. Dependent on the 'priorities' of the incoming minister and the related practices of the 'cabinet of the minister', the internal dynamics of the FOD M&V either stimulated or burdened the process of emergence. In the beginning of the development process, Minister Isabelle Durant wanted 'to go the extra mile for sustainable mobility'. Under her directions most actions within the department were initiated with the aim to stimulate *convergence* among the involved actors. Her successors were far less interested in issues of 'sustainable' freight transport. Their priorities rather focused on passenger's transportation. Only a few operational policies regarding freight transport were continued from prior legislation. The cabinet members of the minister, which were formally not a part of the administrative hierarchy, had to make sure that the minister's program was pushed through. This made it extra difficult for the Federal civil servants to stick to the long-term ambitions of the 1997-Federal Act.

10. THE SUCCESS FACTORS IN THE PROCESS OF POLICY-MAKING

In sum, the case observations make clear that the Federal government cannot impose holistic working by fiat. Creating coherence between involved actors rather depends on the manner in which they are structurally included in the process, have the possibility to influence the development of the strategy and are willing to collaborate. We have seen that the attempt to establish a holistic government strategy failed to deliver on most of these conditions. There were also 'exogenous' pressures outside the control of the central coordinator that to various degrees can alter the course of the process. This means that the success for establishing a holistic government strategy in the transport sector depends on the interplay of structural factors, cultural[29] factors, exogenous pressures and the ability of the central coordinator to overcome these burdens, or put in a formula:

$$y = \big(\sigma(\text{structural factors}) + \sigma(\text{cultural factors}) + \sigma(\text{exogenous pressures})\big) \times (\text{actions of the central coordinator})$$

As this case exemplifies the dynamics in which transport policies that challenge the constitutional boundaries of the Belgian federal state emerge, we are able to distil 10 critical conditions that influence the contemporary multi-level process of policymaking when public officials aim to boost the transport sector in an integral way (like in the case of rail freight intermodality).

1. **The willingness of the involved actors to work across organizational and governmental boundaries and the role of the central actor in the constellation:**

   It is clear that within the Belgian political context competences regarding freight transport are spread over a number of organizations at different levels of government and across various policy domains. The tasks of each organization are statutory defined. However, policy initiatives focused on the entire transport sector typically transcend the portfolios of individual organizations and are only a success if the involved actors work across the organizational and governmental boundaries. Therefore, a critical factor in the policy making process is the extent to which involved actors are willing to collaborate and cut across organizational and governmental boundaries, instead of holding on to a self-referential focus. The role and position of the central actor is also decisive in the constellation. The central coordinator can either stimulate the involved actors to collaborate, or the attempts of the central coordinator can be experienced as 'threatening' by other actors.

2. **The inclusiveness of actors in procedures and communication:**

   Procedures proved to be important selection mechanisms in the policy processes. They include some actors, cleavages, problems and solutions while others remain outside of it. In consequence, there is only room to address issues, goals and alternatives of those actors that participate in these procedures. To this end, the 'inclusiveness' of the procedures in terms of bringing together (all) relevant actors determines whether the decision-making premises that are adopted experience the full political support.

[29] Cultural/conceptual features of organizations like e.g.: traditions, symbols, rituals, cultural constructions, interpretations and rhetoric.

3. **Impatience, strict deadlines and the demand for quick wins:**

We have seen that holistic initiatives do not take root overnight. It takes time and patience to build trust between involved partners, to identify the correct focus of the governmental strategy, to develop clear outcome measures and to agree on coordination mechanism and budgetary support schemes. The demand for 'quick wins' or a planning schedule that is too tight can stifle integration between involved parties. Vice versa, policy officials should not lose sight of the continuation of the process. It is task to find the right balance between policy continuity and 'sufficient' time to integrate the tasks of the involved actors.

4. **The compatibility of policy orientations among involved actors:**

Each governmental organization that is involved in the domain of transport has gradually developed unique cultural features as a result of adaption to internal and external pressures. These cultural features define the interpretations, rhetoric and orientations of the organization. Consequently, the success of an all-comprehensive strategy depends on the compatibility of the involved actors. If the compatibility is high, the actors will have a rather similar understanding of a problem situation and embody an equal motivation of what ought and ought not to be done. This will make it easier to compromise on a governmental strategy. While if the compatibility is low, this will be much more difficult to do.

5. **The fit with operational policy plans:**

New policy plans are not implemented in a vacuum. They are initiated in a context where the different administrations at the various levels of government already have their strategic plans in place. In addition, the individual ministries, departments and agencies also have their operational policies. This means that the policy officials will have to take into account and consider the different foci and objectives of these earlier policy strategies when they propose new policy measures. The extent to which they are able to do so determines the amount of conflict or support they face from other actors.

6. **Regionalization of transport competences:**

A sword of Damocles that on the sly hangs over the discussions between the Federal government and the regional partners on matters of transport policies are the deliberations on new state reforms. As the analysis has pointed out, (some) regional administrations prefer(red) to have full control over the rail transport competences. From the 1st of January, 2015 onwards the regions will also get more control over the inland waterways and obtain a part of the authority the Federal government still had in the domain of inland navigation. The fact that these competences belonged or still belong to the Federal government, might create tensions that obstruct future developments of the transport sector.

7. **The growing influence of the European Union and transnational institutions:**

The transport sector has experienced a growing influence of the EU and other transnational institutions, like e.g.: CCR. According to the EU, it is not possible for national governments to successfully address issues and challenges connected to the transport domain alone. The problems require actions and solutions at the European level or even the international level. The European Union has throughout the years stepped up to promote a mobility that is efficient, safe, secure and environmental friendly and will only continue to do so in the near future. In consequence, the dominance of the European policies diminishes in dribs and drabs the (political) discretionary space of the Federal and regional governments, as they have to assure the effective transposal of EU policy plans.

8. **Sectorial changes and demands that have to be taken into account:**

   The sector of waterborne transport and rail transport have developed relatively separate of each other up to the point that they have become each other's competitors rather than attractive alternatives for road transportation. The sectorial challenges in the domain of inland navigation that have evolved after the financial and economic crises are also problems that the regional administrations cannot handle on their own. These pressures require collective action and will soon demand a solution. In this sense, sectorial developments influence the directions of policymaking.

9. **Political proliferation after elections:**

   The Belgian political system has the dynamic that after elections the course of the departments, both at the Federal and regional level, can change radically dependent on what minister from which political party has taken office. Many ministers are haunted by the sense that the political window of opportunity (or for leaving a legacy) never remains open for long and therefore feel the need to draft new policy priorities. This dynamic is reinforced by the role of the cabinet of the minister as it must ensure that the minister's program and legislative work is pushed through and turned into concrete policy actions.

10. **Other exogenous factors that are out of the control of the policy actors:**

    Policy actors also have to respond to other exogenous factors that are out of their control. An example is the problematic management of the SNCB in the early 2000s. This led to a 'downgrading' of the sustainable ambitions regarding rail transport. A force that was not really noticeable in the case but has become more urgent now are the austerity measures that have been introduced by the new Federal and regional governments. It can be expected that these budgetary measures will constrain the decision-making processes in such a way that clear choices must be made on the allocation of resources; there will be less money available for all demands.

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List of respondents

Respondent 1: civil servant of the Federal Department of Transport and Mobility.
Respondent 2: civil servant of the Federal Department of Transport and Mobility.
Respondent 3: civil servant of the Federal Department of Transport and Mobility.
Respondent 4: civil servant of the Federal Department of Transport and Mobility.
Respondent 5: 2 civil servants of the Department of Transport and Mobility at the Flemish level.
Respondent 6: civil servant of the Federal Department of Transport and Mobility.

ANNEX I - POLICY IMPLEMENTATION CHALLENGES: A LITERATURE REVIEW

Introduction

As the detailed description of the BRAIN-TRAINS proposal states, “the main goal of the project is to create a blueprint establishing the detailed criteria and conditions for developing an innovative intermodal network.” Providing such a blueprint will be achieved by building scenarios of future market, policy and intra-sector rail transport development, model and quantify outcomes and impacts for each of the scenarios and simulate the optimal setup of national and international intermodal freight corridors, taking into account government roles and incentives. Though, before we are able to do this, it is necessary to have an idea of the factors that are of influence and which can be modelled. This part of work package 1 therefore looks at the critical success factors that have an effect on the process of policy implementation. The insights in the critical success factors follow from an extensive literature study on the concept of ‘policy implementation’. In this literature review we first devote some attention to what defines successful policy implementation. Next we outline the different generations of research on policy implementation. Thereafter, we present an extensive oversight of scholarly work on the factors that according to various influential scholars impact the implementation process. We finish the review with clusters of success factors that we believe are essential to take into account for the BRAIN-TRAINS project.

What is successful implementation?

Research on policy implementation has been a hot discourse among political scientists from the earlier 1970s onwards when Pressman and Wildavsky (1973) brought the issue of policy implementation to the forefront. Ever since, various scholars have tried to define the concept and find out a clear theory. Inevitably, the term has been operationalized in different shapes and forms – making it hard to distinguish what policy implementation actually is. In its simplest form, one can argue that ‘implementation’ is about carrying out, accomplishing, fulfilling, producing or completing a task. According to the founding fathers of policy implementation, the term must be viewed as a process of interaction between the setting of goals and actions geared to achieve them (Pressman and Wildavsky, 1984). Mazmanian and Sabatier (1983) stated that policy implementation is the carrying out of a basic policy decision, usually incorporated in a statute, but which can also take the form of important executive orders or court decisions – the starting point is always the authoritative decision. O’Toole (1995) remarks that policy implementation refers to the connection between the expression of government intention and actual result. As part of policy cycle, policy implementation concerns how governments put policies into effect (Howlett and Ramesh, 2003). Based on these definitions of influential scholars, policy implementation can best be conceptualized as a process of a series of decisions and actions directed towards putting a prior authoritative decision into effect. The ability to achieve the desired effect then is what determines the success of a policy implementation process. To this end, we see a successful implementation process as a series of decisions and actions adopted by governmental actors that together manage to achieve the desired effect.

Evolution of the policy implementation theories

In general, implementation research has evolved through three generations. The first generation ranged from the early 1970s to the 1980s; the second generation from the 1980s to the 1990s; and the third generation research from 1990 and onwards (Matland, 1995). The first generation implementation research was focused on how a single authority's decision was carried out, either at a single location or at multiple sites (Goggin et. al., 1990). It was a systematic effort to understand the factors that facilitated or constrained the implementation of public policies (Sabatier and Mazmanian, 1981). The research was characterized by pioneering but largely, atheoretical, case-specific and non-cumulative (Gogin et. al., 1990). The second generation implementation studies focused on describing and analysing the relationships between policy and practice. These researchers generated a number of important lessons for policy, practice and analysis. For example, policy cannot always mandate what matters to outcomes at the implementation level; individual incentives and beliefs are central to implementation responses; and effective implementation requires a strategic balance of pressure and support (McLaughlin, 1987). Within the second generation of research the scholars were further engaged in 'the development' of analytical frameworks (Goggin et. al., 1990). The construction of models and research strategies, however, led to a major confrontation between the so-called top-down and bottom-up perspectives of policy implementation (Winter, 2003). The top-down perspective assumed that policy goals can be specified by policymakers and that implementation can be carried out successfully by setting up certain mechanisms (Palumbo and Calista, 1990). This perspective is policy-centred and represents the policymakers' views. A vital point in the approach is the capability of the policymakers to exercise control over the environment and implementers (Younis and Davidson, 1990). The bottom-up perspective, in contrast, directed attention at the formal and informal relationships constituting the policy subsystems involved in making and implementing policies (Howlett and Ramesh, 2003). This perspective has as its starting point a problem in society. The focus is on individuals and their behaviour, and in this respect the 'street-level' bureaucrats are made central in the political process. These 'street-level' bureaucrats are considered to have a better understanding of what clients need as it is they who have direct contact with the sector. Michael Lipsky propounds a theory of 'street-level bureaucracy'. Lipsky's theory focusses on the discretionary decisions that each field worker or 'street-level bureaucrat' makes in relation to individual citizens when they are delivering policies to them. This discretionary role in delivering services or enforcing regulations make street-level bureaucrats essential actors in implementing public policies. As such, both top-down and bottom-up perspectives draw attention to the implementation process, though each tends to ignore the portion of the implementation reality explained by the other approach. There have only been a few scholars that have tried to connect them (see Elmore, 1982; Elmore, 1985; Matland, 1995). While both the first and second generation implementation researchers have added much to our knowledge of what implementation is, how it varies and why it varies, it has been much less helpful in differentiating between the types of implementation outcomes, or in specifying the causal patterns that occur and the relative importance and unique effects of each independent variables. According to Goggin (1986) this problem hampered the development of one broad implementation theory. Therefore, the third generation of implementation studies tested the analytical frameworks on basis of more comparative case studies and statistical research designs which would increase the number of observations (Winter, 2003).

Factors that influence the implementation process

Nonetheless, a single theory on policy implementation did not emerge. This makes it hard to clearly outline what elements affect the practices of involved organizations in the implementation process and how these organizations should cope with these determinants in order to successfully achieve the desired effect of the policy. In consequence, a review of factors that throughout the years have been mentioned in the literature is quite significant. As such, the following table depicts different views of what influential authors have regarded as important variables in policy implementation.

TABLE 3: LITERATURE REVIEW

Authors (year)	Variables affecting the implementation process
Ackermann and Steinmann (1982)	Resources, inter-organizational structure, contextual variables, environmental variables, organizational variables and perceptual variables.
Alexander (1985)	Goal ambiguity
Altenstetter and Bjorkman (1976,1977)	Decisional clarity, consensus and reiteration.
Ball (1976)	Personal attitudes, enforcement resources, reputational authority, homogeneity of issues, role of media, public cost of abatement.
Baum (1976, 1981)	Clarity of directives, accuracy with which the decisions are communicated, interests of subordinates, subordinate policy preferences, authority, insulation, sanctioning, persuasion, branch of government, structure of the inter-organizational interdependence.
Berman and McLaughin (1976); Berman (1976); McLaughin (1976)	Organizational climate, motivations of involved actors, materials development, staff training, planning, frequency of meetings, influence of actors, amount of resources.
Berman (1980)	Important variables depend on context (organizational, political, social and legal). Clarity of policy goals, number of actors participating, implementers' degree of resistance, ineffectualness, inefficiency, degree of control exerted from the top.
Bowen (1982)	Clearances, number of actors, persistence, time.
Bowman (1984)	Tension, contextual factors (e.g. economic context).
Browne and Wildavsky (1984)	Clarity of objectives and priorities, validity of causality, sufficiency of financial resources, sufficiency of power, learning of actors, adaptation of actors in the process.
Browning, Marshall and Tabb (1981, 1984); Browning and Marshall (1976)	Ideology, dominant policy coalitions, time, clarity of statute, orientations of top-level bureaucrats, orientations of subordinates.
Bryner (1981), Bullock (1980)	Clarity of the statute, level of general political support, clarity of statutory standards or objectives, degree of agency support, 'presence or absence of programmatic bias favouring the attainment of the agency's responsibilities', 'attitudes of the agency's sovereigns'.
Bunker (1972)	The degree to which an organization is consensually clear about its task, is appropriately differentiated into parts related to its pertinent sub-environments, is integrated by information exchanges and effective conflict management devices, has a clear knowledge about its performance, is self-reflective and able to make corrective adjustments in own behaviour; issue salience, power resources, agreement.
Chase (1979)	Operational demands, resources, authority, structure of interdependence.
Cleaves (1980)	Complexity of the change mechanism, degree of change, number of actors, number of goals, clarity of goals, duration.
Davies and Mason (1982)	The economy, resources, legitimacy.

Durant (1984)	Extent of behavioural change required, complexity of joint action, socio-political environment, non-compliance, implementers' disposition, adequacy and credibility of enforcement resources.
Edwards (1980)	Communication (transmission, clarity and consistency), resources (staff, information, authority, facilities), attitudes of implementers, bureaucratic structure (standard procedures, fragmentation), complexity.
Elmore (1976, 1977, 1978, 1979-80, 1985)	Structure of power relationships, incentives, discretion and resources.
Goodwin and Moen (1981)	Constituency support, socio-economic environment, learning.
Grindle (1980,1981)	Content of the policy (interests affected, types of benefits, extent of change envisioned, site of decision-making, program implementers and resources) and context of implementation (power interests, strategies of actors involved, institution and regime characteristics, compliance and responsiveness).
Gross et al. (1971)	Implementer's clarity about change, needed skills and knowledge, compatibility of organizational arrangement with change, degree of staff motivation.
Gunn (1978), Hogwood and Gun (1984)	Nature of policy, implementation structure, outside interference, control over implementers, resources.
Hambleton (1983)	Policy message, multiplicity of agents, perspectives and ideologies, resources and politics of planning.
Hargrove (1983)	Type of policy: distributive, regulatory or redistributive.
Hays (1982)	Political conflicts, degree of mediation.
Hucke (1978)	Conditions in agency's implementation field.
Ingram and Mann (1980)	Degree of policy demand, accurate causal theory and incentives.
Jones (1980)	Complexity of implementation program, organizational capabilities.
Kirst and Jung (1982)	Time.
Larson (1980)	Policy goals, implementation procedures, complexity, changes in economic environment.
Lazin (1980)	Administrative linkages.
Levitt (1980)	Timescale for introducing legal powers, public expenditure policy, opportunity costs, policy as a 'sacrifice victim', outside pressure, policy instruments, certainty of benefits from action, policy formulation as an end in itself, stability of the inter-organizational relationship, elements of surprise and power after governmental change, images, consultation, learning, public opinion, trends in interest groups' perceptions, media and international policymaking.
Luft (1976)	Incentives.
McLanahan (1980)	Goal specificity, degree of centralization, interests group participation, public accountability.
Majone and Wildavsky (1978)	Objectives, resources, theory underlying policy, constraints emerging in the implementation process.

Mandell (1984)	Multilateral brokerage role.
Marvel (1982)	Number of levels of government involved.
Mazmanian and Sabatier (1981, 1983); Sabatier and Mazmanian (1979, 1981); Sabatier and Klosterman (1981)	Tractability of the problem, ability of statute to structure the implementation, nonstatutory variables, initial implementation success.
Mead (1977)	Economic and social forces, funding level, incentive structure, weakness of provider institutions, administrative weakness, political constraints.
Mechling (1978)	Technical uncertainty, internal conflict.
Menzel (1981)	Statutory deadlines, configuration of intergovernmental and institutional relationships, supportive relationships among clientele, organizational structure and management rules, enforcement styles.
Mitnick and Backoff (1984)	Incentive system, sender-receiver relationship, organizational setting and distal environment.
Montjoy and O'Toole (1979); O'Toole and Montjoy (1984); O'Toole (1983)	Policy specificity, resources, agency goals, routine, world view, technical requirements of the task, facilitator and perceived risk for implementers.
Moore (1977, 1978)	Incentives, number of clearances, resources.
Mueller (1984)	Degree of change required, level of community support and fixers.
Murphy (1971, 1973, 1974, 1976)	Degree of support among implementers, adequacy of staff, strength of monitoring, law and tradition, constituency pressure.
Nakamura and Smallwood (1980)	Specificity of policy, technical limitations, actors, arenas, organizational structures, bureaucratic norms, resources, motivations, communication networks, compliance mechanisms.
Nixon (1980)	Clarity and consistency of communication.
O'Brien (1980)	Overlapping and conflicting provisions of law.
Pesso (1978)	Rules and supervision.
Porter (1976)	Task technology, type of interdependence, environment.
Pressman and Wildavsky (1984)	Multiplicity of participants, perspectives, decision points, intensity of preferences and resources.
Raelin (1980, 1982)	Power, authority and mandate distributions. Quantity of organizations, network leadership, level of competition and conflict.
Rawson (1981)	Clarity of organizational goals, support of organizational leaders, degree of discretion over means and ends, new vs. established organizations.
Rein and Rabinovitz (1978)	Goal saliency, complexity, nature and level of resources, number of levels, number of agencies, number of participants.
Ripley and Franklin (1982)	Type of policy.
Rogers and Bullock (1976)	Perception of legal standard, degree of agreement with legal standards, perceived costs and benefits for the implementers, environmental factors, degree to which law clearly defines who is responsible, whether the law specifies the type and amount of compliance

	required, perceived sanctions, whether beneficiaries are cohesive and able to take strong actions.
Rosenbaum (1980)	Specificity and enforceability of statute.
Ross (1984)	Implementation strategy, tractability of policy problem, content of the policy, structure of broader socio-political and policy systems, number of actors, extent of power diffusion, institutional dispositions of actors, clarity, adequacy of resources, support of leaders, institutional routines.
Sapolsky (1972)	Environment, resources, skills at bureaucratic politics, ability to manage complexity.
Scharpf (1977, 1978); Scharpf et al. (1978)	Level of conflict, available capacity for conflict resolution or organizational variables.
Scheier (1981)	Decision and control processes, resources, relations with environment, supervisory expectations, routines, technical requirements, communication flow, work group norms, behavior skills, incentives, cognitive support.
Skelcher, Hinings, Leach and Ransom (1983)	Structure of the inter-organizational linkages.
Smith (1973)	Various tensions among idealized policy, implementing organization, target group, environmental factors.
Sorg (1983)	Individual implementer behavior.
Thomas (1979)	Local propensity to accept a program, blend of policy incentives with conditions, how the issue develops.
F. Thompson (1979)	Discretion in policy, agency consensus, ethos and leadership, type of pressure from environment, capacity of oversight of actors.
J. Thompson (1982)	Hierarchy, socio-economic variables.
Tummers (2012)	Policy alienation; strategic powerlessness, tactical powerlessness, operational powerlessness, societal meaningless, client meaningless.
Van Meter and van Horn (1975), van Horn (1978, 1979), van Horn and van Meter (1976)	Policy standards, resources, enforcement, communications, characteristics of implementing agencies, political conditions, economic and social conditions, dispositions of the implementers.
Weatherly and Lipsky (1977)	Resources, coping behaviors of street-level bureaucrats.
Weiler et al. (1982)	Availability of baseline data, extent to which individual programs are affected by required standards of performance, agency attitudes, resources.
Weimer (1983)	Time, civil service system, bureaucratic environment.
Williams (1980, 1982)	Bargaining and fixing, institutional arrangements, staff competence, sectorial pressures, information process, resources.
Yaffee (1982)	Prohibitive character of statute.

SOURCE: OWN CREATION

Clusters of success factors that influence the implementation process

All these studies into the performance of policy implementation indicate the complex and dynamic nature of the subject matter. Investigations have constantly been plagued by the problem that there are too many variables that often impact the process in very different ways (Goggin, 1986). According to Goggin (1986), it is therefore best to look at the 'vital aspects' of the implementation process and see which variables affect these parts. Gogin identified five vital aspects of the implementation process: the form and content of the policy and implementation statute as these set out the direction of the implementation process, the interrelations between involved organizations, the capacity of the individual organizations to deliver their part, the quality of the work of the implementers and changes in the exogenous environment[30]. Following this 'categorization' we have grouped the aforementioned variables of paragraph 4 (see chart on the next page). We believe that these are the factors that need to be taken into account in the BRAIN-TRAINS project when looking at the process of policy implementation. We plan to elaborate on the interplay of these critical success factors in WP6 by linking the factors to conditions and mechanisms of coordination.

[30] The environment refers to technological developments, social developments, political developments, sectorial developments, economic developments and the influence of media and interest groups.

The form of the policy and statute

1. Type of policy (distributive, regulatory, redistributive)
2. Clarity of goals, objectives and priorities
3. Validity and accuracy of causal theory underlying policy
4. Degree of change envisioned
5. Policy instruments
6. Planning, duration and statutory deadlines
7. Prohibitive character of statute
8. Learning processes of past practices
9. Influence of overlapping and conflicting policies

Environmental factors

1. Technological developments
2. Social developments
3. Political developments
4. Sectorial developments
5. Economic developments
6. Media and interest groups

Factors influencing the capacity of involved organizations

Degree to which the organization….:

1. is consensually clear about its task
2. has clear procedures, routines, bureaucratic norms and enforcement styles
3. is appropriately differentiated into parts related to its pertinent sub-environments
4. is integrated by information exchanges and effective conflict management devices
5. has clear knowledge about its performance, is self-reflective and makes corrective adjustments to its own behavior.
6. has the right and a sufficient amount of resources (administrative, financial, physical, human, political, reputation)
7. has little conflict between organizational leaders, top-level bureaucrats and subordinates

Factors influencing the interrelations of involved organizations

1. Inter-organizational structure
   - ✓ Number of actors participating
   - ✓ Number of levels involved
   - ✓ Power, authority and mandate distributions
   - ✓ Type of dependency (pooled, sequential dependency, reciprocal, sequential parallel, networked)
   - ✓ Network leadership
2. Interests, motivations, orientations, strategies and preferences of involved organizations
3. Degree of consensus, support, conflict and mediation
4. Decision and control processes
5. Frequency of contact
6. Transmission, clarity and consistency of communication

Factors influencing the work of implementers

1. Training, expertise, skills and knowledge
2. Discretion
3. Personal attitudes:
   - ✓ Strategic powerlessness: perceived influence on decisions concerning content of policy
   - ✓ Tactical powerlessness: perceived influence on decisions concerning the way of implementation
   - ✓ Operational powerlessness: perceived degree of freedom in making choices
   - ✓ Societal meaningless: perception concerning added value of policy to socially relevant goals
   - ✓ Client meaningless: professionals' perceptions of the added value of their implementing a policy for their own clients.

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DELIVERABLE 1.1 - 1.2 H: SWOT analysis

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INTRODUCTION

In order to define the most plausible future scenarios for the development of intermodal transport and rail freight intermodality, the different SWOT elements above have been rated on their influence, as well as on their likelihood of happening in the future. In this way, a priority ranking can be created for each of the strengths-weaknesses, as well as for the opportunities-threats, which will help to build those scenarios for further analysis.

A questionnaire has been set up (Annex I), containing all the different elements from the SWOT analysis above. Each of the elements was to be rated by the experts of the consultation panel on a Likert-scale from 1 to 5, shown in figure 1. For the influence or impact of each element, the scale ranged from no influence (1) to a maximum influence (5). For the likelihood of happening, the scale indicated options between no likelihood of happening (1) and a very high likelihood of happening (5). For further analysis, the responses on this Likert-scale have been simplified by clustering category 1 and 2 into a negative factor (-), category 3 into a neutral factor (o) and category 4 and 5 into a positive factor (+). For example, the negative factor contains all respondents who state there will be no or weak influence and/or no or a low likelihood of happening for the element. The reason and justification for this clustering will be explained during the method implementation described below. As a main benefit, it will allow for a better interpretation of the results, in order to define a more objective ranking of the different SWOT elements.

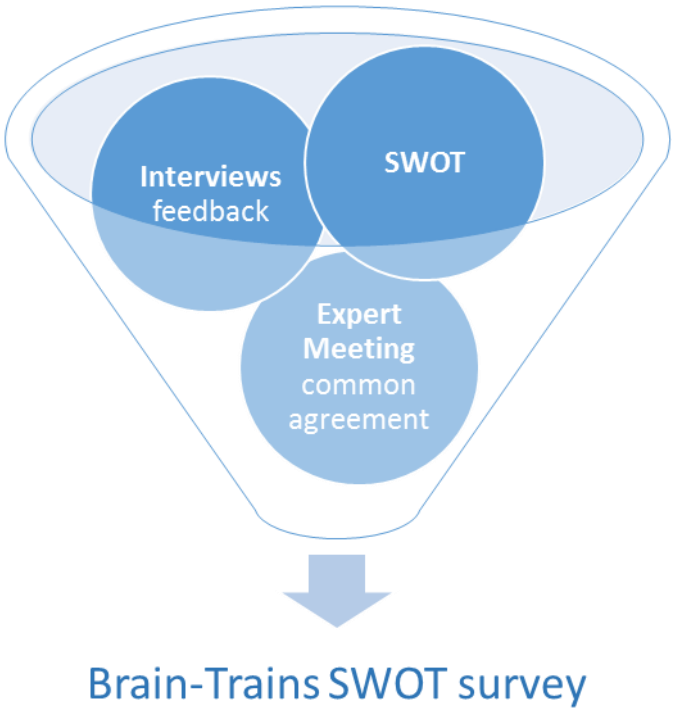
FIGURE 1: USED LIKERT-SCALE FOR THE BRAIN-TRAINS SURVEY ANALYSIS

	1	2	3	4	5
Influence	No influence	Weak influence	Moderate influence	Strong influence	Perfect influence
	-		o	+	
Likelihood	No likelihood	Weak likelihood	Moderate likelihood	High likelihood	Very High likelihood

SOURCE: OWN CREATION

The approach is twofold as shown in figure 2 below, using a heterogeneous panel of experts to obtain a preliminarily verified list of SWOT elements. This Delphi-like approach has been applied, in order to certify the different elements in the SWOT defined by the consortium. Interviews with different specialists and authorities have taken place, where feedback on these parameters was given. In addition, this panel of experts discussed and confirmed the validity of each of the elements during a meeting in Brussels on December 2nd, 2014. This has led to the final version of the SWOT survey as shown in Annex I. Besides the general validation of the statements, it was also asked to the panel if other elements were still missing from this SWOT analysis. When commonly agreed by the panel of experts, these elements have already been taken into consideration into the survey, in which the respondents received another chance to add final comments or missing elements. These comments are collected in section 7 of this chapter and will serve as an extension to the SWOT analysis above. These elements must also be taken into account during the scenario development, but are mentioned separately as they are not commonly validated through the earlier described Delphi-like exercise.

FIGURE 2: DELPHI-LIKE APPROACH TO BUILD THE SWOT QUESTIONNAIRE



SOURCE: OWN CREATION

In total, 14 respondents have participated to the survey: 3 port authorities, 2 rail freight operators, 2 government representatives, 3 consultancy/academic contributors and 4 private intermodal transport users. This variety in experts renders the sample valid for further analysis. The results of this survey will be further analysed and discussed within this chapter, in order to try to define a priority setting for the different elements, with the objective of building possible future scenarios for intermodal rail freight developments.

First a general analysis will be performed in section 1, explaining the used methodology on homogeneity and as such respondents' agreement. In section 2 to 5, the different strengths, weaknesses, opportunities and threats are analysed more into detail, using the frequency tables, the modus and the H-index. In section 6, the Wilcoxon matched-pairs signed-rank test is performed to check if there is a significant difference between the answers on the influence and the answers on the likelihood of the SWOT elements. In the last section of this chapter, a summary of the remarks collected through the survey will be stated.

LIST OF FIGURES

1. GENERAL ANALYSIS

As the data collected from the survey are Likert-scale based (ordinal data), the most common statistical approach would be the use of frequency tables, the modus and the H-index to define the homogeneity of the different answers. In this way, the results can be compared on their consistency, as a first step towards the definition of a priority. The same methodology has been used by Vanelslander & Sys (2014) to evaluate a set of actions in order to increase port competitiveness.

- Frequency tables indicate the percentage of answers for each score on a specific element. From these tables, the scores that have been most selected can be identified. Equally, it does provide a first insight on the spread over the different scoring possibilities, indicating whether the respondents highly agree or not.

- The modus is the score with the highest frequency, i.e. most of the respondents provided this answer to the question. In case multiple answers received the same amount of responses, an adjusted mode could be stated by calculating the average.

- The H-index is a relative homogeneity index and is calculated as the standardized value of the square sum of the percentage frequencies of the ranking. The homogeneity index H is calculated for each SWOT element as follows (Accario et al., 2013):

$$h_i = \sum_j f_{ij}^2$$

  F_{ij} is indicated as the percentage of respondents that ranked an element *i* with value *j*, with $j \in \{1,2,3\}$.

On a 3-point Likert scale, the H-index can be interpreted as follows: When h_i equals 1, maximum homogeneity is reached, as all the elements are given the same score, and when h_i equals 0,333, maximum heterogeneity is reached as all the elements are given a different score. This is illustrated below.

FIGURE 3: MAXIMUM HOMOGENEITY AND HETEROGENEITY EXAMPLES

Respondent 1	3
Respondent 2	3
Respondent 3	3

Frequency		
1	2	3
0%	0%	100%

$$\textbf{Maximum homogeneity: } h_i = 0\%^2 + 0\%^2 + 100\%^2 = 1$$

Respondent 1	1
Respondent 2	2
Respondent 3	3

Frequency		
1	2	3
33,33%	33,33%	33,33%

$$\textbf{Maximum heterogeneity: } h_i = 33.33\%^2 + 33.33\%^2 + 33.33\%^2$$

$$= 3 * 0{,}111$$

$$= 0{,}333$$

SOURCE: OWN CREATION

In order to define the relative homogeneity index H_i, the following formula can be applied:

$$H_i = \frac{h_i - \min(h_i)}{\max(h_i) - \min(h_i)}$$

On a 3-point Likert scale, the relative H-index can be interpreted as follows: when H_i equals 100%, maximum homogeneity is reached, as all the elements are given the same score (respondent agreement), and when H_i equals 0%, maximum heterogeneity is reached, as all the elements are given a different score (respondent disagreement). This is illustrated below:

Figure 4: Maximum relative homogeneity and heterogeneity examples

$$\textbf{Maximum homogeneity}: H_i = \frac{1 - 0{,}333}{1 - 0{,}333} = \frac{0{,}667}{0{,}667} = 100\%$$

$$\textbf{Maximum heterogeneity}: H_i = \frac{0{,}333 - 0{,}333}{1 - 0{,}333} = \frac{0}{0{,}667} = 0\%$$

Source: Own creation

As indicated in the introduction, the originally intended 5-point Likert-scale has been reformed to a 3-point Likert scale, clustering the low/weak and high/very high responses into a negative and positive factor. One of the characteristics of ordinal data is that respondents are free to interpret the definition of the different scores, making it impossible to measure the distance between the different scoring options. As a consequence, respondents who equally value the impact of a certain SWOT element might still score them differently due to the dissimilar scoring interpretations. This could result in an increased heterogeneity of the data, although the spread of the data might mainly take place on one side of the Likert-scale, making the importance or the influence and the likelihood of a certain higher significance in these cases. Some examples with a 5-point Likert-scale will make this clear.

Figure 5: Compared examples on 5-point Likert-scales

Example 1

Respondent 1	1
Respondent 2	2
Respondent 3	5
Respondent 2	5

Frequency				
1	2	3	4	5
25,00%	25,00%	0,00%	0,00%	50,00%
Modus = 5				

$$h_i = 25\%^2 + 25\%^2 + 50\%^2 = 0{,}375 \qquad H_i = \frac{0{,}375 - 0{,}2}{1 - 0{,}2} = \frac{0{,}175}{0{,}8} = 21.88\%$$

Example 2

Respondent 1	3
Respondent 2	4
Respondent 3	5
Respondent 2	5

Frequency				
1	2	3	4	5
0,00%	0,00%	25,00%	25,00%	50,00%
Modus = 5				

$$h_i = 25\%^2 + 25\%^2 + 50\%^2 = 0{,}375 \qquad H_i = \frac{0{,}375 - 0{,}2}{1 - 0{,}2} = \frac{0{,}175}{0{,}8} = 21.88\%$$

Source: Own creation

Both examples result in the same modus (score = 5, very high impact) and the same relative H-index of 21.88%. This might lead to the conclusion that both elements are rated as equally important by the respondents. Nevertheless, it can be seen intuitively from the data that, within the second example, respondents are more commonly agreed on the importance, as all results are indicating a score of 3 or above (moderate to very high impact). In the first example, half of the respondents indicates a very high impact, while the other half indicates no or a minimal influence of the element. When analysing the data with the proposed clustering in figure 1 above (+, o, -), these effects can be neutralized. This is shown in the simplified examples below.

FIGURE 6: COMPARED SIMPLIFIED EXAMPLES ON 3-POINT LIKERT-SCALES

Simplified example 1

Respondent 1	1
Respondent 2	2
Respondent 3	5
Respondent 2	5

Frequency		
- (1 or 2)	o *(3)*	*+ (4 or 5)*
50,00%	0,00%	50,00%
Modus = - & +		

$$h_i = 50\%^2 + 50\%^2 = 0{,}5$$

$$H_i = \frac{0{,}5 - 0{,}333}{1 - 0{,}333} = \frac{0{,}167}{0{,}667} = 25.04\,\%$$

Simplified example 2

Respondent 1	3
Respondent 2	4
Respondent 3	5
Respondent 2	5

Frequency		
- (1 or 2)	o *(3)*	*+ (4 or 5)*
0,00%	25,00%	75,00%
Modus = +		

$$h_i = 25\%^2 + 75\%^2 = 0{,}625$$

$$H_i = \frac{0{,}625 - 0{,}333}{1 - 0{,}333} = \frac{0{,}292}{0{,}667} = 43.78\,\%$$

SOURCE: OWN CREATION

Although the same respondent ratings were used, the first example now has a modus equalling both the negative factor, as well as the positive factor, indicating that the respondents are more divided on whether the element will have an impact or not. This is also reflected by the relatively low H-index of 25.04%. In the second example, which had the same outcome when the 5-point Likert-scale was used, a clear direction is now shown by the modus (positive factor) as well as the increased homoscedasticity to 43.78%. These results correspond with the intuitive feeling that the second example results in a more common acceptance that there is a probable positive influence of the element, where in the first example there is more disagreement on this case.

In an attempt to define the priority for each element, the different categories of the SWOT analysis will be analysed separately in the following sectors. For each category, the frequency table is shown, indicating the answer with the highest frequency and the corresponding modus. In order to define a list of priorities, it is important to focus on the elements with the biggest impact or influence and the highest likelihood of happening. The different category elements will then be ranked according to this modus (positive factor, neutral response or negative factor) as well as the calculated relative H-index indicating the consistency in the respondents' answers.

2. STRENGTHS ANALYSIS

Analysing the frequency table for the strengths (Annex II - Strengths), a very diverse pattern can be found. Both for the influence and for the likelihood of happening, strengths are very much distributed over the negative (12 for impact, 2 for likelihood), neutral (10 for impact, 15 for influence) and positive factors (8 for impact, 9 for influence). It can be concluded that only two strengths are likely to occur, being the larger capacities in terms of payload (WP 2-2), and the liberalization of the market (WP 5-1).

In addition, the homogeneity of the scores on the strengths is rather low, indicating a certain level of disagreement between the respondents. Most agreement can be found on the moderate likelihood of discussions on the transposal and preparation of EU policies (WP 6-9). The impact of this strength is indicated as positive (41.67%), although with a very low agreement. The H-index for the impact is 2.08%, with 33.33% of the respondents indicating a moderate influence and 25% indicating a negative impact.

Also the positive impact of reduced cost and externalities (WP 2-1) as a strength is highly agreed upon, although the likelihood of happening is indicated as moderate, with a low agreement as the H-index is only 4.14%. Indeed, although 46.15% of the respondents agree with the moderate likelihood of happening, 30.77% states a positive likelihood and 23.08% states a negative likelihood of happening.

A ranked top-10 of both the influence and the likelihood of happening of the different strengths is shown in the figures below.

FIGURE 7: RANKING OF THE STRENGTHS BASED ON THEIR IMPACT, WITH MODUS AND HI

		STRENGTHS - IMPACT	Modus	HI	Position in Likelihood
1.	WP2-1	Reduced costs and externalities, as well as increased sustainability over long distances	+	43,20%	16.
2.	WP2-2	Larger capacities and higher payload of containers in comparison to trucks	+	34,18%	1.
3.	WP 5-1	Liberalization of the market	+	34,18%	2.
4.	WP 3-3	Additional synergies within the rail sector and with other sectors (Manufacturing, construction industries, maintenance, services, …)	+	18,34%	10.
5.	WP 3-2	A better modal split ; a better allocation of space affects the crucial transportation ways (in terms of efficient transport and efficient allocation of space)	+	14,79%	15.
6.	WP 5-2	Less governmental involvement	+	6,63%	12.
7.	WP 6-4	The involved government actors all agree on the fact that the modal share of road transport should be reduced	+	6,63%	25.
8.	WP 6-9	There are discussions on the transposal and preparation of EU policies	+	2,08%	14.
9.	WP 6-2	The involved governmental actors have proven to be able to adapt their own strategic plans to EU policies	+	0,59%	7.
10.	WP 6-7	The strategic plans of the regional and federal administrations have gotten some kind of 'shared' language as they are infused with aspects of 'globalization' and 'environmental affairs' due to the EU policies	o	30,77%	3.

SOURCE: OWN CREATION

FIGURE 8: RANKING OF THE STRENGTHS BASED ON THEIR LIKELIHOOD, WITH MODUS AND HI

		STRENGTHS - LIKELIHOOD	Modus	HI	Position in Impact
1.	WP2-2	Larger capacities and higher payload of containers in comparison to trucks	+	9,69%	2.
2.	WP 5-1	Liberalization of the market	+	3,57%	1.
3.	WP 6-7	The strategic plans of the regional and federal administrations have gotten some kind of 'shared' language as they are infused with aspects of 'globalization' and 'environmental affairs' due to the EU policies	o	60,95%	9.
4.	WP 6-5	At the Federal level, the federal ministries managed to agree on a compromise on smart green transport policies that found a proper balance between social, economic and ecological values. Based on this compromise (the White Paper) the FOD M&V has drafted various freight policies	o	31,12%	14.
5.	WP 6-10	There are various, issue-specific partnership agreements between the federal government and the regional administrations	o	27,08%	16.
6.	WP 4-2	Existing literature about transportation in several countries	o	25,44%	21.
7.	WP 6-2	The involved governmental actors have proven to be able to adapt theirown strategic plans to EU policies	o	25,44%	8.
8.	WP 6-3	There are access structures – forums where actors interact on problems and solutions – that encompass the different levels of government. Also within the Federal administration there are forums established to discuss transport affairs. Similarly, within the FOD M&V there are fora that try to find interconnections between the separate divisions of the Federal department	o	21,89%	17.
9.	WP 6-11	There are a number of studies on the execution and drafting of transport policies irrespective of the mode of transport. At the moment, the consultancy firm of Roland Berger is doing a kind alike research focusing on the contemporary state of affairs	o	18,75%	20.
10.	WP 3-3	Additional synergies within the rail sector and with other sectors (manufacturing, construction industries, maintenance, services, …)	o	16,57%	4.

SOURCE: OWN CREATION

This ranking is obtained by sorting the strengths first on the modus, and next on the H-index. As it was already indicated, it becomes clear that elements with a high influence do not necessarily include a high possibility of taking place, and vice versa. For example, the agreement of government actors on the need for modal share of road transport to take place (WP 6-4), is rated 7th in terms of impact, but ends on the last place in terms of likelihood of happening. Also the achievement of a better modal split (WP 3-2) is rated high in terms of importance, with a 5th place. Nevertheless, the respondents are rather sceptical whether this will effectively come true, as this strength is on the 15th place in terms of likelihood of happening.

It should also be mentioned that most of the top-10 strengths have a positive modus on impact, whereas only two strengths are rated positive in terms of likelihood of happening. Most of the strengths are found to have a moderate probability of taking place in the future.

When analysing more into detail the different work packages, the strength with the highest influence and likelihood of happening can be determined. This is shown in figure 9 below. It should be noticed that the synergies with other markets (WP 3-3) and the liberalization of the market (WP 5-1) can be found in both tables, marked in grey, meaning that for these strengths, both impact and likelihood are the highest within their respective work packages. For the other work packages, different strengths are holding the highest impact and the greatest likelihood of occurring.

FIGURE 9: BIGGEST IMPACT AND LIKELIHOOD FOR STRENGTHS PER WORK PACKAGE

BIGGEST IMPACT PER WORK PACKAGE		Modus	Hi
WP2-1	Reduced costs and externalities, as well as increased sustainability over long distances	+	**43,20%**
WP 3-3	Additional synergies within the rail sector and with other sectors (Manufacturing, construction industries, maintenance, services, …)	+	18,34%
WP 4-5	Network of international scientific experts in the transportation field	o	9,69%
WP 5-1	Liberalization of the market	+	**34,18%**
WP 6-4	The involved government actors all agree on the fact that the modal share of road transport should be reduced	+	6,63%

BIGGEST LIKELIHOOD PER WORK PACKAGE		Modus	Hi
WP2-2	Larger capacities and higher payload of containers in comparison to trucks	+	9,69%
WP 3-3	Additional synergies within the rail sector and with other sectors (Manufacturing, construction industries, maintenance, services, …)	o	16,57%
WP 4-2	Existing literature about transportation in several countries	o	**25,44%**
WP 5-1	Liberalization of the market	+	3,57%
WP 6-7	The strategic plans of the regional and federal administrations have gotten some kind of 'shared' language as they are infused with aspects of 'globalization' and 'environmental affairs' due to the EU policies	o	**60,95%**

SOURCE: OWN CREATION

In conclusion, based on the top 5 for both impact and influence, as well as taking into account the frequency table, the defined modus per element and the homogeneity of the answers, a list of strengths can be determined to be taken into account for future scenario development (figure 10). Nevertheless, as the level of disagreement between the respondents is rather high, as well as the earlier shown difference in rating between impact and likelihood, this list does not hold a final priority definition, but is merely a general indication on the most important and plausible strengths for intermodal rail transport development.

FIGURE 10: MOST IMPORTANT AND PLAUSIBLE STRENGTHS FOR SCENARIO DEVELOPMENT

MOST IMPORTANT AND PLAUSIBLE STRENGTHS FOR SCENARIO DEVELOPMENT

(Top 5 combination + Modus and H-index adjustment)

WP 2-1	Reduced costs and externalities, as well as increased sustainability over long distances
WP 2-2	Larger capacities and higher payload of containers in comparison to trucks
WP 3-2	A better modal split ; a better allocation of space affects the crucial transportation ways (in terms of efficient transport and efficient allocation of space)
WP 3-3	Additional synergies within the rail sector and with other sectors (Manufacturing, construction industries, maintenance, services, …)
WP 5-1	Liberalization of the market
WP 6-5	At the Federal level, the federal ministries managed to agree on acompromise on smart green transport policies that found a properbalance between social, economic and ecological values. Based on thiscompromise (the White Book), the FOD M&V has drafted various freightpolicies
WP 6-10	There are various, issue-specific partnership agreements between the federal government and the regional administrations

SOURCE: OWN CREATION

3. WEAKNESSES ANALYSIS

Analysing the frequency table for the weaknesses (Annex II - Weaknesses), a less diverse pattern is noted in comparison to the strengths. It is clear that there is a certain trend towards a positive influence (23). The responses for the likelihood of happening are mainly divided over the positive factor (17) and a moderate possibility (16). It can be concluded that no weaknesses are unlikely to happen, and only one element has a low to moderate impact, being the fact that freight transportation is a new field of knowledge in the LCA methodology (WP 4-4). The homogeneity of the scores has also increased, indicating a higher level of agreement between the respondents.

Most agreement can be found on the high impact of weaker network access compared to road transport (WP 5-2). All respondents agree with the fact that this weakness will have a high or very high influence on the future development of intermodal rail transport. Also the likelihood of happening for this weakness is rated positive (76.92%), with a high level of agreement. The H-index for the likelihood of this weakness is 43.2%, with 15.38% indicating a moderate likelihood and 7.69% indicating none or at most a low likelihood.

A ranked top-10 of both the influence and the likelihood of happening of the different weaknesses is shown in figures 11 and 12 below. This ranking is obtained by sorting the weaknesses first on the modus, and next on the H-index. It can be seen that elements with a high influence also have a high possibility of taking place, and vice versa. For example, the network access which was discussed above, is rated 1st both in terms of impact and likelihood. Also the opportunity cost of intermodal rail freight due to unreliability and longer travel times (WP 2-1) scores high in terms of impact as well as probability.

It should also be mentioned that all of the top-10 weaknesses have a positive modus for both the influence and the likelihood, but homogeneity is higher for the impact of these weaknesses, compared to the likelihood of happening.

FIGURE 11: RANKING OF THE WEAKNESSES BASED ON THEIR IMPACT, WITH MODUS AND HI

		WEAKNESSES - IMPACT	Modus	HI	Position in Likelihood
1.	WP 5-2	Network access is weaker compared to road transport	+	100,00%	1.
2.	WP 2-1	Opportunity cost due to unreliability and longer travel times	+	60,95%	2.
3.	WP 5-1	High CAPEX investments to enter the market	+	60,95%	14.
4.	WP 5-3	Not completely fair competition because of existing power of the major market players, which leads to discrimination in path allocation and discriminatory or excessive charges	+	60,95%	4.
5.	WP 6-8	There are different policy priorities among the involved governmental actors	+	58,33%	5.
6.	WP 6-10	There has not been a major effort to enable a change in the road transport sector by e.g.: applying the 'polluters-pays-principle' to the road haulage system.	+	58,33%	11.
7.	WP 2-6	Longer lead times before operating a new service	+	46,75%	6.
8.	WP 2-2	High drayage operations costs	+	36,10%	3.
9.	WP 6-4	No National Plan on Sustainable Mobility has been drafted instead there is a scattered landscape of policy initiatives related to sustainable mobility	+	30,77%	10.
10.	WP 2-4	Complexity in selecting adequate pricing strategies, as well as subsidies policies	+	28,99%	7.

SOURCE: OWN CREATION

FIGURE 12: RANKING OF THE WEAKNESSES BASED ON THEIR LIKELIHOOD, WITH MODUS AND HI

		WEAKNESSES - LIKELIHOOD	Modus	HI	Position in Impact
1.	WP 5-2	Network access is weaker compared to road transport	+	43,20%	1.
2.	WP 2-1	Opportunity cost due to unreliability and longer travel times	+	36,10%	2.
3.	WP 2-2	High drayage operations costs	+	28,99%	8.
4.	WP 5-3	Not completely fair competition because of existing power of the major market players, which leads to discrimination in path allocation and discriminatory or excessive charges	+	28,99%	4.
5.	WP 6-8	There are different policy priorities among the involved governmental actors	+	27,08%	5.
6.	WP 2-6	Longer lead times before operating a new service	+	21,89%	7.
7.	WP 2-4	Complexity in selecting adequate pricing strategies, as well as subsidies policies	+	16,57%	10.
8.	WP 2-5	Flexibility issues: planning schedules with respect to the passengers railand optimizing locomotives operations with compliance to the marketdemands	+	14,79%	14.
9.	WP 6-1	Competences are spread over a multitude of departments and organizations at different levels of government and various policy domains	+	14,79%	13.
10.	WP 6-4	No National Plan on Sustainable Mobility has been drafted instead there is a scattered landscape of policy initiatives related to sustainable mobility	+	14,79%	9.

SOURCE: OWN CREATION

Analysing more into detail the different work packages in figure 13, the weakness with the highest influence and likelihood of happening can be determined. It should be noticed that the opportunity cost due to unreliability and longer travel times (WP 2-1), the weak network access (WP 5-2) and the different policy priorities (WP 6-8) can be found in both tables, marked in grey, meaning that for these weaknesses both impact and likelihood are the highest within their respective work packages. For the other work packages, different weaknesses are holding the highest impact and the greatest likelihood of occurring.

FIGURE 13: BIGGEST IMPACT AND LIKELIHOOD FOR WEAKNESSES PER WORK PACKAGE

BIGGEST IMPACT PER WORK PACKAGE		**Modus**	**Hi**
WP 2-1	Opportunity cost due to unreliability and longer travel times	+	**60,95%**
WP 3-1	The potential insufficient capacity gap of the existing network on therailways freight development ('missing links')	+	**28,99%**
WP 4-5	Commercial transportation databases are non-specific to Belgium and should be improved and updated	+	9,47%
WP 5-2	Network access is weaker compared to road transport	+	**100,00%**
WP 6-8	There are different policy priorities among the involved governmental actors	+	**58,33%**

BIGGEST LIKELIHOOD PER WORK PACKAGE		**Modus**	**Hi**
WP 2-1	Opportunity cost due to unreliability and longer travel times	+	**36,10%**
WP 3-2	The shifting demand from other sustainable transportation modes (f.ex.Inland Navigation)	+	2,37%
WP 4-4	Freight transportation is a new field of knowledge in the LCA field in general	o	**30,77%**
WP 5-2	Network access is weaker compared to road transport	+	**43,20%**
WP 6-8	There are different policy priorities among the involved governmental actors	+	**27,08%**

SOURCE: OWN CREATION

In conclusion, based on the top 5 for both impact and influence, as well as taking into account the frequency table, the defined modus per element and the homogeneity of the answers, a number of weaknesses can be determined to be taken into account for future scenario development (figure 14). Although the level of disagreement between the respondents is less than it was the case with the strengths, it is still existing. In addition, there also sometimes remains a difference in rating between impact and likelihood. Therefore this list does not hold a final priority definition, but is merely a general indication on the most important and plausible weaknesses for intermodal rail transport development.

FIGURE 14: MOST IMPORTANT AND PLAUSIBLE WEAKNESSES FOR SCENARIO DEVELOPMENT

MOST IMPORTANT AND PLAUSIBLE WEAKNESSES FOR SCENARIO DEVELOPMENT

(Top 5 combination + Modus and H-index adjustment)

WP 2-1	Opportunity cost due to unreliability and longer travel times
WP 2-2	High drayage operations costs
WP 2-4	Complexity in selecting adequate pricing strategies, as well as subsidies policies
WP 2-6	Longer lead times before operating a new service
WP 3-1	The potential insufficient capacity gap of the existing network on therailways freight development ('missing links')
WP 5-1	High CAPEX investments to enter the market
WP 5-2	Network access is weaker compared to road transport
WP 5-3	Not completely fair competition because of existing power of the major market players, which leads to discrimination in path allocation and discriminatory or excessive charges
WP 6-4	No National Plan on Sustainable Mobility has been drafted instead there is a scattered landscape of policy initiatives related to sustainable mobility
WP 6-8	There are different policy priorities among the involved governmental actors
WP 6-10	There has not been a major effort to enable a change in the road transport sector by e.g.: applying the 'polluters-pays-principle' to the road haulage system.

SOURCE: OWN CREATION

4. OPPORTUNITIES ANALYSIS

Analysing the frequency table for the opportunities (Annex II - Opportunities), a split between moderate and positive effects can be determined. Both for the influence and the likelihood of happening, opportunities are very much distributed over the moderate (8 for impact, 14 for likelihood) and positive factors (14 for impact, 6 for likelihood). Only one opportunity is unlikely to happen, being the GIS advantages in network design (WP 2-5). None of the opportunities were found to be of none or low importance by the respondents.

In addition, the homogeneity of the scores on the opportunities has decreased compares to the weaknesses, but is still higher compared to the strengths. This indicates that a certain level of disagreement is still present within the results. The highest level of agreement can be found with the agreed importance on consolidation of flows (WP 2-2). However, the likelihood of happening of this bundling is indicated as moderate (57.14%), with a rather low agreement. The H-index for the likelihood of this opportunity is 18.88%, with 35.71% of the respondents indicating a higher chance that this bundling will take place and 7.14% indicating no or a low probability this will occur.

A ranked top-10 of both the influence and the likelihood of happening of the different opportunities is shown in the figures below. This ranking is obtained by sorting the opportunities first on the modus, and next on the H-index.

FIGURE 15: RANKING OF THE OPPORTUNITIES BASED ON THEIR IMPACT, WITH MODUS AND HI

		OPPORTUNITIES - IMPACT	Modus	HI	Position in Likelihood
1.	WP 2-2	Consolidation of flows	+	100,00%	13.
2.	WP 3-1	Internalization of external costs (such as social costs in terms of pollution, traffic congestion, etc.) due to increased rail transport	+	46,75%	14.
3.	WP 5-1	Creating a single European Market can simplify the freight transport along the European corridors. Further standardization of the technical specification and national legislation	+	46,75%	17.
4.	WP 2-4	Homogenization and investments in rail infrastructure, information systems and intermodal transport units	+	38,78%	12.
5.	WP 3-3	Connecting the European corridors and creating a high speed east-west network, as well as linking the national railways to the TEN-T corridors	+	34,18%	1.
6.	WP 2-1	Shorter pre-and post-haulage (PPH) distances	+	30,77%	18.
7.	WP 2-3	Future road taxes on motorways	+	28,99%	2.
8.	WP 3-5	Intermodal platforms and multimodal hubs, bringing an uplifting effect for rail transport	+	18,88%	11.
9.	WP 4-1	Interest of stakeholders to provide needed information and to use results	+	16,57%	7.
10.	WP 6-2	Increased Europeanization of policies (that take into accountthe transport domain irrespective of the mode of transport)	+	16,57%	8.

SOURCE: OWN CREATION

FIGURE 16: RANKING OF THE OPPORTUNITIES BASED ON THEIR LIKELIHOOD, WITH MODUS AND HI

		OPPORTUNITIES - LIKELIHOOD	Modus	HI	Position in Impact
1.	WP 3-3	Connecting the European corridors and creating a high speed east-west network, as well as linking the national railways to the TEN-T corridors	+	26,53%	5.
2.	WP 2-3	Future road taxes on motorways	+	18,34%	7.
3.	WP 4-4	Willingness of Europe to promote intermodal transportation(internalization of external costs)	+	16,57%	13.
4.	WP 3-6	Increased R&D investments (technology), resulting in a positive effect on rail. F.ex. standardization of technologies creating interoperability	+	7,69%	18.
5.	WP 2-6	Interest in "new generation" terminals	+	3,57%	12.
6.	WP 4-3	Development of a transportation plan including environmental aspects for the future and then allowing the reduction of GHG emissions or other pollutants	+	2,37%	20.
7.	WP 4-1	Interest of stakeholders to provide needed information and to use results	o	43,20%	9.
8.	WP 6-2	Increased Europeanization of policies (that take into account the transport domain irrespective of the mode of transport)	o	43,20%	10.
9.	WP 6-3	Growing influence of transnational institutions, like e.g.: the central commission for navigation on the Rhine	o	43,20%	16.
10.	WP 3-4	A positive influence on the demand of mobility when an increase in GDP is reached	o	28,99%	17.

SOURCE: OWN CREATION

As it was already indicated, it becomes clear that elements with a high influence do not necessarily hold a high possibility of taking place, and vice versa. For example, internalization of external costs (WP 3-1) is found to be very important (2nd place in the impact table), but has a low likelihood of happening with a 14th place. Also the creation of a single European market and standardization (WP 5-1) are rated high in terms of importance. Nevertheless, the respondents are once again rather sceptical on whether this will effectively come true, as this opportunity is ranked only 17th in terms of likelihood of happening.

Concerning the TEN-T network connections between Western and Eastern Europe (WP 3-3), the future road taxes on motorways (WP 2-3) and the willingness of Europe to promote intermodal transportation (WP 4-4), the respondents indicate a high probability of happening (top-3 ranking). Nevertheless, there is less agreement on the positive impact of these elements, with a ranking of respectively 5, 7 and 13 and a corresponding homogeneity index of respectively 34.18%, 28.99% and 7.69%.

It should also be mentioned that most of the top-10 opportunities have a positive modus on impact, whereas six opportunities are evaluated positively in terms of likelihood of happening. The remaining four hold a moderate modus.

When checking more into detail the different work packages, the opportunities with the highest influence and likelihood of happening can be determined. This is shown in figure 17 below. It should be noticed that the creation of a single European market (WP 5-1) and the increased Europeanization of policies (WP 6-2) can be found in both tables, marked in grey, meaning that for these opportunities both impact and likelihood are the highest within their respective work packages. For the other work packages, different opportunities are holding the highest impact and the greatest likelihood of occurring.

FIGURE 17: BIGGEST IMPACT AND LIKELIHOOD FOR OPPORTUNITIES PER WORK PACKAGE

BIGGEST IMPACT PER WORK PACKAGE		Modus	Hi
WP 2-2	Consolidation of flows	+	**100,00%**
WP 3-1	Internalization of external costs (such as social costs in terms of pollution, traffic congestion, etc.) due to increased rail transport	+	**46,75%**
WP 4-1	Interest of stakeholders to provide needed information and to use results	+	16,57%
WP 5-1	Creating a single European Market can simplify the freight transport along the European corridors. Further standardization of the technical specification and national legislation	+	**46,75%**
WP 6-2	Increased Europeanization of policies (that take into account the transport domain irrespective of the mode of transport)	+	16,57%
BIGGEST LIKELIHOOD PER WORK PACKAGE		**Modus**	**Hi**
WP 2-3	Future road taxes on motorways	+	18,34%
WP 3-3	Connecting the European corridors and creating a high speed east-west network, as well as linking the national railways to the TEN-T corridors	+	**26,53%**
WP 4-4	Willingness of Europe to promote intermodal transportation(internalization of external costs)	+	16,57%
WP 5-1	Creating a single European Market can simplify the freight transport along the European corridors. Further standardization of the technical specification and national legislation	o	11,24%
WP 6-2	Increased Europeanization of policies (that take into account the transport domain irrespective of the mode of transport)	o	**43,20%**

SOURCE: OWN CREATION

In conclusion, based on the top 5 for both impact and influence, as well as taking into account the frequency table, the defined modus per element and the homogeneity of the answers, the following opportunities can be determined to be taken into account for future scenario development (figure 18). Nevertheless, as the level of disagreement between the respondents is high, as well as the earlier shown difference in rating between impact and likelihood exists, this list does not hold a final priority definition, but is merely a general indication on the most important and plausible opportunities for intermodal rail transport development.

FIGURE 18: MOST IMPORTANT AND PLAUSIBLE OPPORTUNITIES FOR SCENARIO DEVELOPMENT

MOST IMPORTANT AND PLAUSIBLE OPPORTUNITIES FOR SCENARIO DEVELOPMENT

(Top 5 combination + Modus and H-index adjustment)

WP 2-2	Consolidation of flows
WP 2-3	Future road taxes on motorways
WP 2-4	Homogenization and investments in rail infrastructure, information systems and intermodal transport units
WP 3-1	Internalization of external costs (such as social costs in terms of pollution, traffic congestion, etc.) due to increased rail transport
WP 3-3	Connecting the European corridors and creating a high speed east-west network, as well as linking the national railways to the TEN-T corridors
WP 4-4	Willingness of Europe to promote intermodal transportation (internalization of external costs)
WP 5-1	Creating a single European Market can simplify the freight transport along the European corridors. Further standardization of the technical specification and national legislation
WP 6-1	Sectoral developments and demands in the aftermath of the financial and economic crises

SOURCE: OWN CREATION

5. THREATS ANALYSIS

Analysing the frequency table for the threats (Annex II - Threats), a less diverse pattern is noted for the influence. It is clear that there is a certain trend towards a positive impact (15). The responses for the likelihood of happening are equally divided over the positive factor (11) and a moderate possibility (11). It can be concluded no threats are unlikely to happen, and three elements have a low to moderate impact, being the lack of specific Belgian data (WP 4-2), the regionalization of transport competences (WP 6-2) and the possible changes of policy priorities (WP 6-3). The homogeneity of the scores is still rather low, indicating the level of disagreement also exists for the threats.

Most agreement can be found on the high impact and likelihood of high investments becoming unsure in times of severe savings (WP 3-1). 78.57% of the respondents agree on the fact that this threat will have a high or very high influence on the future development of intermodal rail transport. Also the likelihood of happening for this threat is rated positive (78.57%), with a fairly high agreement. The H-index for the likelihood of this threat is 46.43%, with 14.29% indicating a moderate likelihood and only 7.14% indicating no or at most a low likelihood.

A ranked top-10 of both the influence and the likelihood of happening of the different threats is shown in figures 19 and 20 below. This ranking is obtained by sorting the threats first on the modus, and next on the H-index. Despite the low homogeneity, it can be seen that most of the elements with a high influence also have a high possibility of taking place, and vice versa. For example, investments in times of severe public savings (WP 3-1) is rated first both in terms of impact and likelihood.

It should also be mentioned that all of the top-10 threats have a positive modus, but homogeneity is slightly higher for the impact of these threats, compared to the likelihood of happening.

FIGURE 19: RANKING OF THE THREATS BASED ON THEIR IMPACT, WITH MODUS AND HI

		THREATS - IMPACT	Modus	HI	Position in Likelihood
1.	WP 3-1	Investments not (fully) taking place in times of severe public savings	+	49,49%	1.
2.	WP 2-1	Impossibility of consolidating flows	+	46,75%	16.
3.	WP 2-4	Interoperability barriers: on the infrastructure, regulatory, as well as the actors level	+	36,10%	7.
4.	WP 3-2	Tough decision-making processes for crucial European funds and subsidies in the future	+	21,94%	5.
5.	WP 5-1	Different legislation throughout European Union	+	21,89%	4.
6.	WP 2-2	Number of intermodal terminals	+	18,88%	17.
7.	WP 2-3	Removal of current state subsidies	+	18,88%	3.
8.	WP 3-3	Increased passenger rail traffic taking away the capacity from freight transport per rail	+	15,82%	19.
9.	WP 3-4	Shortage of capable personnel and aging of existing personnel	+	14,29%	10.
10.	WP 5-2	Evolution to one or two European widespread multinational companies. Instead of many different companies with great competitiveness as a result	+	11,24%	2.

SOURCE: OWN CREATION

FIGURE 20: RANKING OF THE THREATS BASED ON THEIR IMPACT, WITH MODUS AND HI

		THREATS - LIKELIHOOD	Modus	HI	Position in Impact
1.	WP 3-1	Investments not (fully) taking place in times of severe public savings	+	46,43%	1.
2.	WP 5-2	Evolution to one or two European widespread multinational companies. Instead of many different companies with great competitiveness as a result	+	30,77%	10.
3.	WP 2-3	Removal of current state subsidies	+	18,88%	7.
4.	WP 5-1	Different legislation throughout European Union	+	16,57%	5.
5.	WP 3-2	Tough decision-making processes for crucial European funds and subsidies in the future	+	14,29%	4.
6.	WP 3-5	Shortage of operational subsidies affecting railway freight development	+	14,29%	13.
7.	WP 2-4	Interoperability barriers: on the infrastructure, regulatory, as well as the actors level	+	11,24%	3.
8.	WP 4-3	Existence of 13 rail freight operators, leading some difficulties in getting consolidated results	+	7,69%	12.
9.	WP 6-1	Austerity measures that have to be taken due to bad economic and financial climate	+	7,69%	14.
10.	WP 3-4	Shortage of capable personnel and aging of existing personnel	+	3,57%	9.

SOURCE: OWN CREATION

Analysing more into detail the different work packages, the threats with the highest influence and likelihood of happening can be determined. This is shown in figure 21 below. It should be noticed that the threat of investments not taking place in times of public savings (WP 3-1), the existence of thirteen rail freight operators leading to difficulties in getting consolidated results (WP 4-3) and the austerity measures that have to be taken due to a bad economic and financial climate (WP 6-1), can be found in both tables, meaning that for these threats both impact and likelihood are the highest within their respective work package.

FIGURE 21: BIGGEST IMPACT AND LIKELIHOOD FOR THREATS PER WORK PACKAGE

BIGGEST IMPACT PER WORK PACKAGE		**Modus**	**Hi**
WP 2-1	Impossibility of consolidating flows	+	**46,75%**
WP 3-1	Investments not (fully) taking place in times of severe public savings	+	**49,49%**
WP 4-3	Existence of 13 rail freight operators, leading some difficulties in getting consolidated results	+	7,69%
WP 5-1	Different legislation throughout European Union	+	21,89%
WP 6-1	Austerity measures that have to be taken due to bad economic and financial climate	+	4,14%

BIGGEST LIKELIHOOD PER WORK PACKAGE		**Modus**	**Hi**
WP 2-3	Removal of current state subsidies	+	18,88%
WP 3-1	Investments not (fully) taking place in times of severe public savings	+	**46,43%**
WP 4-3	Existence of 13 rail freight operators, leading some difficulties in getting consolidated results	+	7,69%
WP 5-2	Evolution to one or two European widespread multinational companies. Instead of many different companies with great competitiveness as a result	+	**30,77%**
WP 6-1	Austerity measures that have to be taken due to bad economic and financial climate	+	7,69%

SOURCE: OWN CREATION

In conclusion, based on the top 5 for both impact and influence, as well as taking into account the frequency table, the defined modus per element and the homogeneity of the answers, a list of threats can be determined, to be taken into account for future scenario development (figure 22). Nevertheless, the level of disagreement between the respondents is high, indicated by the low homogeneity results. In addition, there also sometimes remains a difference in rating between impact and likelihood. Therefore this list does not hold a final priority definition, but is merely a general indication on the most important and plausible threats for intermodal rail transport development.

FIGURE 22: MOST IMPORTANT AND PLAUSIBLE THREATS FOR SCENARIO DEVELOPMENT

MOST IMPORTANT AND PLAUSIBLE THREATS FOR SCENARIO DEVELOPMENT

(Top 5 combination + Modus and H-index adjustment)

WP 2-1	Impossibility of consolidating flows
WP 2-3	Removal of current state subsidies
WP 2-4	Interoperability barriers: on the infrastructure, regulatory, as well as the actors level
WP 3-1	Investments not (fully) taking place in times of severe public savings
WP 3-2	Tough decision-making processes for crucial European funds and subsidies in the future
WP 5-1	Different legislation throughout European Union
WP 5-2	Evolution to one or two European widespread multinational companies. Instead of many different companies with great competitiveness as a result

SOURCE: OWN CREATION

6. WILCOXON MATCHED-PAIRS SIGNED-RANK TEST

To end the analysis of the different SWOT elements, the Wilcoxon matched-pairs signed-rank test has been performed in SPSS, on the different ratings that have been attributed to the importance of each element (influence), as well as the likelihood of happening. The purpose of this test is to check whether there is a significant difference between the mean rating of the influence and the mean rating of the likelihood. In case no significant difference is found, the null hypothesis is retained, indicating that the respondents scored the influence of an element and the likelihood of happening of an element in the same way.

$$H_0: \mu_{influence} = \mu_{likelihood}$$

$$H_1: \mu_{influence} \neq \mu_{likelihood}$$

$$\propto = 0.05$$

When this test is performed for all individual answers, the null hypothesis is clearly rejected ($p < 0.05$) in favour of the alternative hypothesis, indicating that the respondents rated the SWOT elements differently in terms of influence (impact) and likelihood. This is also clear from previous analysis.

FIGURE 23: WILCOXON SIGNED RANKS TEST FOR ALL INDIVIDUAL RATINGS

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
Likelihood - Impact	Negative Ranks	30[a]	19,23	577,00
	Positive Ranks	7[b]	18,00	126,00
	Ties	56[c]		
	Total	93		

a. Likelihood < Impact

b. Likelihood > Impact

c. Likelihood = Impact

Test Statistics[a]

	Likelihood - Impact
Z	-3,811[b]
Asymp. Sig. (2-tailed)	,000

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

SOURCE: OWN CREATION

However, when looking more into detail to the different parts of the SWOT analysis in figures 24 to 27, it can be noted that for the weaknesses and threats, the null hypothesis is accepted ($p > 0.05$), indicating that for both the weaknesses and the threats, respondents have rated the elements similar in terms of influence and likelihood. Therefore, it can be stated that the two total rankings of weaknesses and threats are not significantly different. This is also clear from previous analysis, where the top-10 tables of these two variables are corresponding more for the weaknesses and threats, compared to the strengths and opportunities.

FIGURE 24: WILCOXON SIGNED RANKS TEST FOR STRENGTHS RATINGS

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Impact	25	2,16	,746	1	3
Likelihood	25	1,72	,614	1	3

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
Likelihood - Impact	Negative Ranks	11[a]	6,55	72,00
	Positive Ranks	1[b]	6,00	6,00
	Ties	13[c]		
	Total	25		

a. Likelihood < Impact

b. Likelihood > Impact

c. Likelihood = Impact

Test Statistics[a]

	Likelihood - Impact
Z	-2,840[b]
Asymp. Sig. (2-tailed)	,005

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

SOURCE: OWN CREATION

FIGURE 25: WILCOXON SIGNED RANKS TEST FOR WEAKNESSES RATINGS

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Impact	27	2,81	,483	1	3
Likelihood	27	2,63	,492	2	3

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
Likelihood - Impact	Negative Ranks	6[a]	4,00	24,00
	Positive Ranks	1[b]	4,00	4,00
	Ties	20[c]		
	Total	27		

a. Likelihood < Impact

b. Likelihood > Impact

c. Likelihood = Impact

Test Statistics[a]

	Likelihood - Impact
Z	-1,890[b]
Asymp. Sig. (2-tailed)	,059

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

SOURCE: OWN CREATION

FIGURE 26: WILCOXON SIGNED RANKS TEST FOR OPPORTUNITIES RATINGS

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Impact	20	2,65	,489	2	3
Likelihood	20	2,25	,550	1	3

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
Likelihood - Impact	Negative Ranks	9[a]	6,11	55,00
	Positive Ranks	2[b]	5,50	11,00
	Ties	9[c]		
	Total	20		

a. Likelihood < Impact

b. Likelihood > Impact

c. Likelihood = Impact

Test Statistics[a]

	Likelihood - Impact
Z	-2,138[b]
Asymp. Sig. (2-tailed)	,033

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

SOURCE: OWN CREATION

FIGURE 27: WILCOXON SIGNED RANKS TEST FOR THREATS RATINGS

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Impact	21	2,57	,746	1	3
Likelihood	21	2,52	,512	2	3

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
Likelihood - Impact	Negative Ranks	4[a]	4,00	16,00
	Positive Ranks	3[b]	4,00	12,00
	Ties	14[c]		
	Total	21		

a. Likelihood < Impact

b. Likelihood > Impact

c. Likelihood = Impact

Test Statistics[a]

	Likelihood - Impact
Z	-,378[b]
Asymp. Sig. (2-tailed)	,705

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

SOURCE: OWN CREATION

7. SURVEY REMARKS

At the end of the survey, respondents received the opportunity to indicate any remarks or missing elements, according to their opinion. As these elements are the result of a single personal view, formulated after the conclusion of the SWOT, the common acceptance of these original elements by the panel of experts and the corresponding assessments, they are not included within the SWOT itself, but listed within this section as additional feedback. Nevertheless, they should be taken into account during the further analysis of the project and the creation of future scenarios for the development of intermodal (rail) freight transport.

In terms of **strengths**, it was indicated by one of the respondents that a clear focus and the corresponding targeting on block trains, could make it possible to beat road transportation in both speed, reliability and cost. This strength is rated with a high importance and probability to take place in the future.

Four remarks were given to the **weaknesses** of intermodal rail freight development. First of all, the lack of a strong independent and competent market regulator is resulting in the continuation of market barriers. Secondly, the poor quality of service of rail freight transport in terms of punctuality, reliability, lead times and communication towards the customers, is not matching the real needs of the end-customers such as freight forwarders, the automotive industry and the chemical industry. Thirdly, rail transportation is confronted with a lack of flexibility of the staff as a weakness, resulting in higher personnel costs. This is already partially captured in the threat concerning the shortage of personnel. And last but not least, intermodal rail freight is confronted with modern approaches and cross border supply chain realities, such as the rise of e-commerce. As a consequence, the customer needs are not always understood and the 'old-generation' decision-makers are not sufficiently equipped to deal with these challenges.

Concerning the **opportunities**, it was mentioned that the development of policies to make it more interesting for road transport companies to buy lorries that are especially suited to be transported by intermodal trains should be taken into account. According to industry sources, currently only approximately 15% of all the lorries can be lifted by a reach stacker, without having to use special installations or techniques. The respondent rated this opportunity with a high impact, but a low likelihood of happening. This point could be integrated within the indicated necessary standardization measures, as well as the importance of research and development. Another opportunity might lay in the introduction of intermodal (rail) freight into educational material, under the subject of sustainable, green developments.

As for the **threats**, a too strong political, top-down policy might not understand or even be rejected by the market. This could undermine the healthy entrepreneurship on rail developments. In addition, road transportation is continuing the development of more sustainable techniques, copying the typical rail system advantages such as electrification, which could threaten the advantageous position of rail transport as a more sustainable mode of transport in the future.

ANNEX I - SWOT QUESTIONNAIRE

INTRODUCTION

Dear sir / madam,

The purpose of this questionnaire is to identify the importance of each element in the defined SWOT analysis of the BRAIN-TRAINS project (Belgian Research Action through Interdisciplinary Networks - TRAnsveral assessment of new INtermodal Strategies.

Note that although it is asked to verify yourself, all answers will be treated anonymously.

Thank you in advance for your cooperation.

Best regards,
Frank Troch, on behalf of the consortium colleagues

Instructions

Please rate each **strength**, **weakness**, **opportunity** and **threat** on the 2 identified parameters (scale 1-5):
- The influence/impact that the strength, weakness, opportunity or threat has on intermodal rail freight
- The likelihood that the strength, weakness, opportunity or threat will take place

After all SWOT elements are rated, you will have the opportunity to add any additional SWOT elements or any other remarks or feedback you would like to state.

The total survey will take approximately 30-60 minutes. The survey is saved automatically, so it is possible finish the survey at a later time if necessary by reclicking the link in the e-mail you received.

Please identify yourself with **your name**

Please state **your professional occupation**

STRENGTHS & WEAKNESSES

Please rate each **strength** variable on a scale from 1-5 for its influence/impact on intermodal rail transport development, as well as its likelihood

	Influence / Impact					Likelihood (Occurrence)				
	None (1)	Weak (2)	Moderate (3)	Strong (4)	Perfect (5)	No (1)	Low (2)	Moderate (3)	High (4)	Very High (5)
Reduced costs and externalities, as well as increased sustainability over long distances	○	○	○	○	○	○	○	○	○	○
Larger capacities and higher payload of containers in comparison to trucks	○	○	○	○	○	○	○	○	○	○
Increased/improved mobility infrastructure has an impact on the GDP	○	○	○	○	○	○	○	○	○	○
A better modal split ; a better allocation of space affects the crucial transportation ways (in terms of efficient transport and efficient allocation of space)	○	○	○	○	○	○	○	○	○	○
Additional synergies within the rail sector and with other sectors (Manufacturing, construction industries, maintenance, services, ...)	○	○	○	○	○	○	○	○	○	○
Synergies between the development of railways industry and jobs creation	○	○	○	○	○	○	○	○	○	○
Increase in the km transported by railways results in the decrease in overhead cost of legislation and administration	○	○	○	○	○	○	○	○	○	○
Life Cycle Assessment (LCA) methodology as environment tool has an international reputation	○	○	○	○	○	○	○	○	○	○
Existing literature about transportation in several countries	○	○	○	○	○	○	○	○	○	○
Available software and accessible commercial databases relative to generic transportation impacts	○	○	○	○	○	○	○	○	○	○
Possibilities of developing specific countries and/or scenario databases	○	○	○	○	○	○	○	○	○	○
Network of international scientific experts in the transportation field	○	○	○	○	○	○	○	○	○	○
Liberalization of the market	○	○	○	○	○	○	○	○	○	○
Less governmental involvement	○	○	○	○	○	○	○	○	○	○
The involved governmental actors all have their strategic plans which and are clear on their policy directions	○	○	○	○	○	○	○	○	○	○
The involved governmental actors have proven to be able to adapt their own strategic plans to EU policies	○	○	○	○	○	○	○	○	○	○
There are access structures – forums where actors interact on problems and solutions – that encompass the different levels of government. Also within the Federal administration there are forums established to discuss transport affairs. Similarly, within the FOD M&V there are fora that try to find interconnections between the separate divisions of the Federal department	○	○	○	○	○	○	○	○	○	○
The involved government actors all agree on the fact that the modal share of road transport should be reduced	○	○	○	○	○	○	○	○	○	○
At the Federal level, the federal ministries managed to agree on a compromise on smart green transport policies that found a proper balance between social, economic and ecological values. Based on this compromise (the White Book), the FOD M&V has drafted various freight policies	○	○	○	○	○	○	○	○	○	○
The FOD M&V has undertaken various attempts to align governmental strategies of the federal and regional administrations	○	○	○	○	○	○	○	○	○	○
The strategic plans of the regional and federal administrations have gotten some kind of 'shared' language as they are infused with aspects of 'globalization' and 'environmental affairs' due to the EU policies	○	○	○	○	○	○	○	○	○	○

Please rate each **weakness** variable on a scale from 1-5 for its influence/impact on intermodal rail transport development, as well as its likelihood

	Influence / Impact					Likelihood (Occurrence)				
	None (1)	Weak (2)	Moderate (3)	Strong (4)	Perfect (5)	No (1)	Low (2)	Moderate (3)	High (4)	Very High (5)
Opportunity cost due to unreliability and longer travel times	○	○	○	○	○	○	○	○	○	○
High drayage operations costs	○	○	○	○	○	○	○	○	○	○
Complexity in multi-actor chain coordination	○	○	○	○	○	○	○	○	○	○
Complexity in selecting adequate pricing strategies, as well as subsidies policies	○	○	○	○	○	○	○	○	○	○
Flexibility issues: planning schedules with respect to the passengers rail and optimizing locomotives operations with compliance to the market demands	○	○	○	○	○	○	○	○	○	○
Longer lead times before operating a new service	○	○	○	○	○	○	○	○	○	○
The potential insufficient capacity gap of the existing network on the railways freight development ('missing links')	○	○	○	○	○	○	○	○	○	○
The shifting demand from other sustainable transportation modes (f.ex. Inland Navigation)	○	○	○	○	○	○	○	○	○	○
Delays and network failures as a result of the increase in traffic on the rail freight development	○	○	○	○	○	○	○	○	○	○
Development of a new methodology taking into account accidents and land use planning for impact assessment	○	○	○	○	○	○	○	○	○	○
Difficulties to regionalize impacts	○	○	○	○	○	○	○	○	○	○
Difficulties to divide impacts of infrastructure between passengers and freight transportation	○	○	○	○	○	○	○	○	○	○
Freight transportation is a new field of knowledge in the LCA field in general	○	○	○	○	○	○	○	○	○	○
Commercial transportation databases are non-specific to Belgium and should be improved and updated	○	○	○	○	○	○	○	○	○	○
High CAPEX investments to enter the market	○	○	○	○	○	○	○	○	○	○
Network access is weaker compared to road transport	○	○	○	○	○	○	○	○	○	○
Not completely fair competition because of existing power of the major market players, which leads to discrimination in path allocation and discriminatory or excessive charges	○	○	○	○	○	○	○	○	○	○
Competences are spread over a multitude of departments and organizations at different levels of government and various policy domains	○	○	○	○	○	○	○	○	○	○
Not all actors, problems, cleavages and solutions are included in the debates on an all-comprehensive transport vision	○	○	○	○	○	○	○	○	○	○
Federal initiatives that aim to boost the entire transport sector often follow strict guidelines and demand quick wins	○	○	○	○	○	○	○	○	○	○
No National Plan on Sustainable Mobility has been drafted instead there is a scattered landscape of policy initiatives related to sustainable mobility	○	○	○	○	○	○	○	○	○	○
No contact exists between regional administrations on strategic issues, rather on operational affairs	○	○	○	○	○	○	○	○	○	○
From time to time, there is little recognition of the authority of the federal government in the transport domain	○	○	○	○	○	○	○	○	○	○

OPPORTUNITIES & THREATS

Please rate each **opportunity** variable on a scale from 1-5 for its influence/impact on intermodal rail transport development, as well as its likelihood

	Influence / Impact					Likelihood (Probability)				
	None (1)	Weak (2)	Moderate (3)	Strong (4)	Perfect (5)	Will not happen (1)	Less likely to happen (2)	Moderate probability (3)	More likely to happen (4)	Will happen (5)
Shorter pre-and post-haulage (PPH) distances	○	○	○	○	○	○	○	○	○	○
Consolidation of flows	○	○	○	○	○	○	○	○	○	○
Future road taxes on motorways	○	○	○	○	○	○	○	○	○	○
Homogenization and investments in rail infrastructure, information systems and intermodal transport units	○	○	○	○	○	○	○	○	○	○
Geographic Information Systems (GIS) advantages in networks design	○	○	○	○	○	○	○	○	○	○
Interest in "new generation" terminals	○	○	○	○	○	○	○	○	○	○
Internalization of external costs (such as social costs in terms of pollution, traffic congestion, etc.) due to increased rail transport	○	○	○	○	○	○	○	○	○	○
Positive influence on the future demand of transport by the European GDP surrounding Belgium ('Blue banana' advantage)	○	○	○	○	○	○	○	○	○	○
Connecting the European corridors and creating a high speed east-west network, as well as linking the national railways to the TEN-T corridors	○	○	○	○	○	○	○	○	○	○
A positive influence on the demand of mobility when an increase in GDP is reached	○	○	○	○	○	○	○	○	○	○
Intermodal platforms and multimodal hubs, bringing an uplifting effect for rail transport	○	○	○	○	○	○	○	○	○	○
Increased R&D investments (technology), resulting in a positive effect on rail. F.ex. standardization of technologies creating interoperability	○	○	○	○	○	○	○	○	○	○
Interest of stakeholders to provide needed information and to use results	○	○	○	○	○	○	○	○	○	○
Improvement of transport databases and then improvement of transportation impacts on environment and associated costs relative to air pollution	○	○	○	○	○	○	○	○	○	○
Development of a transportation plan including environmental aspects for the future and then allowing the reduction of GHG emissions or other pollutants	○	○	○	○	○	○	○	○	○	○
Willingness of Europe to promote intermodal transportation (internalization of external costs)	○	○	○	○	○	○	○	○	○	○
Creating a single European Market can simplify the freight transport along the European corridors. Further standardization of the technical specification and national legislation	○	○	○	○	○	○	○	○	○	○
Sectoral developments and demands in the aftermath of the financial and economic crises	○	○	○	○	○	○	○	○	○	○
Increased Europeanization of policies (that take into account the transport domain irrespective of the mode of transport)	○	○	○	○	○	○	○	○	○	○
Growing influence of transnational institutions, like e.g.: the central commission for navigation on the Rhine	○	○	○	○	○	○	○	○	○	○

Please rate each **threat** variable on a scale from 1-5 for its influence/impact on intermodal rail transport development, as well as its likelihood

	Influence / Impact					Likelihood (Probability)				
	None (1)	Weak (2)	Moderate (3)	Strong (4)	Perfect (5)	Will not happen (1)	Less likely to happen (2)	Moderate probability (3)	More likely to happen (4)	Will happen (5)
Impossibility of consolidating flows	○	○	○	○	○	○	○	○	○	○
Number of intermodal terminals	○	○	○	○	○	○	○	○	○	○
Removal of current state subsidies	○	○	○	○	○	○	○	○	○	○
Interoperability barriers: on the infrastructure, regulatory, as well as the actors level	○	○	○	○	○	○	○	○	○	○
Commodities nature	○	○	○	○	○	○	○	○	○	○
Complications to the development of decision support systems for intermodal transport: data accessibility/availability, systems' computational features and integrating several actors' perspectives	○	○	○	○	○	○	○	○	○	○
Investments not (fully) taking place in times of severe public savings	○	○	○	○	○	○	○	○	○	○
Tough decision-making processes for crucial European funds and subsidies in the future	○	○	○	○	○	○	○	○	○	○
Increased passenger rail traffic taking away the capacity from freight transport per rail	○	○	○	○	○	○	○	○	○	○
Shortage of capable personnel and aging of existing personnel	○	○	○	○	○	○	○	○	○	○
Shortage of operational subsidies affecting railway freight development	○	○	○	○	○	○	○	○	○	○
Lack of data concerning emissions for the assessment of transportation impacts and data concerning building infrastructure	○	○	○	○	○	○	○	○	○	○
Lack of specific Belgian data for freight transportation (machine type, roads, capacity, energy supply, etc.)	○	○	○	○	○	○	○	○	○	○
Existence of 13 rail freight operators, leading some difficulties in getting consolidated results	○	○	○	○	○	○	○	○	○	○
Difficulties to get an overall view of Belgian situation due to regionalization of data for freight transport (fluvial navigation)	○	○	○	○	○	○	○	○	○	○
Different legislation throughout European Union	○	○	○	○	○	○	○	○	○	○
Evolution to one or two European widespread multinational companies. Instead of many different companies with great competitiveness as a result	○	○	○	○	○	○	○	○	○	○
The danger of over regulation	○	○	○	○	○	○	○	○	○	○
Austerity measures that have to be taken due to bad economic and financial climate	○	○	○	○	○	○	○	○	○	○
Regionalization of transport competences	○	○	○	○	○	○	○	○	○	○
A change of policy priorities due to a new minister or a new coalition of political parties	○	○	○	○	○	○	○	○	○	○

ANNEX II – FREQUENCY TABLES, MODUS AND H-INDEX

STRENGTHS

FIGURE 28: FREQUENCY TABLE OF THE STRENGTHS, WITH MODUS AND HI

STRENGTHS		INFLUENCE					LIKELIHOOD				
		Frequency			Modus	Relative HI	Frequency			Modus	Relative HI
		-	o	+		0% - 100%	-	o	+		0% - 100%
WP 2-1	Reduced costs and externalities, as well as increased sustainability over long distances	7,69%	15,38%	**76,92%**	+	**43,20%**	23,08%	**46,15%**	30,77%	o	4,14%
WP 2-2	Larger capacities and higher payload of containers in comparison to trucks	7,14%	21,43%	**71,43%**	+	**34,18%**	14,29%	35,71%	**50,00%**	+	9,69%
WP 3-1	Increased/improved mobility infrastructure has an impact on the GDP	21,43%	**57,14%**	21,43%	o	12,76%	28,57%	**57,14%**	14,29%	o	14,29%
WP 3-2	A better modal split ; a better allocation of space affects the crucial transportation ways (in terms of efficient transport and efficient allocation of space)	7,69%	**46,15%**	**46,15%**	o & +	14,79%	38,46%	**46,15%**	15,38%	o	7,69%
WP 3-3	Additional synergies within the rail sector and with other sectors (manufacturing, construction industries, maintenance, services, ...)	23,08%	15,38%	**61,54%**	+	18,34%	38,46%	**53,85%**	7,69%	o	16,57%
WP 3-4	Synergies between the development of railways industry and jobs creation	**53,85%**	23,08%	23,08%	-	9,47%	**61,54%**	38,46%	0,00%	-	**28,99%**
WP 3-5	Increase in the km transported by railways results in the decrease in overhead cost of legislation and administration	**50,00%**	7,14%	42,86%	-	15,82%	**57,14%**	35,71%	7,14%	-	18,88%
WP 4-1	Life Cycle Assessment (LCA) methodology as environment tool has aninternational reputation	**46,15%**	38,46%	15,38%	-	7,69%	**53,85%**	38,46%	7,69%	-	16,57%
WP 4-2	Existing literature about transportation in several countries	**53,85%**	38,46%	7,69%	-	16,57%	46,15%	**53,85%**	0,00%	o	**25,44%**
WP 4-3	Available software and accessible commercial databases relative to generic transportation impacts	**38,46%**	23,08%	**38,46%**	- & +	2,37%	**46,15%**	23,08%	30,77%	-	4,14%
WP 4-4	Possibilities of developing specific countries and/or scenario databases	**38,46%**	30,77%	30,77%	-	0,59%	**38,46%**	**38,46%**	23,08%	- & o	2,37%
WP 4-5	Network of international scientific experts in the transportation field	35,71%	**50,00%**	14,29%	o	9,69%	21,43%	**57,14%**	21,43%	o	12,76%
WP 5-1	Liberalization of the market	7,14%	21,43%	**71,43%**	+	**34,18%**	21,43%	35,71%	**42,86%**	+	3,57%
WP 5-2	Less governmental involvement	21,43%	28,57%	**50,00%**	+	6,63%	28,57%	**57,14%**	14,29%	o	14,29%

STRENGTHS		INFLUENCE					LIKELIHOOD				
		Frequency			Modus	Relative HI	Frequency			Modus	Relative HI
		-	o	+		0% - 100%	-	o	+		0% - 100%
WP 6-1	The involved governmental actors all have their strategic plans which are clear on their policy directions	30,77%	**38,46%**	30,77%	o	0,59%	**53,85%**	46,15%	0,00%	-	**25,44%**
WP 6-2	The involved governmental actors have proven to be able to adapt their own strategic plans to EU policies	30,77%	30,77%	**38,46%**	+	0,59%	25,00%	**66,67%**	8,33%	o	**27,08%**
WP 6-3	There are access structures – forums where actors interact on problems and solutions – that encompass the different levels of government. Also within the Federal administration there are forums established to discuss transport affairs. Similarly, within the FOD M&V there are fora that try to find interconnections between the separate divisions of the Federal department	**38,46%**	23,08%	**38,46%**	- & +	2,37%	8,33%	**58,33%**	33,33%	o	18,75%
WP 6-4	The involved government actors all agree on the fact that the modalshare of road transport should be reduced	21,43%	28,57%	**50,00%**	+	6,63%	46,15%	**53,85%**	0,00%	o	**25,44%**
WP 6-5	At the Federal level, the federal ministries managed to agree on a compromise on smart green transport policies that found a proper balance between social, economic and ecological values. Based on this compromise (the White Paper) the FOD M&V has drafted various freight policies	14,29%	**50,00%**	35,71%	o	9,69%	30,77%	**61,54%**	7,69%	o	21,89%
WP 6-6	The FOD M&V has undertaken various attempts to align governmental strategies of the federal and regional administrations	15,38%	**53,85%**	30,77%	o	11,24%	**42,86%**	28,57%	28,57%	-	2,04%
WP 6-7	The strategic plans of the regional and federal administrations have gotten some kind of 'shared' language as they are infused with aspects of 'globalization' and 'environmental affairs' due to the EU policies	23,08%	**69,23%**	7,69%	o	**30,77%**	35,71%	**64,29%**	0,00%	o	31,12%
WP 6-8	Both the Federal and regional administrations have a say in the resource allocation of INFRABEL and NMBS.	25,00%	**50,00%**	25,00%	o	6,25%	**53,85%**	46,15%	0,00%	-	**25,44%**
WP 6-9	There are discussions on the transposal and preparation of EU policies	25,00%	**33,33%**	41,67%	+	**2,08%**	15,38%	**84,62%**	0,00%	o	60,95%
WP 6-10	There are various, issue-specific partnership agreements between the federal government and the regional administrations	25,00%	**50,00%**	25,00%	o	6,25%	**50,00%**	41,67%	8,33%	-	14,58%
WP 6-11	There are a number of studies on the execution and drafting of transport policies irrespective of the mode of transport. At the moment, the consultancy firm of Roland Berger is doing a kind alike research focusing on the contemporary state of affairs	33,33%	33,33%	**33,33%**	-, o & +	0,00%	16,67%	**50,00%**	33,33%	o	**8,33%**

SOURCE: OWN CREATION

WEAKNESSES

FIGURE 29: FREQUENCY TABLE OF THE WEAKNESSES, WITH MODUS AND HI

WEAKNESSES		INFLUENCE					LIKELIHOOD				
		Frequency			Modus	Relative HI	Frequency			Modus	Relative HI
		-	o	+		0% - 100%	-	o	+		0% - 100%
WP 2-1	Opportunity cost due to unreliability and longer travel times	0,00%	15,38%	**84,62%**	+	**60,95%**	0,00%	30,77%	**69,23%**	+	**36,10%**
WP 2-2	High drayage operations costs	0,00%	30,77%	**69,23%**	+	**36,10%**	0,00%	38,46%	**61,54%**	+	**28,99%**
WP 2-3	Complexity in multi-actor chain coordination	7,69%	30,77%	**61,54%**	+	21,89%	23,08%	23,08%	**53,85%**	+	9,47%
WP 2-4	Complexity in selecting adequate pricing strategies, as well as subsidies policies	0,00%	38,46%	**61,54%**	+	**28,99%**	7,69%	38,46%	**53,85%**	+	16,57%
WP 2-5	Flexibility issues: planning schedules with respect to the passengers railand optimizing locomotives operations with compliance to the marketdemands	7,69%	38,46%	**53,85%**	+	16,57%	7,69%	**46,15%**	**46,15%**	o & +	14,79%
WP 2-6	Longer lead times before operating a new service	0,00%	23,08%	**76,92%**	+	46,75%	7,69%	30,77%	**61,54%**	+	21,89%
WP 3-1	The potential insufficient capacity gap of the existing network on therailways freight development ('missing links')	0,00%	38,46%	**61,54%**	+	**28,99%**	7,69%	**61,54%**	30,77%	o	21,89%
WP 3-2	The shifting demand from other sustainable transportation modes (f.ex.Inland Navigation)	23,08%	**38,46%**	**38,46%**	o & +	2,37%	23,08%	**38,46%**	**38,46%**	o & +	2,37%
WP 3-3	Delays and network failures as a result of the increase in traffic on the rail freight development	7,69%	38,46%	**53,85%**	+	16,57%	7,69%	**61,54%**	30,77%	o	21,89%
WP 4-1	Development of a new methodology taking into account accidents and land use planning for impact assessment	30,77%	**38,46%**	30,77%	o	0,59%	23,08%	**61,54%**	15,38%	o	18,34%
WP 4-2	Difficulties to regionalize impacts	23,08%	30,77%	**46,15%**	+	4,14%	15,38%	**61,54%**	23,08%	o	18,34%
WP 4-3	Difficulties to divide impacts of infrastructure between passengers and freight transportation	15,38%	38,46%	**46,15%**	+	7,69%	30,77%	**53,85%**	15,38%	o	11,24%
WP 4-4	Freight transportation is a new field of knowledge in the LCA field in general	**38,46%**	**38,46%**	23,08%	- & o	2,37%	23,08%	**69,23%**	7,69%	o	**30,77%**
WP 4-5	Commercial transportation databases are non-specific to Belgium and should be improved and updated	23,08%	23,08%	**53,85%**	+	9,47%	15,38%	**69,23%**	15,38%	o	**28,99%**

WEAKNESSES		INFLUENCE					LIKELIHOOD				
		Frequency			Modus	Relative HI	Frequency			Modus	Relative HI
		-	o	+		0% - 100%	-	o	+		0% - 100%
WP 5-1	High CAPEX investments to enter the market	0,00%	15,38%	**84,62%**	+	**60,95%**	15,38%	38,46%	**46,15%**	+	7,69%
WP 5-2	Network access is weaker compared to road transport	0,00%	0,00%	**100,00%**	+	**100,00%**	7,69%	15,38%	**76,92%**	+	**43,20%**
WP 5-3	Not completely fair competition because of existing power of the major market players, which leads to discrimination in path allocation and discriminatory or excessive charges	0,00%	15,38%	**84,62%**	+	**60,95%**	0,00%	38,46%	**61,54%**	+	**28,99%**
WP 6-1	Competences are spread over a multitude of departments and organizations at different levels of government and various policy domains	7,69%	30,77%	**61,54%**	+	21,89%	7,69%	**46,15%**	**46,15%**	o & +	14,79%
WP 6-2	Not all actors, problems, cleavages and solutions are included in the debates on an all-comprehensive transport vision	0,00%	16,67%	**83,33%**	+	**58,33%**	16,67%	25,00%	**58,33%**	+	14,58%
WP 6-3	Federal initiatives that aim to boost the entire transport sector often follow strict guidelines and demand quick wins	30,77%	30,77%	**38,46%**	+	0,59%	23,08%	**38,46%**	**38,46%**	o & +	2,37%
WP 6-4	No National Plan on Sustainable Mobility has been drafted instead there is a scattered landscape of policy initiatives related to sustainable mobility	7,69%	**46,15%**	**46,15%**	o & +	14,79%	0,00%	**69,23%**	30,77%	o	**36,10%**
WP 6-5	No contact exists between regional administrations on strategic issues, rather on operational affairs	7,69%	23,08%	**69,23%**	+	**30,77%**	7,69%	**46,15%**	**46,15%**	o & +	14,79%
WP 6-6	From time to time, there is little recognition of the authority of the federal government in the transport domain	16,67%	**50,00%**	33,33%	o	8,33%	8,33%	**58,33%**	33,33%	o	18,75%
WP 6-7	Involved actors are aware of the fact that the different administrations have to work across the organizational and governmental boundaries in order to change the transport sector in an integral way; however, the actors have the reflex to only focus on the width of their own competences and accept little interference from 'outside parties', meaning 'little cross-boundary spanning'.	30,77%	**53,85%**	15,38%	o	11,24%	23,08%	**61,54%**	15,38%	o	18,34%
WP 6-8	There are different policy priorities among the involved governmental actors	25,00%	25,00%	**50,00%**	+	6,25%	8,33%	41,67%	**50,00%**	+	14,58%
WP 6-9	The policy making in the different modes of transport have developed rather independently of each other up to the point that waterborne transport and fail freight transport have become competitors rather than attractive alternatives for road transportation.	16,67%	0,00%	**83,33%**	+	58,33%	0,00%	41,67%	**58,33%**	+	27,08%
WP 6-10	There has not been a major effort to enable a change in the road transport sector by e.g.: applying the 'polluters-pays-principle' to the road haulage system.	16,67%	25,00%	**58,33%**	+	**14,58%**	16,67%	41,67%	**41,67%**	o & +	**6,25%**

SOURCE: OWN CREATION

OPPORTUNITIES

FIGURE 30: FREQUENCY TABLE OF THE OPPORTUNITIES, WITH MODUS AND HI

OPPORTUNITIES		INFLUENCE					LIKELIHOOD				
		Frequency			Modus	Relative HI	Frequency			Modus	Relative HI
		-	o	+		0% - 100%	-	o	+		0% - 100%
WP 2-1	Shorter pre-and post-haulage (PPH) distances	7,69%	23,08%	**69,23%**	+	**30,77%**	30,77%	**38,46%**	30,77%	o	0,59%
WP 2-2	Consolidation of flows	0,00%	0,00%	**100,00%**	+	**100,00%**	7,14%	**57,14%**	35,71%	o	18,88%
WP 2-3	Future road taxes on motorways	15,38%	15,38%	**69,23%**	+	**28,99%**	15,38%	23,08%	**61,54%**	+	18,34%
WP 2-4	Homogenization and investments in rail infrastructure, information systems and intermodal transport units	0,00%	28,57%	**71,43%**	+	**38,78%**	14,29%	**64,29%**	21,43%	o	21,94%
WP 2-5	Geographic Information Systems (GIS) advantages in networks design	7,69%	**46,15%**	**46,15%**	o & +	14,79%	**38,46%**	30,77%	30,77%	-	0,59%
WP 2-6	Interest in "new generation" terminals	14,29%	28,57%	**57,14%**	+	14,29%	35,71%	21,43%	**42,86%**	+	3,57%
WP 3-1	Internalization of external costs (such as social costs in terms of pollution, traffic congestion, etc.) due to increased rail transport	0,00%	23,08%	**76,92%**	+	**46,75%**	15,38%	**61,54%**	23,08%	o	18,34%
WP 3-2	Positive influence on the future demand of transport by the European GDP surrounding Belgium ('Blue banana' advantage)	7,69%	**61,54%**	30,77%	o	21,89%	30,77%	**38,46%**	30,77%	o	0,59%
WP 3-3	Connecting the European corridors and creating a high speed east-west network, as well as linking the national railways to the TEN-T corridors	7,14%	21,43%	**71,43%**	+	**34,18%**	0,00%	42,86%	**57,14%**	+	**26,53%**
WP 3-4	A positive influence on the demand of mobility when an increase in GDP is reached	7,69%	**53,85%**	38,46%	o	16,57%	15,38%	**69,23%**	15,38%	o	**28,99%**
WP 3-5	Intermodal platforms and multimodal hubs, bringing an uplifting effect for rail transport	7,14%	35,71%	**57,14%**	+	18,88%	0,00%	**57,14%**	42,86%	o	**26,53%**
WP 3-6	Increased R&D investments (technology), resulting in a positive effect on rail. F.ex. standardization of technologies creating interoperability	7,69%	**46,15%**	**46,15%**	o & +	14,79%	15,38%	38,46%	**46,15%**	+	7,69%

OPPORTUNITIES		INFLUENCE					LIKELIHOOD				
		Frequency			Modus	Relative HI	Frequency			Modus	Relative HI
		-	o	+		0% - 100%	-	o	+		0% - 100%
WP 4-1	Interest of stakeholders to provide needed information and to use results	7,69%	38,46%	**53,85%**	+	16,57%	15,38%	**76,92%**	7,69%	o	**43,20%**
WP 4-2	Improvement of transport databases and then improvement oftransportation impacts on environment and associated costsrelative to air pollution	30,77%	**38,46%**	30,77%	o	0,59%	15,38%	**61,54%**	23,08%	o	18,34%
WP 4-3	Development of a transportation plan including environmental aspects for the future and then allowing the reduction of GHGemissions or other pollutants	30,77%	**38,46%**	30,77%	o	0,59%	23,08%	**38,46%**	**38,46%**	o & +	2,37%
WP 4-4	Willingness of Europe to promote intermodal transportation(internalization of external costs)	15,38%	38,46%	**46,15%**	+	7,69%	7,69%	38,46%	**53,85%**	+	16,57%
WP 5-1	Creating a single European Market can simplify the freight transport along the European corridors. Further standardization of the technical specification and national legislation	0,00%	23,08%	**76,92%**	+	**46,75%**	30,77%	**53,85%**	15,38%	o	11,24%
WP 6-1	Sectoral developments and demands in the aftermath of thefinancial and economic crises	0,00%	**61,54%**	38,46%	o	**28,99%**	23,08%	**61,54%**	15,38%	o	18,34%
WP 6-2	Increased Europeanization of policies (that take into accountthe transport domain irrespective of the mode of transport)	7,69%	38,46%	**53,85%**	+	16,57%	7,69%	**76,92%**	15,38%	o	**43,20%**
WP 6-3	Growing influence of transnational institutions, like e.g.: thecentral commission for navigation on the Rhine	15,38%	**61,54%**	23,08%	o	18,34%	7,69%	**76,92%**	15,38%	o	**43,20%**

SOURCE: OWN CREATION

THREATS

FIGURE 31: FREQUENCY TABLE OF THE WEAKNESSES, WITH MODUS AND HI

THREATS		INFLUENCE					LIKELIHOOD				
		Frequency			Modus	Relative HI	Frequency			Modus	Relative HI
		-	o	+		0% - 100%	-	o	+		0% - 100%
WP 2-1	Impossibility of consolidating flows	0,00%	23,08%	**76,92%**	+	**46,75%**	30,77%	**46,15%**	23,08%	o	4,14%
WP 2-2	Number of intermodal terminals	7,14%	35,71%	**57,14%**	+	18,88%	35,71%	**42,86%**	21,43%	o	3,57%
WP 2-3	Removal of current state subsidies	7,14%	35,71%	**57,14%**	+	18,88%	7,14%	35,71%	**57,14%**	+	18,88%
WP 2-4	Interoperability barriers: on the infrastructure, regulatory, as well as the actors level	0,00%	30,77%	**69,23%**	+	**36,10%**	15,38%	30,77%	**53,85%**	+	11,24%
WP 2-5	Commodities nature	28,57%	**50,00%**	21,43%	o	6,63%	35,71%	**42,86%**	21,43%	o	3,57%
WP 2-6	Complications to the development of decision support systems for intermodal transport: data accessibility/availability, systems' computational features and integrating several actors' perspectives	14,29%	**50,00%**	35,71%	o	9,69%	28,57%	**50,00%**	21,43%	o	6,63%
WP 3-1	Investments not (fully) taking place in times of severe public savings	0,00%	21,43%	**78,57%**	+	**49,49%**	7,14%	14,29%	**78,57%**	+	**46,43%**
WP 3-2	Tough decision-making processes for crucial European funds and subsidies in the future	14,29%	21,43%	**64,29%**	+	21,94%	14,29%	28,57%	**57,14%**	+	14,29%
WP 3-3	Increased passenger rail traffic taking away the capacity from freight transport per rail	7,14%	42,86%	**50,00%**	+	15,82%	21,43%	**42,86%**	35,71%	o	3,57%
WP 3-4	Shortage of capable personnel and aging of existing personnel	28,57%	14,29%	**57,14%**	+	14,29%	35,71%	21,43%	**42,86%**	+	3,57%
WP 3-5	Shortage of operational subsidies affecting railway freight development	21,43%	28,57%	**50,00%**	+	6,63%	14,29%	28,57%	**57,14%**	+	14,29%
WP 4-1	Lack of data concerning emissions for the assessment of transportation impacts and data concerning building infrastructure	38,46%	**53,85%**	7,69%	o	16,57%	15,38%	**76,92%**	7,69%	o	**43,20%**
WP 4-2	Lack of specific Belgian data for freight transportation(machine type, roads, capacity, energy supply, etc.)	**46,15%**	**46,15%**	7,69%	- & o	14,79%	23,08%	**61,54%**	15,38%	o	18,34%
WP 4-3	Existence of 13 rail freight operators, leading some difficulties in getting consolidated results	38,46%	15,38%	**46,15%**	+	7,69%	15,38%	38,46%	**46,15%**	+	7,69%
WP 4-4	Difficulties to get an overall view of Belgian situation due to regionalization of data for freight transport (fluvial navigation)	30,77%	30,77%	**38,46%**	+	0,59%	15,38%	**53,85%**	30,77%	o	11,24%

THREATS		INFLUENCE					LIKELIHOOD				
		Frequency			Modus	Relative HI	Frequency			Modus	Relative HI
		-	o	+		0% - 100%	-	o	+		0% - 100%
WP 5-1	Different legislation throughout European Union	7,69%	30,77%	**61,54%**	+	21,89%	7,69%	38,46%	**53,85%**	+	16,57%
WP 5-2	Evolution to one or two European widespread multinational companies. Instead of many different companies with great competitiveness as a result	15,38%	30,77%	**53,85%**	+	11,24%	23,08%	7,69%	**69,23%**	+	**30,77%**
WP 5-3	The danger of over regulation	15,38%	30,77%	**53,85%**	+	11,24%	23,08%	**38,46%**	**38,46%**	o & +	2,37%
WP 6-1	Austerity measures that have to be taken due to bad economic and financial climate	23,08%	30,77%	**46,15%**	+	4,14%	15,38%	38,46%	**46,15%**	+	7,69%
WP 6-2	Regionalization of transport competences	**46,15%**	38,46%	15,38%	-	7,69%	30,77%	**38,46%**	30,77%	o	0,59%
WP 6-3	A change of policy priorities due to a new minister or a new coalition of political parties	**46,15%**	30,77%	23,08%	-	4,14%	38,46%	**46,15%**	15,38%	o	7,69%

SOURCE: OWN CREATION

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Vanelslander, T., Sys, C. (2014). *Port business: market challenges and management actions.* University Press Antwerp, Brussels.

APPENDIX

Organisation	Member name	Competence domain
FPS Mobility and Transport	Martine Serbruyns	Director intermodality
Flemish Department Public Works and Mobility	Ilse Hoet	Head of ports and water management
Wallon Public Service	Jean-Michel Baijot Pierre Arnold	Public works Public works
Brussels Region	Marianne Thys	Direction freight strategies
NMBS Logistics / InterFerryBoats	Johan Gemels Frédéric Buyse	Managing director Public affairs manager
Crossrail	Jeroen Lejeune	Managing director
ArcelorMittal	David De Rocker	Head rail Unit
CMA-CGM Benelux	Patrick Kockx	General manager ILS Benelux
Port of Antwerp	Koen Cuypers	Head rail Unit
Port of Ghent	Kate Verslype	Head rail Unit
Port of Zeebruges	Patrick Vancauwenberghe	Head of research
European Intermodal Association	Peter Wolters	Managing director
Ecole Polytechnique Fédérale de Lausanne	Prof. Matthias Finger	Rail regulation
Belgian Federal Planning Office	Bruno Hoornaert	Traffic forecasting
National Bank of Belgium	Georges Van Gastel	Micro-economic forecasting
Infrabel	Els Houtman	Network management
Port de Liège	Anne-Sylvie Lonnoy	Economic department
Logistics in Wallonia	Bernard Piette	Manager
Walloon Department of Mobility	Thibaud Mouzelart	Managing director