Fact-finding studies in support of the development of an EU strategy for freight transport logistics
Lot 1: Analysis of the EU logistics sector

Final report

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Lot 1: Analysis of the EU logistics sector

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List of Abbreviations

3PL	Third Party Logistics Service Provider
4PL	Fourth Party Logistics Service Provider
AA	Association Agreement
AAGR	Average Annual Growth Rates
ANS	Air Navigation Services
ASEAN	Association of South-East Asian Nations
ASLOG	Association Française pour la Logistique
B2A	Business to Administration
B2B	Business to Business
B2C	Business to Consumer
BE-LOGIC	Benchmark Logistics for Co-modality
CEP	Courier, Express and Parcel Services
CETA	Comprehensive Economic and Trade Agreement
CO2	Carbon Dioxide
CSCMP	Council of Supply Chain Management Professionals USA
DC	Distribution Centre
DCFTA	Deep and Comprehensive Free Trade Agreement
DDA	Doha Development Agenda
EATMN	European Air Traffic Management Network
EBIT	Earnings Before Interest and Taxes
EDU	Educational and vocational training institutions
EEA	European Environment Agency
EEA	European Economic Area
EETS	European Electronic Toll Service
EFQM	European Foundation of Quality Management Excellence
ELA	European Logistics Association
EU	European Union
EU ETS	EU Emissions Trading System
EUF	EU institutions providing financial support
FDI	Foreign Direct Investment
FIB	Financial Institutions / Banks
FMCG	Fast Moving Consumer Goods
FTA	Freight Transport Association UK
FTLAP	Freight Transport Logistics Action Plan
FTO	Freight Transport Operators
FYROM	Former Yugoslav Republic of Macedonia
GATS	General Agreement on Trade in Services
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GNSS	Global Navigation Satellite Systems
HGV	Heavy Goods Vehicles
ICAO	International Civil Aviation Organization

ICT	Information and Communication Technology
IT	Information Technology
ITS	Intelligent Transport Systems
IWW	Inland Waterway
KPA	Key Performance Area
KPI	Key Performance Indicator
KWH	Kilo Watt Hour
Ldn	Day-night Average Sound Level
LE	Logistics Employees
LHV	Longer and/or Heavier Vehicles
LIB	Rail Liberalisation Index
LP	Labour Productivity
LPE	Logistics Process Efficiency
LPI	Logistics Performance Index
LPO	Logistics Professionals Organisation
LSP	Logistic Service Provider
LTL	Less Than Truckload
MS	Member States
NMF	National Ministries of Finance
NMVOC	Non Methane Volatile Organic Compound
NOx	Nitrogen Oxide
NFS	New Financing Scheme
OBD	On-Board Diagnostics
OCR	Optical Character Recognition
OECD	Organisation for Economic Cooperation and Development
PA	Public Authorities
PEST	Political, Economic, Socio-cultural and Technological factors
PESTLE	Political, Economic, Socio-cultural, Technological, Legal and Environmental factors
PM10	Particular Matter
R&D	Research and Development
RFID	Radio Frequency Identification
SCR	Selective Catalytic Reduction
SD	Standard Deviation
SEALS	Statistical coverage and Economic Analysis of the Logistics Sector in the EU
SES	Single European Sky
SH	Shippers
SMART	Strategic Measurement Analysis and Reporting Technique
SME	Small and Medium-Sized Enterprise
SOx	Sulphur Oxide
TEN-T	Trans-European Transport Network
TERM	Transport and Environment Reporting Mechanism
TFEU	Treaty on the Functioning of the European Union
TIO	Terminal Infrastructure Operators
TiSA	Trade in Services Agreement

TKM	Tonnes-Kilometres
TT	Travel Time
TTIP	Transatlantic Trade and Investment Partnership
TWH	Terra Watt Hour
UIRR	International Union of Combined Road-Rail Transport Companies
VDI	Verband Deutscher Ingenieure
WTO	World Trade Organization

Abstract

In this report support is provided for the development of an EU strategy for freight transport logistics. The report provides information on logistics trends and developments, and includes reviews of existing policies, supported by inputs from relevant key stakeholders. There is a clear need for the European Commission to develop a new logistics policy, focusing on the main problem areas of the logistics sector. These problem areas are: rising costs, increasing negative external effects and insufficient quality and quantity of relevant staff. In developing the logistics policy it is recommended that specific actions from earlier action plans are redefined and coordinated within the new policy. New actions need to be further developed. For some of them, additional impact assessments are recommended. Furthermore, it is recommended that coherent and consistent monitoring of the logistic sector's performance is introduced. This would allow both companies and policy-makers to follow the logistic sector's performance and monitor its behaviour, which is particularly important when it comes to considering new policy options and actions.

Résumé

Ce rapport apporte un appui au développement d'une stratégie européenne pour la logistique du transport de marchandises. Le rapport fournit des informations sur les tendances et les développements logistiques ainsi que des analyses des politiques existantes, soutenues par les apports d'acteurs clés. Il y a clairement une demande pour que la Commission européenne développe une nouvelle politique logistique, axée sur les principaux domaines de préoccupation du secteur logistique. Ces domaines critiques sont: l'augmentation des coûts, l'augmentation des effets externes négatifs et la pénurie de personnel compétent. Lors du développement de la politique logistique, il est préconisé que les actions spécifiques des plans d'action antérieurs soient redéfinies et intégrées à la nouvelle politique. De nouvelles actions doivent encore être développées. Pour certaines d'entre elles des évaluations d'impact complémentaires sont requises. De plus, il faut instaurer un suivi cohérent et logique des performances du secteur logistique. Ceci devrait permettre tant aux sociétés qu'aux responsables politiques de suivre l'évolution du secteur logistique et d'évaluer son comportement, ce qui revêt une importance particulière lorsqu'il s'agit d'envisager de nouvelles options et actions stratégiques.

Executive summary

Economic growth is at the heart of Europe's strategy. An effective and efficient EU market is a precondition for economic progress, and logistics play a pivotal role in this. Therefore it is important to have a focused set of policy actions to optimise and improve the performance of the logistics sector.

The logistics sector is vital to the effective and efficient functioning of the internal EU market, as a frictionless logistics sector is a key enabler for the free flow of goods through the EU. Moreover, the sector contributes significantly to GDP and employment in Europe, both directly through creating jobs and adding value, but also through enabling other economic sectors to perform efficiently.

The current performance of the EU logistics sector is at a high level, only surpassed by the performance of the United States and Japan. However, a number of issues are threatening this performance. These include rising logistics costs, the negative environmental footprint of the sector and an increasing shortage of qualified staff. These problems will persist in the future and might possibly even worsen.

Seven years ago, the European Commission adopted and implemented an action plan for the logistics sector (FTLAP 2007) to tackle the problems that were present at the time. This action plan has had a positive effect on the overall functioning of the logistics sector. However, the current issues faced by the sector call for renewed policy actions that expand and build on the actions developed previously.

To address this need, the Commission initiated a study to further analyse the logistics sector. This executive summary presents the highlights of this study. The underlying report holds a considerable amount of supporting evidence and examples, and can be used as a reference when discussing the future of the European freight transport logistics sector.

Report

The overall purpose of this report is to provide understanding of the scope, functioning and performance of the European freight transport logistics sector, to enable the development of a mid-to long-term EU policy. Part of this understanding will be gained through an analysis of the European logistics sector and the challenges it is facing that impact its future development. This will provide the rationale and insight to develop relevant and effective policy actions to improve this situation.

The report provides information on logistics trends and developments, and includes reviews of existing policies. This is further supported by inputs from relevant key stakeholders.

Several different methods have been used throughout the study, combining (top-down) data analysis and (bottom-up) market analysis. Performances and trends have been identified and analysed, both from a data point of view and a stakeholder point of view. Furthermore, future scenarios have been developed and analysed. Together with a review of the former policy actions at European level, new policy actions have been defined, followed by an impact analysis to gain insight into the potential impacts of these policy options on relevant output indicators.

As such, the report provides a solid basis and understanding for anyone with an interest in the logistics sector of today, and who wants to play a role in the debate on its future.

Key findings

The European freight transport logistics sector contributes significantly to the European economy. The value added and jobs generated by the sector are significant. Moreover, the sector functions as a key enabler in the effective and efficient functioning of other services and economic activities. Transport and warehousing are the most prominent economic activities within the logistics sector, representing the majority of added value created.

The EU logistics sector performs above the world average, although some countries (e.g. Japan and the United States) are clearly outperforming Europe. The performance varies strongly between EU Member States, as a result of differences in economic and industrial strength, geographical conditions, infrastructure quality and population density.

The sector is faced with a large number of external developments and trends. These include both technology-driven ones (e.g. e-commerce, e-procurement, etc.), and developments that focus on enhanced collaboration and integration within the logistical chain (e.g. supply chain integration, multi-modality and reverse logistics).

There are three clear problem areas for the European freight transport logistic sector that exist today and will remain in the foreseeable future. These problems will lead to an ineffective and inefficient use of transport modes within the sector. The first problem is the continuous rise in costs, in particular for transport activities (although other cost components also show increases). The second problem area relates to the external environmental effects of the logistics sector, where energy use and CO_2 emissions are threatening its sustainability. The third key issue concerns the quality and quantity of relevant staff. These problems not only affect the sector's contribution to Europe's society, but also limit the ability of stakeholders to respond to their customer requirements.

These problem areas are structural and continue to persist in all four future scenarios that have been developed as part of this study. These scenarios have been developed around two distinct drivers which influence the future of the logistics industry, encompassing the main uncertainties that impact the sector. These are the uncertainties around the economic development of Europe from stagnant to dynamic and prosperous and uncertainty related to the spatial patterns of production and consumption (from regional to global levels).

To address these problems that are challenging the logistics sector in Europe, various objectives have been formulated that lay the foundation for future policy actions. The utilisation of resources needs to be improved, new technologies need to be adapted faster and innovation needs to be stimulated, especially within SMEs. The interoperability between transport modes needs to be improved, as well as the coordination of the supply chain. Administrative barriers need to be removed and red tape reduced. The environmental sustainable behaviour of sector agents and governments should be enhanced, and the use of alternative solutions (fuel, technology and business models) needs to be accelerated, resulting in lower negative externalities. Finally, the attractiveness and understanding of logistics professions needs to be strengthened.

The European Commission has various policy options to realise these objectives and in this study three were identified. Each of these options consists of a proposed set of specific actions to tackle the most important problems in the logistics sector.

The first policy option is a selective continuation of FTLAP 2007. Those FTLAP 2007 actions that are deemed particularly relevant to address the current and future problems are continued under this option.

The second policy option adopts the same actions as the first policy option, but expands them with what is called an extra "minimum intervention" in the logistics market. The specific actions that are added in this policy option aim to create a framework for business to further excel. Actions comprise, for example, creating a framework for clean technology standards that encourages investment in an initial level of electricity charging points in urban areas, and raises end users' awareness of the last-mile impact of e-commerce. In this option further development and innovation is mostly left to the market.

The third policy option aims to provide more substantial support to the logistics market in the EU by proposing a set of actions that contribute significantly to the market's efficiency and effectiveness. It therefore leaves less freedom for the market, but adds European Commission involvement in tackling the industry's problems. Examples of possible actions are increasing access through national funds for technology innovation, organising campaigns and training support, creating standards for CO_2 calculation methodology, stimulating price differentiation for return-trips on e-commerce, and pursuing tax measures for the taking-up of alternative fuels.

Our analysis of the possible impacts of these policy options demonstrates that the third option would be most effective in terms of achieving the specified objectives and would contribute most to resolving the problems of the logistics sector in the EU. This third option, however, also requires the strongest policy intervention from the Commission, requiring the highest amount of financial support and the creation of a pro-active action plan towards creating the necessary support for the logistics sector.

Recommendations

The analysis has shown that there is a clear need for the European Commission to develop a new mid- to long-term logistics policy, focusing on the main problem areas of the logistics sector (rising costs, external effects and staffing). In developing the logistics policy it is recommended that specific actions from earlier action plans are redefined and coordinated within the new policy. New actions need to be further developed. For some of them, additional impact assessments are recommended. Furthermore, it is recommended that coherent and consistent monitoring of the logistic sector's performance is introduced. This would allow both companies and policy-makers to follow the logistic sector's performance and monitor its behaviour, which is particularly important when it comes to considering new policy options and actions. An improved information base on the state of the sector should allow for timely reactions to the sector's (under) performance and help evaluate policy actions.

Résumé

Le développement économique est au cœur de la stratégie européenne. Un marché européen efficace et productif est une condition préalable au progrès économique et la logistique joue un rôle essentiel dans ce processus. Il importe dès lors de disposer d'une série de plans d'action ciblés visant à optimiser et améliorer les performances du secteur logistique.

Le secteur logistique est indispensable au fonctionnement efficace et performant du marché intérieur de l'UE, un secteur logistique harmonisé garantissant la libre circulation des marchandises à travers l'UE. De plus, ce secteur contribue de manière significative à la croissance du produit intérieur brut et de l'emploi en Europe, d'une part de manière directe en créant des emplois et de la valeur ajoutée, et d'autre part en permettant à d'autres secteurs économiques de fonctionner avec efficacité.

Les performances actuelles du secteur logistique de l'UE atteignent un niveau élevé, qui n'est dépassé que par les Etats Unis et le Japon. Toutefois, certains aspects négatifs menacent de compromettre ces résultats. Ils incluent la croissance des coûts logistiques, l'impact environnemental négatif du secteur et une pénurie croissante de main d'œuvre qualifiée. Ces problèmes vont persister dans l'avenir et menacent même de s'aggraver.

Il y a sept ans, la Commission européenne a adopté et mis en œuvre un plan d'action destiné au secteur logistique (FTLAP 2007), pour faire face aux problèmes détectés à l'époque. Ce plan d'action a eu un effet positif sur l'ensemble du fonctionnement du secteur logistique. Toutefois, les problèmes auxquels le secteur est confronté à l'heure actuelle requièrent de nouvelles mesures stratégiques visant à développer et intensifier les actions déjà entreprises.

Pour répondre à cette nécessité, la Commission a initié une étude visant à analyser de manière plus approfondie le secteur logistique. Cette synthèse présente les principaux éléments de cette étude. Le rapport proprement dit apporte un nombre considérable de données probantes et d'exemples et peut servir de référence lors de l'examen de l'avenir du secteur logistique du transport de marchandises européen.

Rapport

L'objectif global de ce rapport est de fournir des informations utiles sur le champ d'action, le fonctionnement et les performances du secteur logistique du transport de marchandises européen, pour permettre le développement d'une politique européenne à moyen et long terme. Cette prise de connaissance se fera en partie sur base d'une analyse du secteur logistique européen ainsi que des problèmes auxquels il est confronté et qui ont une incidence sur son développement futur. Elle fournira des bases et des perspectives en vue d'élaborer des plans d'action efficaces destinés à améliorer cette situation.

Le rapport apporte des informations sur les évolutions et développements logistiques et inclut les analyses de politiques existantes. Ces données sont étayées par des contributions d'acteurs clés.

Plusieurs méthodes différentes ont été utilisées lors de l'élaboration de cette étude, combinant les analyses de données descendantes et des analyses de marché ascendantes. Performances et tendances ont été identifiées et analysées tant du point de vue des données que du point de vue des parties prenantes. De plus, de futurs scénarios ont été élaborés et analysés. En même temps qu'une évaluation des anciens

plans d'action au niveau européen, de nouveaux plans d'action ont été définis, suivis d'une analyse d'impact permettant d'obtenir une vision approfondie des impacts potentiels de ces options stratégiques sur des indicateurs de résultats pertinents.

Comme tel, le rapport constitue une excellente base de compréhension pour celui qui s'intéresse au secteur logistique actuel et souhaite jouer un rôle dans le débat du futur.

Principales constatations

Le secteur logistique du transport de marchandises européen contribue de manière significative à l'économie européenne. La valeur ajoutée et les emplois générés par le secteur sont significatifs. De plus le secteur joue un rôle clé dans le fonctionnement efficace et performant d'autres services et activités économiques. Le transport et l'entreposage sont les activités économiques les plus marquantes du secteur logistique et représentent la majorité de la valeur ajoutée engendrée.

Les résultats du secteur logistique européen dépassent la moyenne mondiale, bien que certains pays (p.ex. le Japon et les Etats Unis) se montrent nettement plus performants que l'Europe. On enregistre une forte variation des résultats entre les Etats membres de l'UE, due aux différences de puissance économique et industrielle, aux configurations géographiques, à la qualité de l'infrastructure et à la densité de population.

Le secteur est confronté à un grand nombre de développements et évolutions externes. Ils incluent des développements et évolutions issus de la technologie (p.ex. e-commerce, passation de marchés en ligne, etc.) ainsi que des développements axés sur une meilleure collaboration et intégration au sein de la chaîne logistique (p.ex. intégration de la chaîne de l'offre, et logistiques multimodales et de recyclage).

Il y a clairement trois domaines critiques liés au secteur de la logistique du transport de marchandises qui existent aujourd'hui et vont perdurer dans un avenir prévisible. Ces problèmes vont avoir pour effet une utilisation inefficace et non productive des modes de transport dans le secteur. Le premier problème est la croissance permanente des coûts, en particulier pour les activités de transport (bien que d'autres composantes du coût subissent également des augmentations). Le second domaine critique concerne l'impact environnemental externe du secteur logistique, la consommation d'énergie et les émissions de CO2 mettant en péril sa viabilité. Le troisième problème majeur concerne la qualité et la quantité de personnel qualifié. Ces problèmes affectent non seulement la contribution du secteur à la société européenne, mais empêchent également les acteurs concernés de satisfaire correctement les exigences de leurs clients.

Ces domaines critiques sont structuraux et continuent de persister dans les quatre scénarios d'avenir élaborés dans cette étude. Ces scénarios ont été développés autour de deux paramètres distincts qui influencent l'avenir de l'industrie logistique et englobent les principales incertitudes qui pèsent sur le secteur. Il s'agit des incertitudes concernant le développement économique de l'Europe (qui peuvent être associées à diverses tendances allant de stagnante à dynamique et prospère) et de l'incertitude liée aux structures spatiales de production et de consommation (du niveau régional au niveau mondial).

Pour résoudre les problèmes auxquels le secteur logistique européen doit faire face, divers objectifs qui jettent les bases de futurs plans d'action ont été formulés. L'utilisation des ressources doit être améliorée, les nouvelles technologies doivent être

adaptées plus rapidement et l'innovation doit être stimulée, en particulier au sein des PME. L'interopérabilité entre les modes de transport ainsi que la coordination de la chaîne d'approvisionnement doivent être améliorées. Les barrières administratives doivent disparaître et la bureaucratie doit être réduite. Le comportement respectueux de l'environnement des administrations publiques et de leurs agents doit progresser, et l'utilisation de solutions alternatives (carburants, modèles technologiques et économiques) doit être accélérée pour aboutir à la réduction des effets externes négatifs. Enfin, l'attractivité et la perception des métiers de la logistique doivent être améliorées

La Commission européenne dispose de différentes options stratégiques pour réaliser ces objectifs et nous en avons identifié trois. Chacune de ces options propose une série d'actions spécifiques destinées à résoudre les principaux problèmes du secteur logistique.

La première option stratégique est une poursuite sélective de FTLAP 2007. Selon cette option, les actions de FTLAP 2007 jugées particulièrement appropriées pour faire face aux problèmes actuels et futurs seront poursuivies.

La seconde option stratégique adopte les mêmes stratégies que la première, mais la renforce par une « intervention minimum » complémentaire dans le marché de la logistique. Les actions spécifiques qui viennent s'ajouter dans cette option stratégique visent à créer une structure destinée à promouvoir l'excellence dans le monde des affaires. Ces actions comprennent par exemple la création d'une structure pour des normes de technologie propre qui encouragent l'investissement dans un niveau initial de bornes de recharge électrique en zones urbaines et sensibilise les consommateurs finaux à l'impact du « dernier kilomètre » du commerce électronique. Dans cette option, le développement ultérieur et l'innovation sont principalement du ressort du marché.

La troisième option stratégique a pour but d'apporter un appui plus large au marché logistique dans l'UE en proposant une série d'actions destinées à contribuer de manière significative à l'efficacité et à l'efficience du marché. Elle réduit dès lors l'espace de liberté du marché mais apporte l'aide de la Commission européenne pour résoudre les problèmes de l'industrie. Des exemples d'actions possibles concernent l'amélioration de l'accès à l'innovation technologique grâce à des fonds nationaux, l'organisation de campagnes et de soutien à la formation, la création de normes en matière de méthodologie de calcul du CO2, la stimulation de la différentiation des prix pour les trajets aller-retour sur les sites de commerce en ligne, et la poursuite de mesures fiscales en faveur de l'adoption de carburants alternatifs.

Notre analyse des répercussions possibles de ces plans d'action démontre que la troisième option sera la plus efficace pour atteindre les objectifs fixés et aura le plus d'impact pour remédier aux problèmes du secteur logistique de l'UE. Toutefois, cette troisième option implique la plus importante intervention politique de la Commission, car elle nécessite la plus grande participation financière et l'élaboration d'un plan d'action pro-actif destiné à apporter un soutien indispensable au secteur logistique.

Recommandations

L'analyse a démontré qu'il y a clairement une demande pour que la Commission européenne développe une nouvelle politique logistique à moyen et long terme axée sur les principaux domaines de préoccupation du secteur logistique (augmentation des coûts, nuisances externes et manque de personnel). Lors du développement de la politique logistique, il est préconisé que les actions spécifiques des plans d'action antérieurs soient redéfinies et intégrées à la nouvelle politique. De nouvelles actions

doivent encore être développées. Pour certaines d'entre elles des évaluations d'impact complémentaires sont requises. De plus, il faut instaurer un suivi cohérent et logique des performances du secteur logistique. Ceci devrait permettre tant aux sociétés qu'aux responsables politiques de suivre les performances du secteur logistique et d'évaluer son comportement, ce qui revêt une importance particulière lorsqu'il s'agit d'envisager de nouvelles options et actions stratégiques. Une meilleure base d'informations sur l'état du secteur devrait permettre de réagir en temps opportun aux (sous) performances du secteur et aider à évaluer les actions stratégiques.

1. Introduction

1.1 Background

Logistics is a set of services including the planning, organisation, management, execution and monitoring of a company's entire material, goods and information flows (from purchasing, production and warehousing, to added value services, distribution and reverse logistics). Studies have estimated that, within the EU, this sector represented a market volume of nearly € 878 bn in 2012[1].

The importance of logistics has been elevated enormously in the globalised economy as it represents the backbone of highly complex and globally extended supply chains, which require the efficient, cost-effective and reliable flow of goods and information. Freight transport logistics is, therefore, highly dependent on the external environment that shapes the needs and patterns for production and consumption of goods. As such, the logistics sector is a dynamic system that continuously needs to adapt to the new challenges and chances that the development of the socio-cultural, economic, technological and political environment provides.

The Commission highlighted the importance of the freight transport logistics sector in a 2006 Communication[2], in which it identified areas for possible actions to help improve the performance of the sector and remove bottlenecks. Subsequently, the Commission adopted the Freight Transport Logistics Action Plan (FTLAP) in 2007[3], proposing concrete measures which aimed to create a more sustainable and competitive logistics sector in the EU.

EU logistics policy has an important facilitating function in maintaining the global competitive position of the logistics sector and positively contributing to the EU economy in a sustainable way. Given the dynamic character of the logistics sector and rapid pace at which certain technological developments advance, the Commission is looking ahead to 2030 defining a mid- to long-term strategy for the European freight transport logistics sector.

In order to help choose the right approach and measures for future policies, this study provides the Commission with:

- A sound knowledge and understanding of the current scope, functioning and performance of the logistics sector within the EU;
- An analysis of the (external) trends and challenges the sector is likely to face in the mid- to long-term perspective, as well as the effects these trends might have;
- An assessment of market trends that should be addressed in the reviewed FTLAP and proposals for appropriate policy options;
- An analysis of impacts of proposed future logistics policy options;
- An inventory of existing performance measurement tools and concrete recommendations for assessing logistics performance at country level and at company level.

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1 See Kille/Schwemmer: Top 100 in European Transport and Logistics Services, DVV Media Group, Hamburg, 2013, p. 48.

2 COM (2006) 336 final of 28.06.2006 "Freight Transport Logistics in Europe – the key to sustainable mobility.

3 COM (2007) 607 final of 18.10.2007 "Freight Transport Logistics Action Plan'.

Ultimately, the study "contributes to such a knowledge basis and understanding, enabling the development of a mid- to long-term policy strategy for the European freight transport logistics sector." Such a strategy could follow-up the FTLAP currently in place.

The study forms part of a wider range of interlinked studies. In its invitation to tender (Nº MOVE/D1/335-1), the Directorate-General for Mobility and Transport (DG MOVE) of the European Commission has identified four lots as part of the "Fact-finding studies in support of the development of an EU strategy for freight transport logistics". This study corresponds to "Lot 1: Analysis of the EU logistics sector", and was carried out by the study consortium consisting of Ecorys, Fraunhofer, TCI, Progtrans AG and AUEB-RC/TRANSLOG.

Stakeholder consultation

The involvement of stakeholders was crucial in this study. The study initiated a questionnaire and a workshop in order to gain input for the analysis and obtain views of stakeholders on the problems in the area of logistics.

In the questionnaire, sent to 400+ stakeholders, the representatives provided feedback on the identified problems, logistic trends, FTLAP actions, logistics performance measurement and proposed policy objectives. The questionnaire was online during the period December 2013 – January 2014.

The workshop of 4 July 2014 provided a final stakeholder consultation round, with 35 key stakeholders present. During the workshop the outlined policy options were presented and discussed with the stakeholders. They reflected on the strategies, indicators and problem definitions, and discussed all seven policy objectives separately.

The results of the stakeholder consultation are presented in Annex VII of the report.

1.2 Report structure

This is the final report of the Lot 1 study "Analysis of the EU logistics sector". The study was built upon four tasks, which were defined under the Tender Specifications of the study[4]. Each of the tasks was performed under the responsibility of the task leader:

Task 1: Statistical Analysis - Fraunhofer;
Task 2: Performance indicators and benchmarking – TCI;
Task 3: Trends and external developments - Progtrans AG;
Task 4: Review and follow-up of FTLAP – Ecorys.

AUEB-RC/TRANSLOG worked together with the task leaders within task 2 and task 3.

The relation between the abovementioned tasks of the whole study and the chapters as presented in this report is shown in the table below.

[4] CALL FOR TENDERS N° MOVE/D1/355-1;"Fact-finding studies in support of the development of an EU strategy for freight transport logistics": TENDER SPECIFICATIONS.

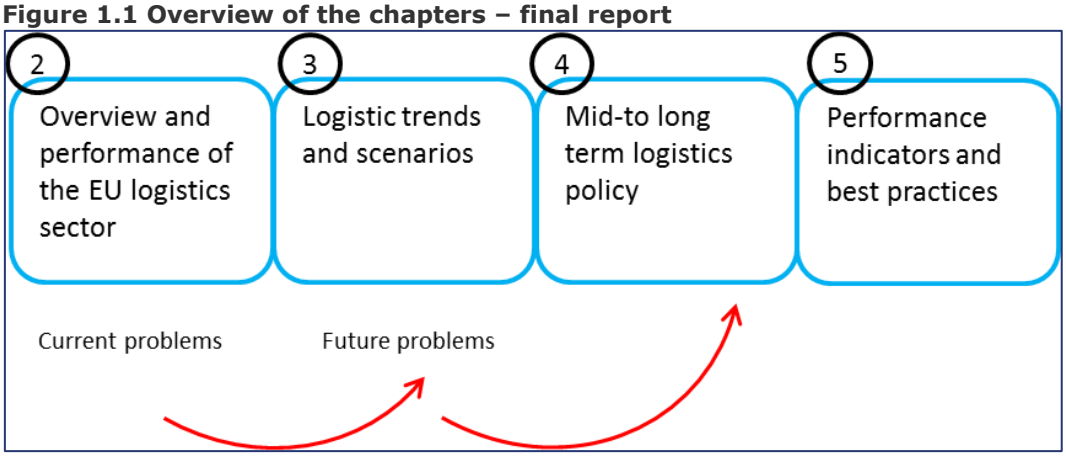
Table 1.1 Relation between the study tasks and report chapters

Task/Chapters	Chapter 2	Chapter 3	Chapter 4	Chapter 5
Task 1	✓			
Task 2				✓
Task 3		✓		
Task 4			✓	

1.2.1 Structure and relation between the chapters of the final report

This final report is built around four specific but interlinked chapters, which are necessary to contribute to the required knowledge base and understanding for future EU logistics policy. An illustrative overview of the chapters is provided in the figure below.

Figure 1.1 Overview of the chapters – final report



An understanding of the relevant problems of the logistics industry is an important pre-condition to defining a new set of policy options for EU logistics in the mid- to long-term. Therefore, this report is chronologically structured. The problem base to be addressed for future logistics policy is based on currently observed and future problems.

Chapter 2 presents a complete statistical basis, which provides key parameters regarding the structure, costs, performance and added value of the EU logistics sector. The inventory of data is based on currently available sources. This chapter presents further evidence for the current problems within the European logistics sector. In addition, the recommendations are made with regard to the improvement of the collection of statistics on logistics within the EU.

Furthermore, the study identifies trends within external factors and business strategies. Illustrative scenarios are developed on the main trends which are expected to pose new challenges to the EU logistics system in the future (Chapter 3). This chapter builds on the earlier identified problems and presents the problems for the future, not tackled by the market itself.

With this background, the study brings together the problems identified and proposes follow-up policy options for FTLAP. An ex-ante assessment of these options is carried out. The current FTLAP actions are reviewed based on their relevance to the current and future outlook of the EU logistics sector (Chapter 4). The problem definition is built on the findings from Chapters 2 and 3.

Finally, recommendations are made concerning the assessment of logistics performance and benchmarking tools (Chapter 5). This includes a proposal for measuring and benchmarking the performance of logistics, at micro and national level. There is a close relationship between this chapter and the last part of Chapter 2 – "Performance of EU freight transport logistics".

A literature list is included as Annex I, and an evaluation of secondary logistics sources as Annex II. Annex III comprises logistics market segment descriptions and Annex IV presents the input-output methodology for assessing the added value of logistics. Annex V presents the metadata of all data collected. Annex VI identifies data availability problems. The stakeholder questionnaire is analysed in detail in Annex VII and Annex VIII presents factsheets of logistics performance studies. Annex IX additionally evaluates possible KPI for logistics.

2. Overview and performance of the EU logistics sector

2.1 Introduction

Logistics systems are enablers of a work-sharing economy, with high interactions between the countries of Europe, and are therefore highly complex. The whole European logistics market size (including the EU28 countries) amounted to about € 878 bn in 2012[5]. However, although the availability of statistics and other sources has increased in the last couple of years, there still exists a lack of systematic and consistent data in the field of transport and logistics – especially at a pan-European level.

In this study, logistics is considered *as a set of services including the planning, organisation, management, execution and monitoring of a company's entire material, goods and information flows (from purchasing, production and warehousing, to added value services, distribution and reverse logistics).*

To provide an adequate statistical basis for a mid- and long-term policy strategy for the EU logistic sector, the study analyses and evaluates the available logistics data in the EU and identifies gaps, as well as solutions, for the logistics data collection.

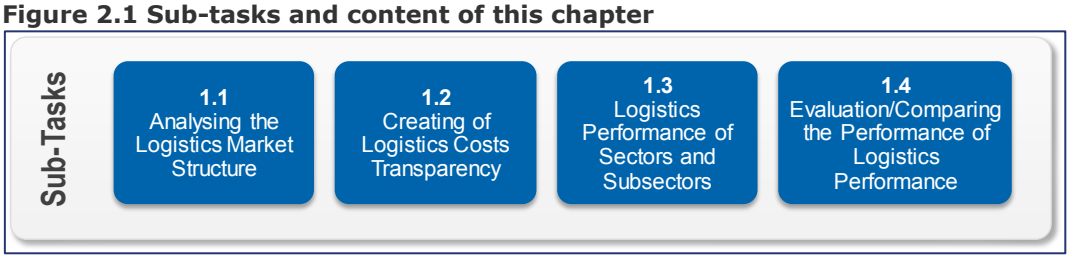
In this chapter a number of analytical steps have been carried out:

- Analysis of existing studies and reports in the field of logistical data;
- Review and evaluation of retrievable and available public and commercial statistics;
- Identification of gaps in quantity, quality and detail of those sources;
- Application of existing or development of new methods to close the data gaps;
- Documentation of sources, update processes and methods on country and aggregated European level.

The focus of the statistical basis is to provide as much quantified data from public, reliable sources as possible. The figures should cover all EU28 countries and represent a time series from 2005 to 2012. In the events that there is a dearth of sources or reasonable doubts about the quality, expert judgements will be used to close these gaps. In this case, the affected data is marked as estimated and methods of statistical methodology will be explained.

The next figure shows all four sub-task of task 1.

Figure 2.1 Sub-tasks and content of this chapter



As a whole, this chapter presents the results of the above mentioned sub-tasks. The first sub-task (1.1) analyses the logistics market structure and provides important key figures of logistics service providers in Europe. Sub-task 1.2 creates transparency of the logistics costs structure. In sub-task 1.3, the economic added value of logistics is derived from the national macroeconomic total accounts. This analysis shows how

[5] See Kille/Schwemmer: Top 100 in European Transport and Logistics Services, DVV Media Group, Hamburg, 2013, p. 48.

important logistics is for single sectors (primary, secondary, tertiary economic sectors) and subsectors (certain industries). It also shows how different Member States perform in comparison to one another and the EU as a whole. Finally, the performance of the logistics systems in Europe is evaluated and compared to a selected number of non-European countries under sub-task 1.4. In the course of subtask 1.4, input from task 2 (performance indicators and best practices) is taken into consideration.

The underlying statistical dataset, which covers the indicators of sub-task 1.4, is issued as a separate file to the Commission Services of DG MOVE. Annex V presents the structure and content of this dataset in more detail. Annex II presents the evaluation of the secondary sources used as input for this chapter.

2.2 Preliminary analysis of data sources and data to collect

2.2.1 Source screening

The analysis of existing studies, the review of retrievable statistics and the evaluation of possible data sources is a fundamental task prior to task 1 content and data analysis.

The main relevant sources are the studies "SEALS – Statistical coverage and economic analysis of the logistics sector in the EU" and "BE-LOGIC - Benchmark Logistics for Co-modality", which were carried out for the EU Commission in the years 2008 (SEALS) and 2011 (BE-LOGIC).

Another category of valid sources are the national statistics institutes of the EU Member States and the Eurostat database.

As the collection also addresses data with additional information, complementary sources are evaluated. The following table gives a list of sources and works which have been evaluated with an assessment profile that shows what kind of research was conducted.

Table 2.1 Secondary data source evaluation

Overview of evaluated secondary data sources (as from 02-2014)				
No.	**Organisation / Title of publication**	**Single release**	**Research portal**	**Database**
1	ACEA (European Automobile Manufacturers Association) - Tax Guide	✓		
2	BMWI (Federal Ministry for Economic Affairs and Energy) - The Trend of Energy Markets up to the Year 2030	✓		
3	Bureau van Dijk - Company Database AMADEUS			✓
4	CEA (European Insurance and Reinsurance Federation) - The European Motor Insurance Market	✓		
5	CIA (Central Intelligence Agency) - The World Factbook			✓
6	Cushman & Wakefield – Research		✓	
7	Deka Bank - Europäische Logistikmärkte	✓		
8	Deka Bank - Real Estate Research		✓	
9	DIW (Deutsches Institut für Wirtschaftsforschung) - Research & Advice		✓	

Overview of evaluated secondary data sources (as from 02-2014)				
No.	**Organisation / Title of publication**	**Single release**	**Research portal**	**Database**
10	ECG (Association of European Vehicle Logistics) - Fuel Prices	✓		
11	Economy Watch - Economic Statistics		✓	
12	ESPO (European Sea Ports Organisation) - Statistics		✓	
13	Fraunhofer SCS - The Top 100 in European Transport and Logistics Services	✓		
14	Frost & Sullivan – Research		✓	
15	IEA (International Energy Agency) – Research		✓	
16	IRF (International Road Federation) - IRF World Road Statistics (WRS)	✓		
17	IRU (International Road Transport Union)		✓	
18	ITF (International Transport Forum)		✓	
20	Jones Lang LaSalle - Logistikimmobilien Report Deutschland	✓		
21	Jones Lang LaSalle - Research Germany		✓	
19	Jones Lang LaSalle - Global Market Research		✓	
22	KombiConsult		✓	
23	OECD (Organisation for Economic Cooperation and Development) - Economic Outlook	✓		
24	OECD.Stat (Organisation for Economic Cooperation and Development)			✓
25	Postbank – Research		✓	
26	ProgTrans - World Report	✓		
27	Savills - Research (Germany, Europe, Asia-Pacific Region)		✓	
28	The World Bank - Logistics Performance Indicator	✓		
29	UIC (International Union of Railways)		✓	
30	UIRR (International Union of Combined Road-Rail Transport Companies)		✓	
31	UNCTADStat (United Nations Conference on Trade and Development)			✓
32	UNECE Statistical Database (United Nations Economic Commission for Europe)			✓

Source: Fraunhofer SCS.

The publications are categorised as single release (e.g. Top 100 market surveys), portals that provide different publications (e.g. Postbank Research) or databases (e.g. OECD Stat).

The following figure shows one of the source profiles provided by the "Top 100 in European Transport and Logistics Services" reports.

Figure 2.2 Source evaluation of Top 100 in European Transport and Logistics Services reports

Fraunhofer SCS – Top 100 in European Transport and Logistics Services					
Description: The Top 100 in European Transport and Logistics Services provides data on logistics market sizes and market structures for the European countries (EU28 plus Norway, Switzerland). Its core results are rankings of the largest logistics services providers in Europe and in all of the assessed countries.					
Reference: http://www.scs.fraunhofer.de/de/studien/logistikmarkt/top100_13.html					
Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Interviews	Questionnaire	Case Studies	
	Approach	Qualitative	Quantitative		
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free	On charge		

Source: Fraunhofer SCS.

The dimensions that have been rated per source are:

- "Type of survey" – describes the data collection. The categories are: "Census", "Sample Representative", "Sample not Representative" and "Secondary Data";
- "Interrogation" – shows if data is collected by "Interviews", "Questionnaire" or "Case Studies";
- "General Approach" states if the report or study has a "Qualitative" or "Quantitative" approach;
- "Frequency" of publication or data update – categories are "Once", "Infrequent", "Biannual" and "Annual";
- "Geographical Scope" – shows which geographical area is addressed or evaluated by the conducted works;
- "Geographical Detail" – evaluates the granularity of data, i.e. on which level figures and indicators within the evaluated report are assessing the logistics market or parts of it;
- "Availability" – categories are "free" or "On charge".

Research often uses combined approaches. In the "Top 100" reports, for instance, two types of interrogation are relevant: "Interviews" are conducted and "Questionnaires" are used to gather data and therefore highlighted in a cyan colour. The compiled profiles are attached in Annex III.

2.2.2 Possible indicator assessment

A comprehensive data collection is fundamental for this study. To start data collection, introductory steps were carried out regarding the definition of data needs and what had to be retrieved. First, possible data for completing the tasks and assessments were analysed and collected in a list. Second, the list's entries were rated according to their availability or derivability within the scope of the project. The list does not show a concrete indicator in every case. The approach in setting up the list was to identify fields of data needs. This list is attached in Annex IX, where indications are provided on the availability of data as from 2013.

The availability of information or data regarding the indicators was estimated as a starting point for discussion on indicators to be collected. The columns on the right-

hand side in the table (Annex IX) show the result of this preliminary evaluation process.

This list was discussed internally over several rounds. The result of this process is the list of logistics indicators shown below. The study aimed to collect data on all of these indicators.

Table 2.2 List of indicators to be collected within task 1[6]

No.	Indicators	Intention of indicator collection
1	Tonnes (per transport mode)	Freight performance and modal split per country
2	Tonne-kilometres	Performance of freight transport sector
3	Tonnes per inhabitant	Performance of logistics system; state of development of nation's logistics sector
4	Number of vehicles	Freight sector data
5	Number of vehicle movements	Utilisation of fleet; performance of logistical planning
6	Number of empty runs	Utilisation of fleet; performance of logistical planning
7	Tonnes per vehicle	Qualitative aspect of transportation
8	Total turnover	Size of outsourced logistics market
9	Number of logistic service providers	Size of outsourced logistics market
10	Number of employees	Size of outsourced logistics market
11	Average turnover per service provider	Performance of logistics
12	Average vehicle age	Qualitative aspect of transportation (sustainability)
13	Average vehicle size	Qualitative aspect of transportation
14	Average length of haul	Qualitative aspect of transportation
15	Overall logistic expenses per country	Logistics volume for each country
16	Vehicle / train-tkm	Utilisation of fleet; performance of logistical planning
17	Number of trips per vehicle-kilometre	Utilisation of fleet; performance of logistical planning
18	Number of road freight vehicles in different categories	Qualitative information on sustainability of fleet
19	Owned and hired fleet share (poss. for road)	Share of commercial freight and own freight
20	Number of kilometres of TEN-T highways and rail lines	International relevance as transit country

[6] **Note:** The reduced list of indicators is still voluminous with 36 of these items listed above. Some indicators can be directly collected from sources; others are only partly or very selectively available. The practicality of collection or generation of this data could not be guaranteed within the project.

No.	Indicators	Intention of indicator collection
21	Modal share of intermodal transport	Qualitative information on sustainability
22	Size of transport units	Qualitative data per country
23	Share of logistics costs on the total product costs	Relevance of logistics sector
24	Share of turnover of the logistics sector in total turnover	Relevance of logistics sector
25	Share of added value of the logistics sector in total value added	Economic relevance of logistics sector
26	Productivity – added value per employee in the logistic sector	Productivity in country comparison
27	Import/exports value density per country	Qualitative aspect of logistics
28	Transport performance (tonne-kilometres) per GDP (transport intensity)	Correlation between logistics and economic performance of countries
29	Fuel costs; capital costs; real estate; toll costs; labour costs	Cost transparency
30	Average wages	Cost transparency
31	No. of warehouses per country	Qualitative aspect of logistics
32	m² per warehouse	Qualitative aspect of logistics
33	Inventory stock turn rate	Speedup of trade flows; state of development of logistics sector
34	Handling factor = ratio of tonnes-lifted to the actual weight of goods produced or consumed	Speedup of trade flows; state of development of logistics sector
35	Logistics efficiency (utilisation of vehicles and transhipment facilities)	Performance of logistics system; state of development of nations logistics sector
36	Share of investments in ICT	Use of technology / innovation

Source: Fraunhofer SCS.

2.3 Analysis of the logistics market structure

The first sub-task provides an overview of the logistics market structure in Europe. Quantitative measures were analysed to identify similarities and differences in logistics markets across Europe. As logistics is a network business, a national approach on figures was considered to be an appropriate level of analysis for this task.

A combined approach was used in the analysis of the logistics market structures. The analysis first built on the detailed microeconomic insights from the Top 100 market surveys of Fraunhofer SCS and continued with additional statistics to gain further insights from a macroeconomic point of view.

2.3.1 The EU logistics market structure – macro data

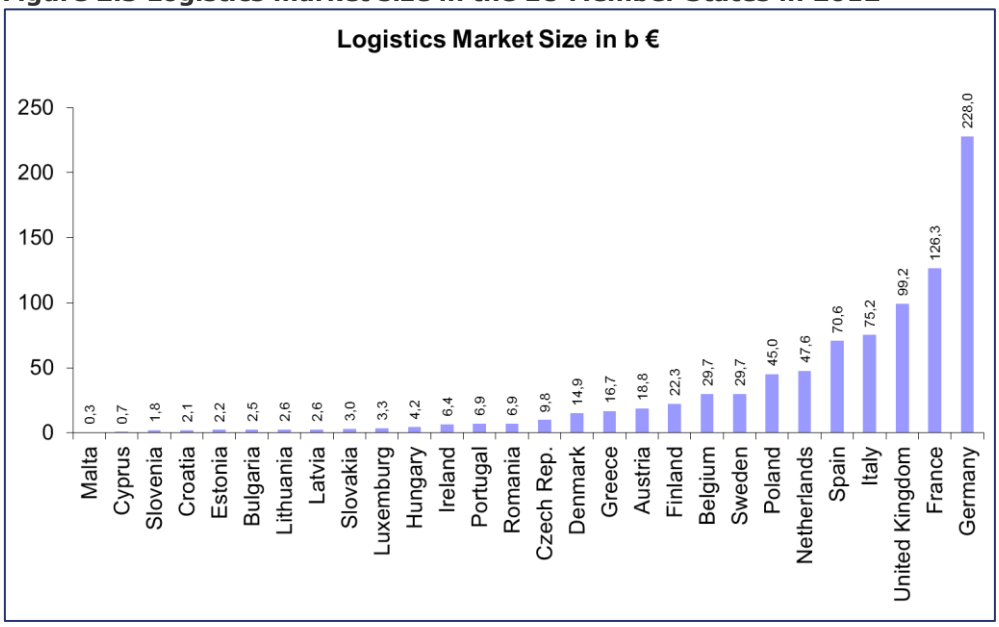
Market size

The "Top 100 in European Transport and Logistics Services" is one of the most comprehensive market surveys for the European transport and logistics sector. One of the essential results of this study is the estimation of logistics market sizes for all Member States of the EU. The latest edition from October 2013 supplies data for the year 2012.

The "Top 100" studies provide estimates that are calculated by different approaches. Derived from the tonnages moved in the assessed countries in the six relevant modes of transport (road, rail, sea, barge, pipeline and air), expenses for these sectors are extrapolated according to cost per tonne figures derived from the assessment of the German transport market. According to Davis/Establish, 2013[7] the transportation sector expenses are extrapolated to calculate the overall logistics expenses that, besides transportation, comprise warehousing, capital costs, administration and order processing. The results are benchmarked against a second estimation approach that calculates the logistical expenses on the level of single industry branches for the whole EU[8]. As both approaches come to similar final results, the findings are considered to be "robust" by the Top 100 authors within a +/- 5% margin of error.

The following figure displays the results (total logistics expenses) for the EU28 countries.

Figure 2.3 Logistics market size in the EU Member States in 2012



Source: Fraunhofer SCS / Top 100 in European Transport and Logistics Services 2013-2014; for year 2012.

These market volumes combine all expenses for logistics services that were borne in 2012 for the countries indicated. It includes the figures of outsourced logistics services that are performed by the specialised service providers of each country, as well as logistics activities brought in by industrial companies themselves. Therefore the market size is not based on turnover, as there is no turnover generated in industrial companies with logistics activities. The market size is based on costs emerging for personnel, vehicles, stock, and administration and planning of logistical activities. The total logistics expenses amount to € 877.8 bn for the EU Member States[9], which are ranked by total market size.

The following figure provides an EU27 time series (without Croatia for comparison) with the percentage share of EU27 GDP presented in the bottom row. The GDP share

[7] The Davis database is collected by "Establish", a consulting company that collects data of logistics companies throughout the world. Yearly presentations provide the latest findings.

[8] The "Top 100" reports spend (depending on the edition) about a minimum of 30 pages on deliberations and remarks on methodology, the assumptions made and data quality of the results. For further reading see "Top 100 in European Transport and Logistics Services 2013", p. 27-58.

[9] The "Top 100" market surveys estimate a total market volume for the 28 EU Member States plus Norway and Switzerland. The EU 28 value sums up to a total market volume of about € 878 bn.

has declined since 2010. The reasons are manifold, but the fact can partly be explained by difficult economic situations in some countries (Spain, Greece and Italy) that are partly compensated by the still growing European economies. The logistics sector very quickly reacts to difficult market conditions by lower load factors and capacity surplus, decreasing the share of logistics expenses measured against the EU27 GDP[10].

Table 2.3 Logistics expenses of the EU27 from 2008 to 2012 as a share of EU27 GDP

	2008	2009	2010	2011	2012
Log.Exp. EU27 in bn. €	889,0	857,0	937,0	917,0	876,0
Share of GDP	7,1%	7,3%	7,6%	7,2%	6,8%

About 46% of logistics expenses are outsourced and emerge for services carried out by logistics service providers, while the rest comprises logistics activities in other industry sectors[11]. Germany is the largest logistics nation in the EU with a market volume of about € 228 bn in 2012, about a quarter of the total EU logistics market size.

Outsourcing

As logistics is a cross-section industry of high importance all over the economic sectors, logistics activities may be carried out by the manufacturing industries themselves while others are purchased from logistics service providers. The term "outsourced market share" covers these purchased activities. A first indication for an outsourcing share can be drawn from the "Top 100" surveys with an estimated share of about 50%[12]. This means that about one half of logistical activities are carried out by in-house, non-logistically-focused industrial companies. The other half is carried out by the logistics service providers[13].

Logistics costs share

As logistics covers more than the transportation sector alone, the "Top 100" market surveys take into account different types of logistics costs according to Davis/Establish, 2013[14]. The following pie chart gives an overview of which cost categories are considered and what share of the total they amount to.

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10 Note: Due to incremental methodological adjustments in the "Top 100" studies, time series comparisons need to be interpreted carefully.

11 See "Top 100 in European Transport and Logistics Services 2013", p. 108 and p. 116.

12 A possible approach to assess the extent of outsourcing and own logistics services as shares of the overall expenses is to gather data on the numbers of vehicles used in these categories. The collection and assessment of data available via Eurostat turned out to be inconclusive due to a lack of data regarding logistics activities that are performed in the industry sectors. Eurostat gathers figures for road transportation, but the reports for fleet sizes or tonnages moved showed more gaps than values. For the moment it has to be stated that this does not lead to a valid estimation for the share of outsourced logistics activities on a national level. While there are statistics collected for the road sector, warehousing, inventory carrying, administration and order processing cannot be assessed. The "Top 100" studies calculate the outsourced share of the total logistics expenses by taking into account statistics on persons employed. The German employment office can provide detailed information on the types of jobs and employers (for purchase). Detailed explanation can be found in "Top 100 in European Transport and Logistics Services 2013", p. 36-38 and in particular in the previous edition: "Top 100 in European Transport and Logistics Services 2011", p. 29-34, especially tables 4,5 and 6.

13 Construction sector example. To use the example of the construction sector: not every transport service is purchased from a logistics service provider –some are performed by own employees and own equipment. Construction companies often deliver building materials from their own depot to the construction site and, consequently, there is a need to differentiate between the segments "hired logistics services" (outsourced) and "own logistics services".

14 The Davis database is collected by "Establish", a consulting company that collects data of logistics companies throughout the world. Yearly presentations provide the latest findings.

Figure 2.4 Logistics volume and cost components in EU28 in 2012

Source: Fraunhofer SCS / adapted from the Top 100 in European Transport and Logistics Services 2013-2014.

Market players

The focus of the "Top 100" market surveys (which are published yearly) is to create transparency regarding the market players in Europe as a whole and in every Member State. The following table shows the 20 biggest logistics service providers in 2012, ranked by revenue generated in the geographical area of Europe. As the postal sector is not considered part of the logistics sector, revenues in this sector are excluded. This is especially relevant for the figures of Deutsche Post DHL whose total revenue (including postal services) added up to € 55.5 bn in 2012. Logistics activities amounted to € 46.2 bn worldwide and to € 27.8 bn in Europe, making the company the biggest logistics company in Europe as well as worldwide, even with revenues from postal delivery subtracted from the total amount.

Table 2.4 Top 20 ranking of EU Member States logistics service providers in 2012

Rank	Company	Data quality	Logistics revenue worldwide 2012 in € m	Logistics revenue in Europe 2012 in € m	Employees
1	Deutsche Post DHL (Group) (DE)	**	46,261	27,830	428,129
2	Maersk A/S (DK)	**	29,667	15,000	152,000
3	DB Mobility Logistics AG (Group) (DE)	**	19,931	14,822	225,045
4	SNCF SA (FR)	*	9,515	9,515	249,343
5	CMA-CGM SA (FR)	*	15,900	8,000	18,000
6	La Poste (Group) (FR)	*	6,150	6,150	n.a.
7	UPS Europe NV (BE)	**	40,950	5,700	399,000
8	DSV A/S (DK)	***	6,028	5,150	21,932
9	TNT Express (NL)	***	7,162	4,775	68,628
10	Dachser GmbH & Co. KG (DE)	***	4,410	4,035	21,650
	Top 10 total		**185,974**	**100,977**	
11	Rhenus AG & Co. KG (DE)	***	4,000	4,000	24,000
12	Norbert Dentressangle SA (FR)	***	3,880	3,797	32,506
13	CEVA Group Plc (UK)	***	7,224	2,982	50,449
14	Gefco SA (FR)	***	3,600	2,700	11,200
15	Grimaldi Compagnia di Navigazione	***	2,735	2,500	n.a.

Rank	Company	Data quality	Logistics revenue worldwide 2012 in € m	Logistics revenue in Europe 2012 in € m	Employees
	S.p.A. (IT)				
16	Bolloré Holding SA (FR)	***	5,473	2,250	34,226
17	Hapag-Lloyd Aktiengesellschaft (DE)	***	6,757	2,200	6,950
18	Volkswagen Logistics GmbH & Co. OHG (DE)	*	2,200	2,200	n.a.
19	Stef-TFE SA (FR)	***	2,184	2,184	14,500
20	The Royal Mail Holdings Plc. (Group) (UK)	***	2,165	2,165	n.a.
	Top 20 total		**226,192**	**127,955**	

Source: Fraunhofer SCS / Top 100 in European Transport and Logistics Services 2013-2014.

The Top 20 service providers are based in only 7 different EU countries. The following table shows the dominance of some countries in terms of logistics headquarters.

Table 2.5 Nationalities of the 20 biggest logistics service providers in the EU28 in 2012

France	Germany	Denmark, United Kingdom	Belgium, Italy, Netherlands
7	6	2	1

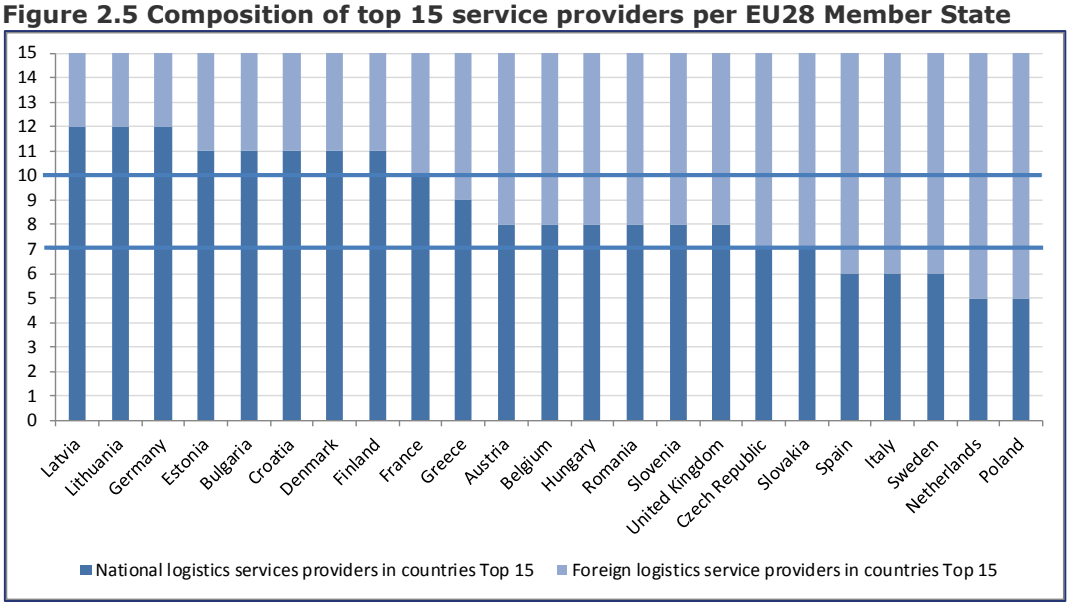
Source: Fraunhofer SCS / based on: Top 100 in European Transport and Logistics Services 2013-2014.

Germany and France are the main home countries for important logistics service providers, Denmark and the United Kingdom hold two of the top 20 companies each and Belgium, Italy and the Netherlands have one each. The biggest logistics companies have a wider international activity. The EU, as a common economic zone, promotes the development of international transport and logistics businesses. Big companies consequently develop into new markets and some have strong positions in various countries. In some Member States, the biggest logistics service providers are not necessarily national companies.

Aside from the top list of logistics service providers in the EU, the study also reports the top 15 biggest service providers per country. Figure 2.5 shows the composition of the most important (top 15) logistics service providers per country. The bars in dark blue indicate the number of national companies, while the light blue bars indicate foreign logistics providers working within the country.

Eight Member States have more than ten national service providers among the top 15 (see the dark blue bars on the left-hand side of the diagram) and the market is shaped by national players. Eight further countries have more than one half of companies from their own national base (see the bars for the nations from France to the United Kingdom). In this case, international companies challenge national competitors for market shares. In seven countries more foreign competitors than national companies make the top 15.

Figure 2.5 Composition of top 15 service providers per EU28 Member State

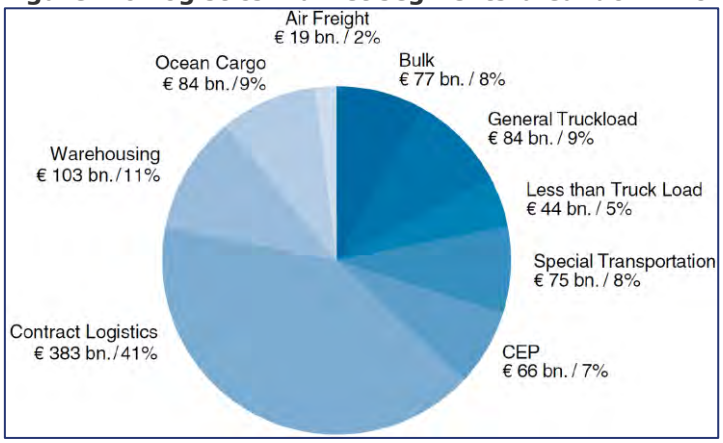


Source: Fraunhofer SCS / based on: Top 100 in European Transport and Logistics Services 2013-2014.

Spain, Italy, Sweden, the Netherlands and Poland, which hold the lowest number of national logistics service providers, are among the largest economies in Europe and are therefore profitable markets. As logistics service providers expand in countries where the expected profit can be maximised, large markets are chosen for expansion. Logistics service providers from the neighbouring countries are often active in these countries. German DHL Deutsche Post, DB Mobility Logistics and Belgian UPS Europe NV are competitors that are active in all five of the above mentioned Member States.

The following graph shows the shares that different market segments have in the total logistics market. As this result is elaborated for the whole of Europe in the study, single countries like Norway or Switzerland that are included in the figures cannot be taken out of the calculation.

Figure 2.6 Logistics market segments breakdown 2012



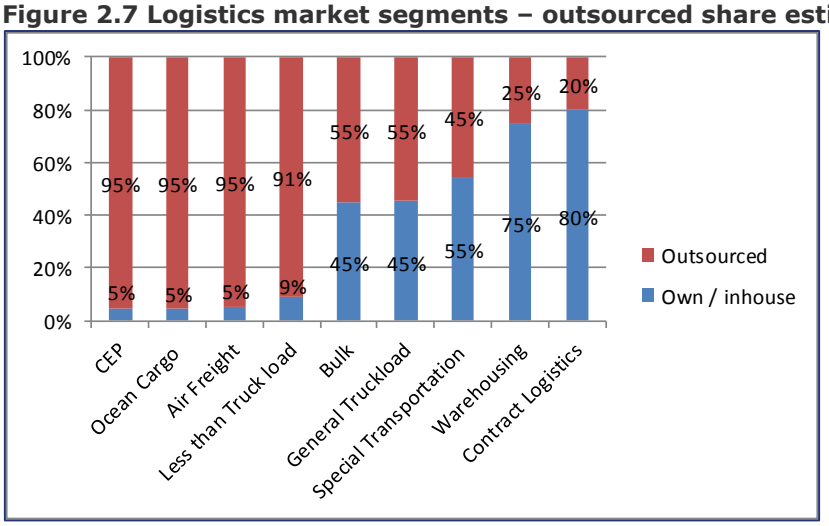
Source: Top 100 in European Transport and Logistics Services 2013-2014, p. 62.

The graph shows the size and heterogeneity of the logistics market as a whole. To give an overview about the listed market segments, Annex III contains an excerpt of the latest "Top 100" report where the market segments are described. The markets are defined by similarity of processes and consignments that are handled. Seven of the market segments basically offer transportation services (from ocean cargo to courier, express and parcel services (abbreviated as CEP in the graph). A major share

of the logistics market comes from the contract logistics and warehousing sectors, where added value services and warehousing are of high importance.

Not all the segments' services or activities are outsourced to logistics service providers to the same degree. The next figure shows results of the "Top 100" in logistics surveys regarding the share of services that are outsourced to logistics service providers.

Figure 2.7 Logistics market segments – outsourced share estimates for EU28 in 2012



Source: Top 100 in European Transport and Logistics Services 2013-2014, p. 62.

The share of outsourced services is estimated through database assessment in the scope of the studies. The biggest market players in every market are known and the outsourcing share is calculated by taking into account the market concentration in the segments. CEP[15] services are mainly outsourced. The same holds true for ocean cargo, air freight and LTL (Less than Truckload)[16] services. These activities are almost completely outsourced to logistics service providers as for industrial companies it often simply does not make sense to carry out such services on their own.

On the other hand, there are market segments that are not very much "given away" to service providers, with contract logistics and warehousing leading the way. Here, the logistical activities are very specialised and much more complex than just transportation. In particular, contract logistics services are very particular and individually dependent on the type of company where they need to be carried out. Therefore, contract logistics cannot be assessed in detail by available statistics. The same holds true for warehousing services, where the amount of available statistical data (e.g. number of warehouses, surface of warehouse space, transhipment capacities, etc.) is not available.

2.3.2 The EU logistics market structure – micro data

The most comprehensive public source for data on transport and logistics aspects within Europe is the Eurostat database. It can be used to retrieve information about European transport and logistics companies from the Structural Business Statistics.

[15] CEP encompasses courier, express and parcel delivery services. The usual goods which are being sent are parcels and documents. A more detailed explanation can be found in Annex III.

[16] Less than truckload (LTL) transport services encompass consignments weighing between about 30 kg and two to three tonnes. These shipments cannot be economically carried directly from sender to consignee, but require consolidation through networks or regional collection and distribution depots. These consignments are usually handled via the use of pallets and are carried in non-specialised trucks and containers. A more detailed explanation can be found in Annex III.

The hierarchical classification of economic activities (NACE[17]) lists all relevant industries and is commonly used in statistics that are retrievable via Eurostat.

The logistics sector is included within divisions 49 to 53. To exclude passenger transportation from the analysis, the following list displays the economic activities that have been considered as logistics activities. This list is used as the evaluation key for the market structure analyses.

From "Division" 49 Land transport and transport via pipelines:
49.2 – Freight rail transport
49.4 – Freight transport by road and removal services
49.5 – Transport via pipeline
From "Division" 50 Water transport:
50.2 – Sea and coastal freight water transport
50.4 – Inland freight water transport
From "Division" 51 Air transport:
51.2 – Freight air transport and space transport
From "Division" 52 Warehousing and support activities for transportation:
52.1 – Warehousing and storage
52.2 – Support activities for transportation
From "Division" 53 Postal and courier activities:
53.2 – Other postal and courier activities

The logistics activities represent the hired services that are carried out by logistics service providers. Own transportation and warehousing carried out by employees in the industry and service sector are not included[18].

The evaluation key derived above is the basis for the analyses in the next steps of the assessment.

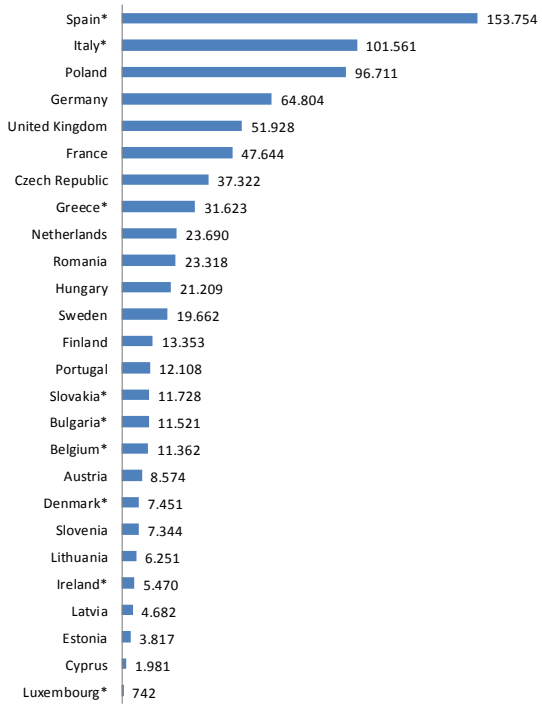
Number of logistics service providers

The number of logistics service providers varies noticeably among the EU Member States. The following graph shows the sum of companies that, based on their NACE Rev. 2 classification, can be attributed to the logistics sector. The number comprises all firms that are market players in the EU28. Although quite complete, comparable values for Malta are missing from the Eurostat database.

[17] The recent NACE classification is named NACE Rev. 2 in detail, as it is the second revision since 2007. The classification comprises codes that define business sectors. It provides codes for all economic activities starting with primary production and going on with the manufacturing industry and the services sector. (European Commission (2008). NACE Rev. 2 Statistical classification of economic activities in the European Community, Luxembourg.).

[18] From a purely academic point of view, "Group" 52.2 – "Support activities for transportation" does not include logistics activities, but rather infrastructural and similar activities (roadside assistance, railway stations, etc.). However, experience shows that some of the most important players in the logistics sector like Schenker, Gefco, Hoyer, DHL Freight, Hermes Logistics, and others, which are under the biggest logistics service providers in Europe, are classified as Group 52.2, especially as Class "52.29 Other transportation support activities", that encompasses forwarding of freight, arranging or organising of transport operations by rail, road, sea or air, activities of sea-freight forwarders and air-cargo agents (and others). Therefore, Group 52.2 is considered as relevant and added to the selection of groups to measure logistics activities within this study.

Figure 2.8 Number of logistics service providers per EU Member State in 2011



	GDP in mln 2011	population in mln 2011	GDP per LSP in mln	population per LSP
Spain	1.046.327	46,8	6,8	304
Italy	1.579.946	61,0	15,6	601
Poland	370.851	38,4	3,8	397
Germany	2.609.900	81,5	40,3	1.257
United Kingdom	1.731.809	62,7	33,4	1.207
France	2.001.398	65,1	42,0	1.366
Czech Republic	155.486	10,2	4,2	273
Greece	208.532	10,8	6,6	340
Netherlands	599.047	16,7	25,3	703
Romania	131.478	21,9	5,6	939
Hungary	98.921	10,0	4,7	471
Sweden	385.451	9,1	19,6	462
Finland	188.744	5,3	14,1	394
Portugal	171.126	10,8	14,1	889
Slovakia	68.974	5,5	5,9	467
Bulgaria	38.505	7,1	3,3	615
Belgium	369.259	10,4	32,5	918
Austria	299.240	8,2	34,9	959
Denmark	240.487	5,5	32,3	742
Slovenia	36.150	2,0	4,9	272
Lithuania	30.959	3,5	5,0	566
Ireland	162.600	4,7	29,7	854
Latvia	20.211	2,2	4,3	470
Estonia	16.216	1,3	4,2	335
Cyprus	17.878	1,1	9,0	565
Luxembourg	41.730	0,5	56,2	674
Sum all	12.621.224	502		
Average			16,2	644

Source: Eurostat 2014 (all values for 2011; Malta/Croatia missing)[19]; population from Institut der deutschen Wirtschaft Köln.

For comparison purposes, the GDP and population figures are shown on the right-hand side of the graph above. In addition, the ratios of GDP and population per LSP (logistics service provider) are given.

Spain holds the highest number of LSP, but relatively low ratios for GDP and population per LSP. Spain's figures are lower than those of countries showing high values like Germany, the United Kingdom, France and others. The European average of € 16 m euros per LSP is also noticeably above. The fact that the GDP per LSP, and the population per LSP, values are far below average in the country indicates difficult circumstances in Spain. Furthermore, the country shows very weak growth in recent years. In 2011, only a marginal growth of 0.4% could be realised. In 2012 and 2013, the GDP decreased by 1.4% (2012) and 1.5% (2013)[20] respectively. This marks additional problematic circumstances for the country.

Referring to the table in Figure 2.8, the values for the ratios of GDP and population per LSP show low results for Spain, Poland, the Czech Republic, Greece, Hungary, Slovakia, Slovenia and Estonia. These two indicators describe the size of the logistics enterprises in the specific country.

The indicators point out that one LSP offers services to less than 400 inhabitants in the specific country, whereas the average figure for the Member States taken into

[19] The values are shown for the year 2011 (last check for more recent data via the Eurostat database in July 2014).Asterisks show values where estimations were needed to complete the figures.

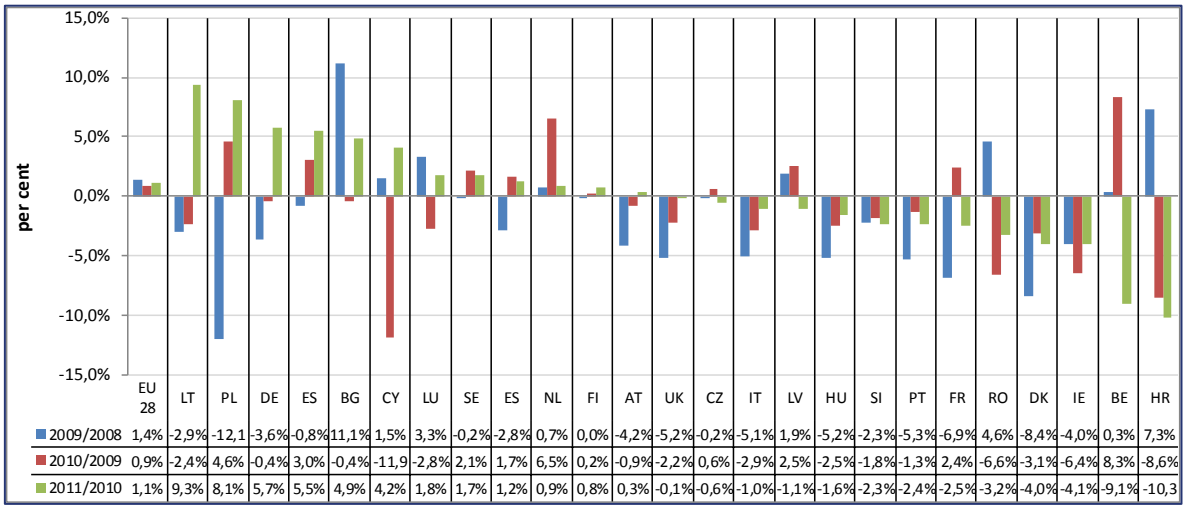
[20] See Kille/Schwemmer: "Top 100 in European Transport and Logistics Services", DVV Media Group, Hamburg, 2013, p. 198 on development of the Spanish economy.

account is 644. In addition, the GDP per LSP figures are far below average and the smallest values can be found for Poland.

The highest values are reached in France, Germany, Belgium, Austria, the United Kingdom, Luxembourg and Denmark. To gain further insights into company sizes and generated turnover, the market for logistics activities is analysed in further steps in terms of its development and structure.

Figure 2.9 illustrates the changes in the absolute numbers of logistics service providers tracked from 2008 to 2011, per country. The visualised data is sorted by the green bars, which show the most recent developments (percent growth in 2011 compared to 2010).

Figure 2.9 Changes in number of logistics service providers per EU Member State from 2008 to 2011 – available Member States



	EU 28	LT	PL	DE	ES	BG	CY	LU	SE	ES	NL	FI	AT	UK	CZ	IT	LV	HU	SI	PT	FR	RO	DK	IE	BE	HR
2009/2008	1,4%	-2,9%	-12,1	-3,6%	-0,8%	11,1%	1,5%	3,3%	-0,2%	-2,8%	0,7%	0,0%	-4,2%	-5,2%	-0,2%	-5,1%	1,9%	-5,2%	-2,3%	-5,3%	-6,9%	4,6%	-8,4%	-4,0%	0,3%	7,3%
2010/2009	0,9%	-2,4%	4,6%	-0,4%	3,0%	-0,4%	-11,9	-2,8%	2,1%	1,7%	6,5%	0,2%	-0,9%	-2,2%	0,6%	-2,9%	2,5%	-2,5%	-1,8%	-1,3%	2,4%	-6,6%	-3,1%	-6,4%	8,3%	-8,6%
2011/2010	1,1%	9,3%	8,1%	5,7%	5,5%	4,9%	4,2%	1,8%	1,7%	1,2%	0,9%	0,8%	0,3%	-0,1%	-0,6%	-1,0%	-1,1%	-1,6%	-2,3%	-2,4%	-2,5%	-3,2%	-4,0%	-4,1%	-9,1%	-10,3

Source: Fraunhofer SCS calculations and diagram / based on data from Eurostat[21].

The EU28 figures are quite solid, with a small but steady growth of just about 1% in the number of providers each year. The diagram and table visualise three growth rates for EU28 and 25 Member States (EE, SK and MT are missing), for a total of 78 growth rates. From these, 45 are negative, while 33 are positive. In general, negative growth rates could indicate market overcapacities, market concentration or shrinking markets. A general conclusion cannot be made as only future development will show what will happen. External factors, trends or political measures can have a noticeable influence too.

The EU 28 aggregate shows little growth and the overall situation seems stable, but it hides radical developments in some Member States. Seven Member States have negative growth rates in two of the years from 2009 to 2011. Another seven have negative rates in all three years (UK, IT, HU, SI, PT, DK and IE). The fact that economically robust Member States such as the UK and Denmark are together with those that are struggling economically (Portugal, Italy and Ireland) as well as Central and Eastern European Members (Hungary and Slovenia) among those with decreasing figures, makes a general conclusion difficult. As the logistics sector is very much growing and declining dependent on the overall economic growth and trade activities, the correlation is direct. All of the enumerated countries were facing severe conditions after the crisis of 2008.

[21] EU28 figures have been calculated for comparison purposes (EU27 aggregate plus Croatia values for the years 2008 to 2011).

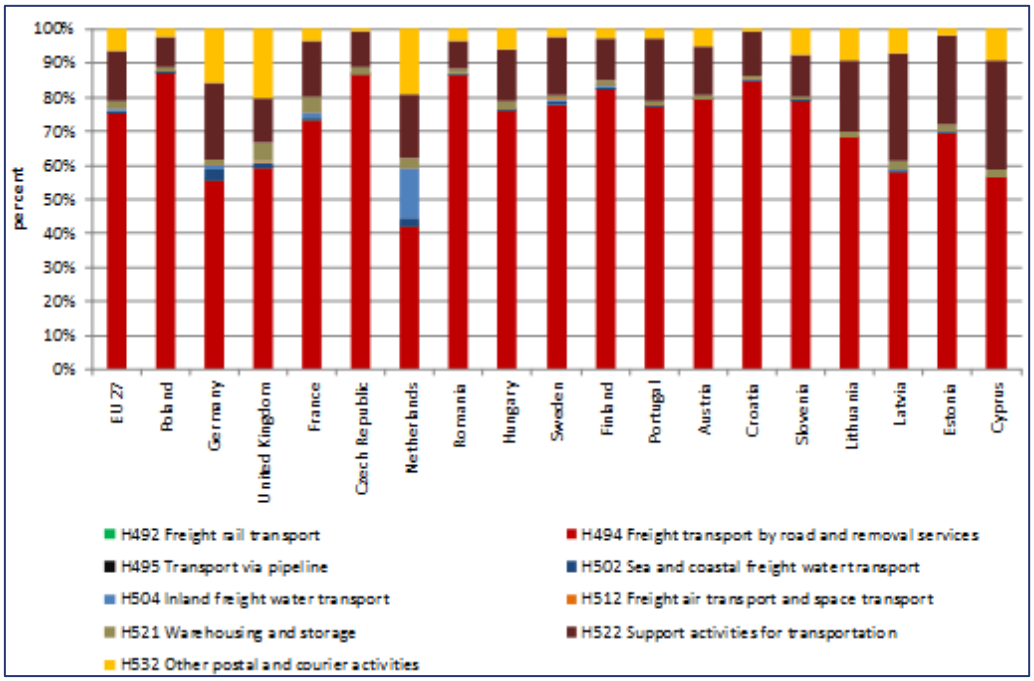
Commonly, the economic crisis of 2008 and the consequential reduction of industrial and private business sectors demand is one of the crucial causes for declining figures from 2008 to 2009. The values for these years are the worst, with 17 negative growth rates overall. In the next year 15 Member States showed negative growth rates. The most recent year shows 13 of them.

Logistics market structure and subsectors relevance22

The distribution and relevance of the several sub-activities within the logistics market can be indicated by the number of logistics enterprises and turnover per type of logistics activity.

The following Figure 2.10 illustrates the relevance of the nine logistics subsectors considered within the logistics service provider market. The data visualised is the amount of enterprises per logistics subsector as indicated in the legend for the EU27 and 18 Member States[23]. The highest share represents the sector with the most enterprises operating in the market. With an arithmetic mean of 75.3% over the Member States, the road freight sector (H494) holds by far the most enterprises.

Figure 2.10 Logistics market structure – enterprises by subsectors in 2011 for selected Member States and the EU27



Source: Fraunhofer SCS calculations and diagram / based on data from Eurostat.

The sector "H522 support activities for transportation (H52.2)" follows with 17.4%. "Other postal and courier services" ranks third according to the amount of enterprises in this sector, with 6.8%. The other sectors hold percentages of under 3% and are not even identified in the diagram. This may indicate that in these markets there are market restrictions and entrance barriers like high investments in infrastructure necessary on a company level. The Netherlands' market structure looks different from the other nations: the share of inland freight water transport (H504) is particularly high because of the relevance of the national inland waterway system.

[22] 18 values for 10 countries with minor data gaps have been closed by values calculated from the Amadeus company database (by Bureau van Dijk).

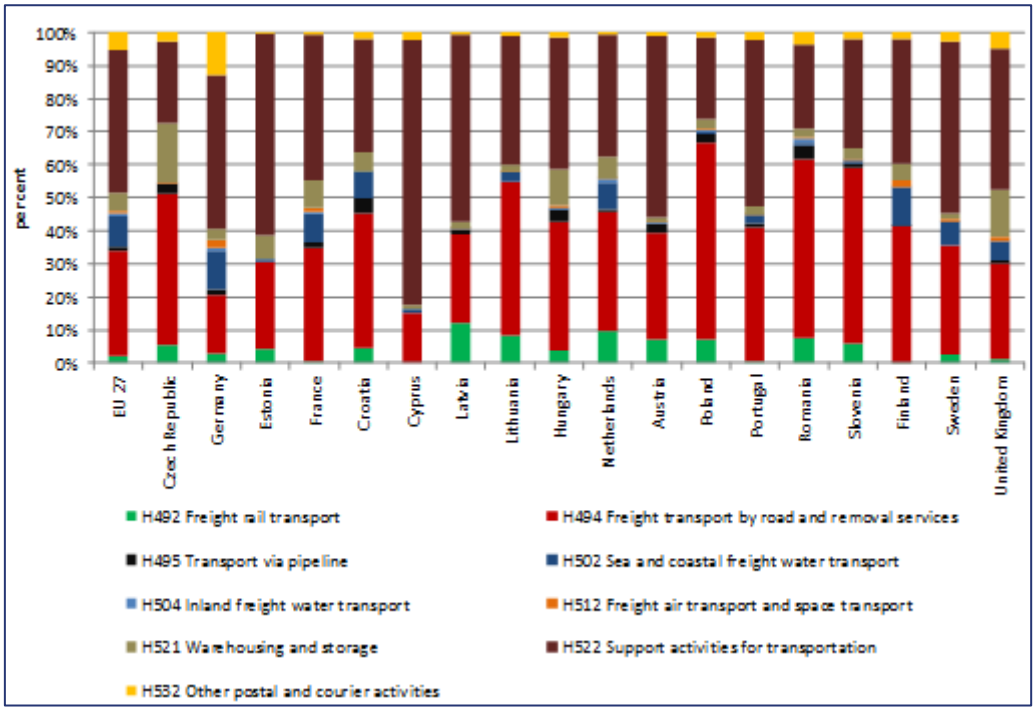
[23] Not all Member States are included due to a lack of data. Comparable data could be compiled for at least 18 Member States.

Besides the number of companies per subsector, the turnover in the respective fields of logistics services is given in the following bar diagram (Figure 2.11). The predominant share of the road freight sector (H494) of the previous diagram is not directly repeated in the turnover overview, though is still of high relevance according to turnover figures. The overall (EU27) share of H494 (the road freight sector) is 32%. That share of overall logistics services turnover of € 936 bn[24]

(EU27) is generated by the 600,000 enterprises in this sector (H494). The overall amount of enterprises in the analysed sectors amounts to about 800,000.

The dark red bars that represent the subsector "H522 support activities for transportation", with 43.2%, indicate the biggest share of the overall turnover. Warehousing (H521) holds a percentage of 5.4% regarding the turnover share (under 2% according to the number of enterprises). The sea and coastal freight water transport sector (H502) was not recognisable in the previous evaluation (Figure 2.10). In Figure 2.11 it is present because of palpable turnover that is generated in this sector. Below one per cent (0.7%) of the logistics service companies generate a share of 9.3% in terms of turnover.

Figure 2.11 Logistics market structure – turnover by subsector in 2011 for selected Member States and the EU27



Source: Fraunhofer SCS calculations and diagram / based on data from Eurostat; Bureau van Dijk[25] [26]

[24] Excursion: Why the Eurostat figures are higher than the stated total logistics market volume of € 878 bn for the EU28. Different aspects can explain differing results of market volume assessment:

1. The "Top 100" studies appraise an estimate for the overall logistics cost volume in an economy, whereas the turnover statistics from Eurostat represent turnover figures only;
2. The NACE Rev. 2 codes taken into account to measure the logistics revenues in this study include revenues of firms that are not considered to be logistics companies in the framework of the "Top 100" market studies. This leads to higher revenues.

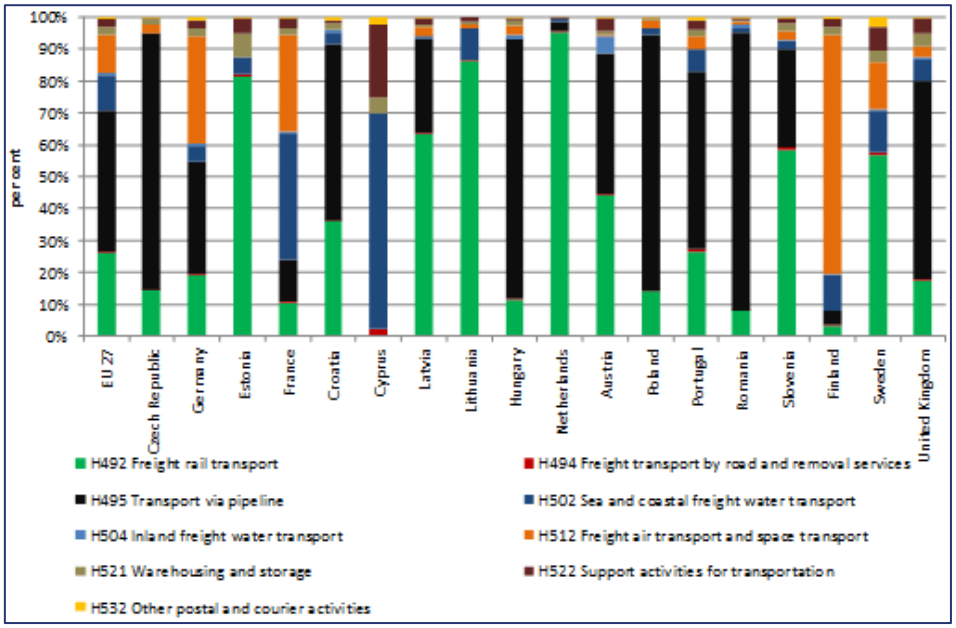
[25] 3. The Top 100 studies determine a cost volume via a bottom up approach by taking into account employees, vehicle stock and economic goods flows to overcome issues of double counting of revenues whereas Eurostat turnover statistics accumulate all revenues of companies assigned to the analysed NACE Rev. 2 codes. In the forwarding business which is a highly dynamic market of the logistics business, companies earn money for the mediation of transports that are carried out by subcontractors. Forwarder and subcontractor generate turnover for the very same service carried out. E.g. when a forwarder gets paid € 100 for a particular transportation service, he might transfer a high share of it to

(EU27 - 2011), is observable in the turnover diagram due to a perceptible share of the overall revenue (1.9% of the € 936 bn for the EU27). Such results show that seemingly small sectors with a very small number of companies can be of relatively high relevance. This is due to different sizes of companies in the different subsectors.

Figure 2.12 below compares the average turnover per enterprise results. The observation on large companies in the rail freight sector is validated by this evaluation, as the green bars, showing the freight rail transport sector (H492), are prominent. The highest turnover per company is generated in the pipeline transport sector (H495), followed by the freight rail transport sector. The EU27 average size of the companies of this sector is € 34.7 m. Considering that the railway transport business has often historically grown around one monopolist, a very high market concentration still exists in many European countries[27]. For 7 of the 18 (about 40%) observed EU Member States, the number of competitors in this market segment is under 10. Other sectors that are clearly identified with a high per company turnover are the sea and coastal freight water transports (H502) as well as freight air transport activities (H512). However, big carriers mostly operate in these business fields as market entrance barriers for small companies are very high due to a necessary high level of fixed costs like infrastructural investments (sea ports, airports, terminals, etc.) and investments in ships or aircrafts.

The road freight transport sector (H494) holds the lowest turnover per company with a turnover of around € 500,000 per year and therefore is not even noticeable in a single bar of the structural overview. The same applies for inland freight water transport (H504) and other postal and courier activities (H532).

Figure 2.12 Logistics market structure – turnover per enterprise and subsector in 2011 for selected Member States and the EU27



Source: Fraunhofer SCS calculations and diagram / based on data from Eurostat; Bureau van Dijk.

the subcontractor that carries out the service physically. That turnover is measured twice by enterprise statistics. The figures are not consolidated and therefore overestimate the "production" of the logistics sector distinctly.

[26] ia the chosen NACE Rev. 2 approach only outsourced logistical activities can be assessed, whereas the Top 100 studies take into account own services as well as outsourced activities.

[27] See Kille/Schwemmer: "Top 100 in European Transport and Logistics Services", DVV Media Group, Hamburg, 2013; the country profiles from p. 104-226 for 30 European countries show that there is often only one rail freight operator among the largest logistics service providers per country.

Conclusions

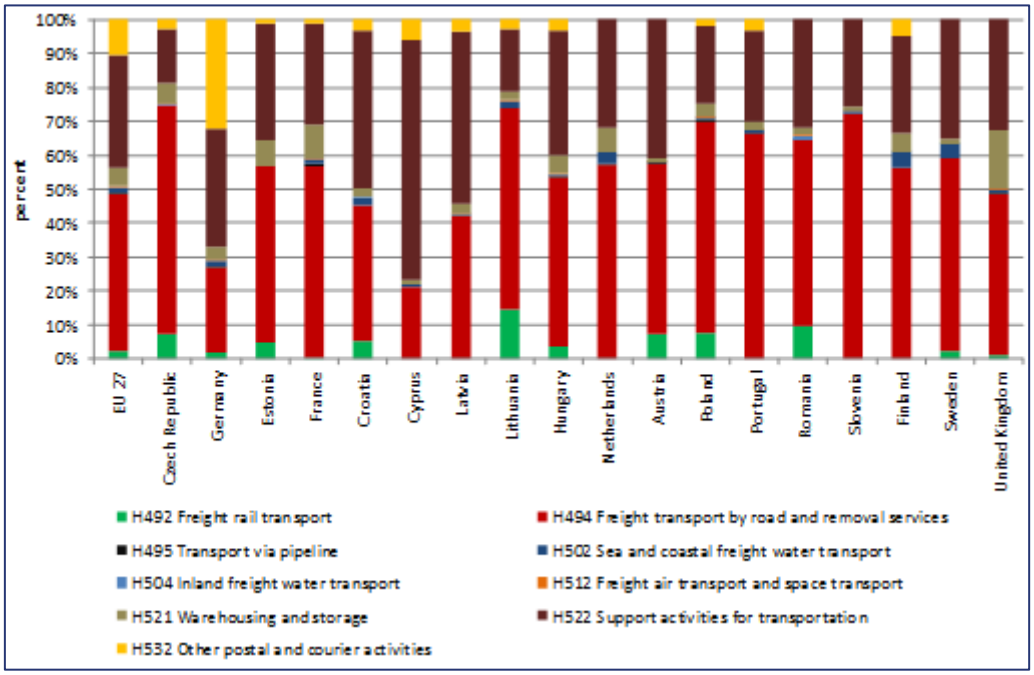
Based on a first evaluation with the focus on turnover or the number of enterprises, the following market characteristics are revealed: the road freight sector (H494) has a high relevance regarding overall turnover and the number of companies that are operating in this business field. 75% of the logistics firms in Europe (EU27 – 2011) are operating in this field. At the same time, this market segment holds the smallest measured mean turnover per company.

Employment figures per subsector

The following figure gives an overview of the shares of logistics subsectors per country.

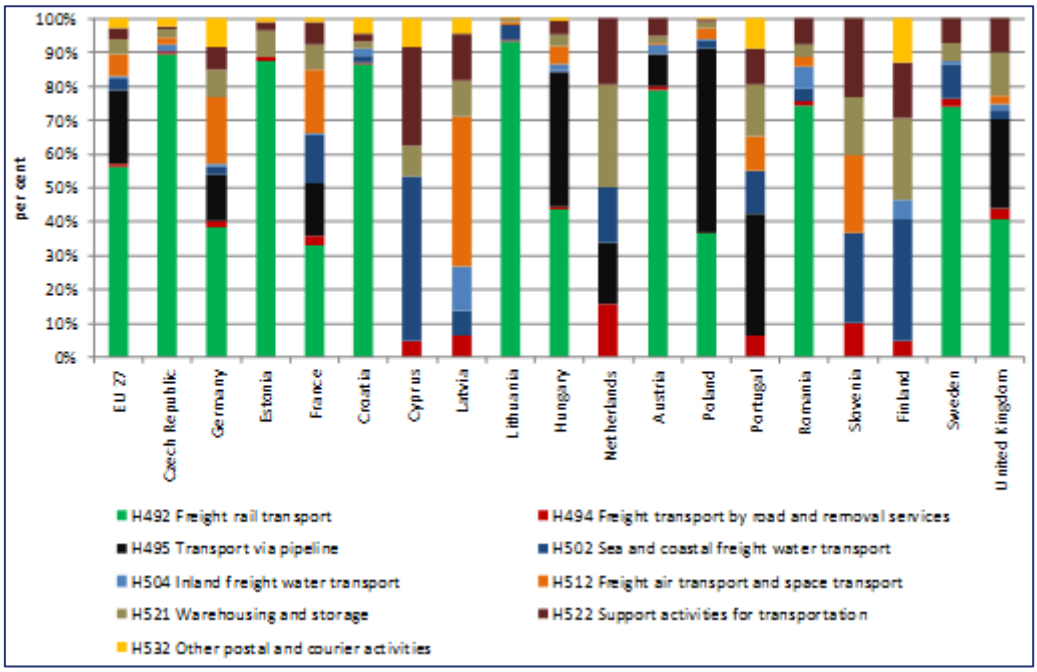
The majority of persons (just under 80%) are employed in two sectors - in freight transport by road (H494) and in support activities for transport (H522) - out of nine logistics subsectors.

Figure 2.13 Logistics market structure – persons employed per subsector in 2011 for selected Member States and the EU27



Fraunhofer SCS calculations and diagram / based on data from Eurostat; Bureau van Dijk.

Figure 2.14 Logistics market structure – persons employed per enterprise and subsector in 2011 for selected Member States and the EU 27



Source: Fraunhofer SCS calculations and diagram / based on data from Eurostat; Bureau van Dijk, single values missing due to discretion aspects.

Bars of very different heights clearly indicate that these averages are not balanced between the Member States. In most countries, the persons employed bar for freight rail transport (green) is clearly visible, meaning that this sector holds the most persons employed per enterprise. For Cyprus – which does not hold a rail freight provider – the sea and coastal freight water transport sector holds the highest figures. In general, the high bars show sectors with big enterprises regarding the number of employees. A short glance at the diagram reveals striking similarities to figure 2.15 (turnover per enterprise). The freight rail transport companies (sector H492) are big employers, while the other extreme is the road freight sector (H494) with very small enterprises: most of the countries hold fewer than 10 employees per enterprise in this sector. On average, 5 persons are employed per road freight transport company. On the other hand, for the rail freight sector (H492) this figure accounts for 289 persons for the EU27. The minimum value for the United Kingdom comes to 111 persons employed per enterprise. All other Member States' figures are above that value.

The data visualised in Figure 2.14 is reproduced in Table 2.6. The values in the table can be used for a more detailed look and to help rate the information represented in the diagram. In the case of the Netherlands, the companies are, in general, relatively small compared to other Member States (this information cannot be drawn from the diagram above). Except for the freight rail sector, the company sizes are very small. The table shows that for several Member States (CZ, EE, CY, NL, RO, FI, SE and SI) the average company size is under 30 persons employed per enterprise. The table also shows the differences for the values on a national level. The EU27 value was calculated as "Persons employed per sector" divided by "number of companies per sector" for the EU27 raw data aggregates. The table contains values or one of three different types of comments:

- "c": if there are only a few companies, the persons employed figures are usually not stated due to confidentiality issues;
- "nc": "no company" means there are no business activities in this field in the particular country.

Table 2.6 Data table: persons employed per enterprise in 2011 for selected Member States

Person employed per enterprise	H492 Freight rail transport	H494 Freight transport by road and removal services	H495 Transport via pipeline	H502 Sea and coastal freight water transport	H504 Inland freight water transport	H512 Freight air transport and space transport	H521 Warehousing and storage	H522 Support activities for transportation	H532 Other postal and courier activities
EU 27	289	5	111	18	4	32	23	18	14
Czech Republic	579	4	C	nc	14	14	14	7	14
Germany	217	11	76	13	6	109	47	37	48
Estonia	310	5	nc	C	nc	C	26	9	4
France	126	10	60	55	2	71	29	25	4
Croatia	835	3	C	20	20	C	21	23	42
Cyprus	nc	2	nc	22	nc	nc	4	13	4
Latvia	278	7	C	8	15	49	12	16	5
Lithuania	2.688	10	nc	131	C	20	23	10	3
Hungary	167	4	152	2	8	20	13	15	3
Netherlands	C	12	13	12	3	C	23	15	5
Austria	580	9	71	nc	21	4	13	39	C
Poland	447	3	661	31	3	42	18	12	4
Portugal	C	7	39	14	nc	11	16	12	9
Romania	280	5	C	14	25	11	13	29	12
Slovenia	C	4	C	10	nc	8	6	8	C
Finland	C	4	C	30	5	0	20	14	11
Sweden	148	5	nc	21	2	0	10	15	C
United Kingdom	111	9	71	8	4	7	35	27	9
Norway	150	3	42	12	1	11	11	13	4
Switzerland	411	15	C	29	20	49	42	49	82

Source: Fraunhofer SCS calculations and table / based on data from Eurostat, Data for 2011; last availability check 07/2014.

For the road sector, the table shows that the Netherlands holds the most persons employed per company, while other columns show completely different dimensions. Lithuania holds an outstanding value of 2,688 persons employed in the rail freight sector (in only 4 companies in this sector).

The road transportation and inland freight water transport sectors (H494 and H504) turn out to hold the smallest enterprises in general (see the figure for EU27 in comparison to the other sectors). Out of all the countries analysed, the highest number of enterprises is found in the road freight sector. The size of enterprises ranges between small (EU average of 18 persons per enterprise) and very small (EU average of 5 persons per enterprise). The biggest value for the road transportation sector is for the Netherlands, with an absolute value of just 12 persons employed per enterprise, which is very small and indicates that these enterprises in general are very small (the lowest value is for Cyprus, with only 2 persons employed per enterprise).

Market entrance barriers are particularly low in the road transportation sector as transport can generally be offered by persons with a driver's license and a vehicle to carry out the transport processes.

This is in contrast with the rail freight sector (H492), which holds the biggest companies in terms of persons employed per enterprise. The barriers for market entrances are much higher here as locomotives or wagons represent a much higher investment than a truck. Also there are barriers to use the infrastructures. Where roads can easily be accessed without crucial restrictions, the same cannot be said of rail tracks. As stated above, the rail freight sector most often shows a high market concentration around one or few rail freight providers per country that have been developed from the mostly formerly state-owned monopolist. As markets are becoming liberalised, the competition in the rail freight sector is growing, but nowhere near as quickly as in the road freight sector where insolvencies are almost part of everyday business.

The sectors "H502 sea and coastal freight water transport", "H512 freight air transport and space transport", "H521 warehousing and storage" and "H532 other postal and courier activities" hold similar figures, from 14 to 32 persons employed there per firm. For sea and coastal freight water transport, as well as freight air transport and space transport, the physical transportation requires very high investments, similar to the rail freight sector. Warehousing and storage firms need at least real estate or storage space to offer services. Other postal and courier activities are often carried by subcontractors with one vehicle. Investments here are very low in comparison.

The transportation via pipeline sector (H495) holds many gaps as not every country has pipeline transportation ("no comp.") or values are not reported mainly due to confidentiality issues ("confidential").

2.3.3 The EU logistics market structure – conclusions

The logistics sectors of the EU Member States turn out to be very different in size. The assessment of the number of logistics service providers per country shown in the introduction in Figure 2.13 underlines this fact. The range of logistics service providers per country differs from under 1,000 companies for Luxembourg (742 companies) to 153,754 companies for Spain. In addition, from an international point of view the market for logistics business seems to be concentrated on a small number of international companies like Deutsche Post DHL, Maersk, DB Mobility, SNCF SA and others. The ripe and big logistics markets like Germany and France hold some of the biggest market players.

Logistics is an international orientated business, and the big players steadily expand their networks and service offers to new countries. An average of about € 16.2 m of the GDP and 644 people of the overall population are calculated as mean in the analysed EU Member States. These average figures vary hugely among the Member States, which indicates that there are differences regarding the composition of the market players, generated turnover and company size and employees. In general, the growth of the number of logistics companies is steady from 2008 to 2011 with just around 1% of growth in each year, untouched by the severe economic crisis of 2008-2009. Alternatively, some of the countries had to report a drop, mostly in 2009. This downturn hit Poland, Denmark, France, Portugal, the UK, Hungary and Italy the most. Nearly all countries reported at least one drop in the timeline, except for the Netherlands and Finland, where an increase in the number of logistics companies is reported every year.

The amount of logistics enterprises is heavily focused on the freight transport by road and removal services sector (H494), which represents 75.3% of all the logistics companies in the assessed Member States. The structure is similar in most of the countries: road transportation is of the highest relevance regarding the logistics sector all over Europe. The turnover assessment per sector shows a different result. The road freight sector still holds a perceptible share, but noticeably below the number of companies' figure, which indicates that the companies in this sector are very small. The very reverse accounts for the rail freight sector (H492), which turns out to hold a countable number of companies that have a considerable average size of € 34.7 m. Big company sizes are also to be found in the air freight, sea and coastal freight water transportation and transport via pipeline sectors. In these sectors, market entrance barriers are high due to necessary high investments in infrastructure and/or vessels or vehicles to start a business. The contrary is true for road freight and the other postal and courier activities sectors (mostly courier and express services). Low market entrance barriers generate a high number of competitors in these logistics sectors.

Taking into account the composition of employees per subsector and per enterprise in the subsector, the picture of the turnover assessment can be repeated or confirmed. Small companies are mainly found in the road-based services (road freight and other postal and courier services) and in the inland freight water transport sector. All other sectors consist of much bigger individual enterprises. The list of the biggest companies (by average number of persons employed) is led by the rail freight sector, followed by transportation via pipeline, freight air transport and the warehousing and storage sector (i.e. external trends or policy measures directed to the rail sector influence only a small number of enterprises, while trends or policies directed to the road sector have an impact on the majority of logistics companies in the EU).

2.4 Creating logistics costs transparency

The cost factors of the various modes of transport and warehousing, along with their development between 2006 and 2012, are compared and analysed in this section. This should contribute to a higher transparency in the field of logistics costs. However, this can only be achieved under certain simplifying assumptions that have been developed based on calculations from the SEALS Study from 2008.

2.4.1 Development of important cost elements

Because of the high rate of standardisation of basic processes like embarkation, packaging, storage and transportation of goods using various transport carriers, a comparison of the European cost structures appears completely feasible at first glance. A potential approach would be the comparison of price lists of representative service providers from the individual EU Member States. The different prices for the allegedly same service could permit a first conclusion to be drawn on the absolute differences of the logistics costs.

However, apart from the pure costs, the price lists also contain the (not evidenced) profits of the service providers and are moreover composed multi-dimensionally: prices are calculated with consideration to distance, weight or volume, as well as special handling requirements. The differences concerning the long-term nature of a service are also added to the equation, i.e. on-the-spot market prices are quite different compared to those for long-term contracts. The customer structure has a certain influence over the price formation of a service provider. More specific customer requirements and more strategic collaboration between a capable logistician and the client result in higher acceptable prices for both sides. While logistics service providers tend to maximize their prices in order to gain a good profit margin, customers always focus on preferably cheap prices on their tenders. Higher prices are accepted in more complex businesses with certain security or reliability standards like the chemical or pharmaceutical industry.

Because of this complexity, an integral comparison of the logistics costs on the basis of prices makes little sense. Therefore, the focus of the next chapters is on the individual cost elements and their development. These elements are summarized in six categories:

- Personnel costs: Mainly the driver costs in the road sector. In the other sectors, supporting activities such as goods handling in air- and seaports, or container handling in terminals for combined transport operations are also included;
- Fuel costs: For rail transportation, electricity is also included;
- Interests, leasing, depreciation costs: All investment-related costs, mainly for vehicles, trailers, etc. Here, constant repayment methods over a specific period of time were assumed;
- Other variable costs: Here, maintenance costs, costs for tires and lubricants, road tolls or port rents are included;

- Taxes and insurance;
- Administration costs: Planning, managing and administering transport operations.

In contrast to the transport sectors, there are only five specific segments for warehousing:

- Personnel costs;
- Real estate costs: including renting or investment;
- Storage equipment costs: e.g. for forklifts, shelves, conveyor belts, etc.;
- Energy costs;
- Other costs: e.g. for facility management or building insurances.

To handle the complexity, only the main cost elements have been analysed over a period of seven years. During the reviewed period of time, personnel, fuel/energy and real estate costs in particular, as well as interests, leasing and depreciation costs, show significant cost shares and changes. The results of this analysis are summarised in the following figures, whereby the percentage difference of the 2012 cost factors compared to the base year 2006, the development curve as a graph, and the development trend of the regarded seven years are depicted respectively.

Figure 2.15 Development of personnel costs 2006-2012 for the EU28

Indicator / Country	Personnel				
	%-Change 2006-2012	DEV	Trend		
Austria	19%				
Belgium	19%				
Bulgaria	72%				
Cyprus	12%				
Czech Republic	28%				
Germany	7%				
Denmark	16%				
Estonia	38%				
Greece	-6%				
Spain	16%				
Finland	18%				
France	17%				
Croatia	n.a.		n.a.		
Hungary	26%				
Ireland	11%				
Italy	18%				
Lithuania	44%				
Luxembourg	16%				
Latvia	80%				
Malta	6%				
Netherlands	13%				
Poland	29%				
Portugal	5%				
Romania	73%				
Sweden	17%			>= 3,0% p.a.	
Slovenia	18%			>= 1,0% p.a.	
Slovakia	20%			>= -1,0% p.a	
United Kingdom	16%			>= -3,0% p.a	
EU- Average	**15%**			<= -3,0% p.a	

Source: Eurostat – Labour cost index for transportation and storage [lc_lci_r2_a].

The development of personnel costs for transportation and warehousing shows a significant increase across nearly the whole of the EU. Apart from Latvia, Romania and

Bulgaria, which had an extremely low output level in 2006 and a very strong increase of up to 80% regarding personnel costs, almost all other countries registered a distinct growth. Thus, due to the low demand for logistics services, labour costs remained almost constant in Ireland and Portugal, whereas in Greece, labour costs declined. Comparatively small are also the increases in Germany, where the local labour market reform led to an almost stagnating wage development despite growing market demand.

Compared to the rest of each country's economy, labour costs in the logistics sector showed, in general, a nearly similar or slightly smaller increase. Outliers can be found in Bulgaria, Malta, Poland and Finland, where the increase in personnel costs for transportation and storage is about 10% lower than that of the overall average. The few countries with declining labour costs during the last few years, like Portugal and Greece, managed to keep loans and wages in logistics more stable than in other sectors.

Considering fuel costs, it is hard to gain comprehensive data for the different aspects of this cost category. While diesel prices are surveyed on a very detailed and regular level in all Member States, there is no such data source for other fuels like bio fuels, heavy oils or kerosene. Even for diesel, there are only average pump prices for end customers available, although transport companies often get cheaper prices because of large contingents and price floaters. There is no public accessible source for transport-specific diesel prices over time on a national level. With this data background and the inherent price connection of all oil derivative fuels, diesel pump prices are the best available indicator for fuel cost development in the logistics sector. Bio fuels, which are a theoretical alternative to diesel fuels, are of minor importance. According to the International Energy Agency, the share of biofuels in energy demand for road transport was 3% in 2011 and will only grow to about 8% by 2035[28].

[28] IEA 2013, p 65.

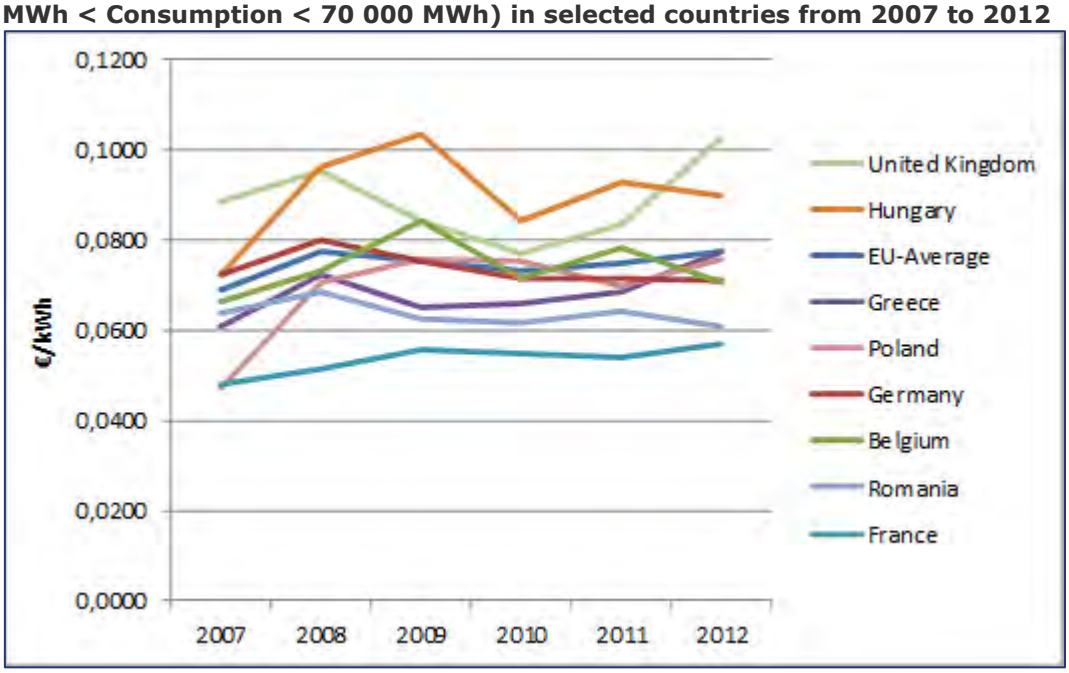
Figure 2.16 Development of diesel prices 2006-2012 for the EU28

Indicator / Country	Fuel				
	%-Change 2006-2012	DEV	Trend		
Austria	40%		↑		
Belgium	43%		↑		
Bulgaria	45%		↑		
Cyprus	48%		↑		
Czech Republic	41%		↑		
Germany	31%		↑		
Denmark	36%		↑		
Estonia	55%		↑		
Greece	55%		↑		
Spain	40%		↑		
Finland	51%		↑		
France	29%		↑		
Croatia	n.a.		n.a.		
Hungary	39%		↑		
Ireland	39%		↑		
Italy	45%		↑		
Lithuania	46%		↑		
Luxembourg	38%		↑		
Latvia	53%		↑		
Malta	39%		↑		
Netherlands	34%		↑		
Poland	37%		↑		
Portugal	37%		↑		
Romania	44%		↑		
Sweden	45%		↑	>= 3,0% p.a.	↑
Slovenia	42%		↑	>= 1,0% p.a.	↗
Slovakia	34%		↑	>= -1,0% p.a	→
United Kingdom	23%		↑	>= -3,0% p.a	↘
EU- Average	**35%**		↑	<= -3,0% p.a	↓

Source: EC Oil Bulletin 2014.

Diesel fuel prices clearly rose in all European countries, and with the exception of one "break" in the crisis year of 2009, they have registered a continuous growth up to the maximum value thus far. The country-specific differences are particularly due to the different development regarding diesel fuel taxation; for example, the excise duties on diesel fuel in Estonia and Greece were distinctly increased in the reviewed period.

Figure 2.17 Development of electricity prices for big industrial customers (20 000 MWh < Consumption < 70 000 MWh) in selected countries from 2007 to 2012



Source: Eurostat 2014.

Electricity prices for big industrial customers stayed at a relatively constant level or even showed a decline during the previous several years in some countries (see Figure 2.17). The EU-average grew under 1% (0.8%) from 2007 to 2012.The highest increase is measured for Poland, where the costs rose by 2.9% in the 5 years from 2007 to 2012. Romania and Germany show decreasing figures with -0.1% (Germany) and -0.3% (Romania). Compared to the fuel price development, the electricity price level can be concluded to be stable.

While electricity is a relevant cost factor in rail transportation, a major share of long-haul goods transports by rail are still carried out by diesel engines. Due to the lack of information on transport performance and fleet shares for diesel and electric driven locomotives, there is no valid way to interpret the cost advantages of electrified rail transports on an aggregated level.

Figure 2.18 Development of interest rates on capital (loans) 2006-2012 for the EU28

Country	%-Change 2006-2012	DEV	Trend
Austria	-38%		↓
Belgium	-50%		↓
Bulgaria	25%		↑
Cyprus	n.a.		n.a.
Czech Republic	-26%		↓
Germany	-34%		↓
Denmark	-5%		→
Estonia	-26%		↓
Greece	21%		↑
Spain	18%		↑
Finland	-32%		↓
France	-34%		↓
Croatia	n.a.		n.a.
Hungary	15%		↗
Ireland	-13%		↘
Italy	4%		→
Lithuania	-2%		→
Luxembourg	-47%		↓
Latvia	-27%		↓
Malta	n.a.		n.a.
Netherlands	-21%		↓
Poland	10%		↗
Portugal	17%		↗
Romania	-20%		↓
Sweden	14%		↗
Slovenia	-45%		↓
Slovakia	-30%		↓
United Kingdom	-57%		↓
EU- Average	**-6%**		→

>= 3,0% p.a.	↑
>= 1,0% p.a.	↗
>= -1,0% p.a	→
>= -3,0% p.a	↘
<= -3,0% p.a	↓

Source: EC Enterprice Finance Index 2014.

The costs of repayment and borrowed capital exhibit a comparatively differentiated development. While these costs partially decreased in the large and relatively stable national economies (-57% in the UK, -50% in Belgium, -34% in Germany), countries affected by the financial crisis like Spain, Portugal and Greece have had to deal with higher costs of capital in recent years. Other Member States like Sweden, Poland and Hungary recorded rising interest rates because of higher requirements on the reliability of bank loans. Together with the increased diesel fuel prices these events represent competitive disadvantages because the refinancing of new assets (especially trucks, trailers and real estate) has become relatively expensive.

Figure 2.19 Development of warehouse rents 2006-2012 for the EU28[29]

Indicator / Country	Real estate rents		
	%-Change 2006-2012	DEV	Trend
Austria	-10%		
Belgium	-18%		
Bulgaria	-22%		
Cyprus	n.a.		n.a.
Czech Republic	-17%		
Germany	-6%		
Denmark	-25%		
Estonia	-6%		
Greece	-23%		
Spain	-28%		
Finland	-4%		
France	4%		
Croatia	n.a.		n.a.
Hungary	-5%		
Ireland	-48%		
Italy	-21%		
Lithuania	-6%		
Luxembourg	n.a.		n.a.
Latvia	-22%		
Malta	n.a.		n.a.
Netherlands	-9%		
Poland	-24%		
Portugal	-27%		
Romania	-24%		
Sweden	11%		
Slovenia	n.a.		n.a.
Slovakia	-8%		
United Kingdom	-27%		

>= 3,0% p.a.	
>= 1,0% p.a.	
>= -1,0% p.a	
>= -3,0% p.a	
<= -3,0% p.a	

Source: Research Fraunhofer SCS; Based on several market reports from Jones Lang LaSalle, Cushman & Wakefield, CBRE, DEKA Bank, Savills, Colliers, DTZ, King Sturge, BNP Paribas.

Concerning rents for logistics real estate, the general development shows a downward trend during the period reviewed, with a few countries like Sweden or France having slightly increased their average rents. This is justified by the market and cost structure of the logistics real estate economy, which are strongly driven by supply and demand. Where a comparatively high demand meets a closely limited offer, constant or even higher rent amounts are called for, even with more standardised construction methods and recently professionalised project developers. In small markets such as Ireland, a decrease in demand has a much clearer effect as evidenced in falling rent prices. While the construction of new warehouses by project developers, even on a speculative basis without any current tenants, reached its climax in 2008, the beginning economic crisis led to a sudden and distinct decline in demand for warehouse space in all Member States. The surprising trend of falling rental prices in most countries is a consequence of these overcapacities, which are largely compensated only in 2013 or 2014.

2.4.2 Cost structures by logistics segments

The method used for the calculation of the cost shares is based on the SEALS project, which was finalised in 2008, and continues to expand the results up to 2012.

[29] Due to missing data on total warehouse space in the European Member States, there is no EU-average accounted for warehouse rents.

Its authors calculated the cost structures in all EU Member States according to the five main transport modes plus warehousing and their development from 1999 to 2006 by using macro-data in combination with micro-data as verification[30]. The methodology was revised and validated with recent company data and complemented with the development of the cost factors from 2006 to 2012, as shown in figures 2-18 to 2-21[31].

Even with this update, there remain some simplifications that have to be accepted in order to create manageable results. It is assumed that the different expenditures (which make up the cost structure) are of national origin: i.e. the personnel are of the nationality of the specific Member State and the fuel and equipment, such as trucks, ships, etc. are purchased in the specific Member State, where data is available. Since there is no valid data source for the share of foreign workers or assets and their origin, only the inland composition of one country's costs can be reviewed over time. In practice, there is a more or less significant share of foreign workers and assets like trucks and containers, mainly to counter a rising cost situation in the own market.

To make the results comparable, the analysis relies on costs per tonne, because this is the unit that matches all the calculated cost structures in transportation and warehousing processes.

2.4.3 Road

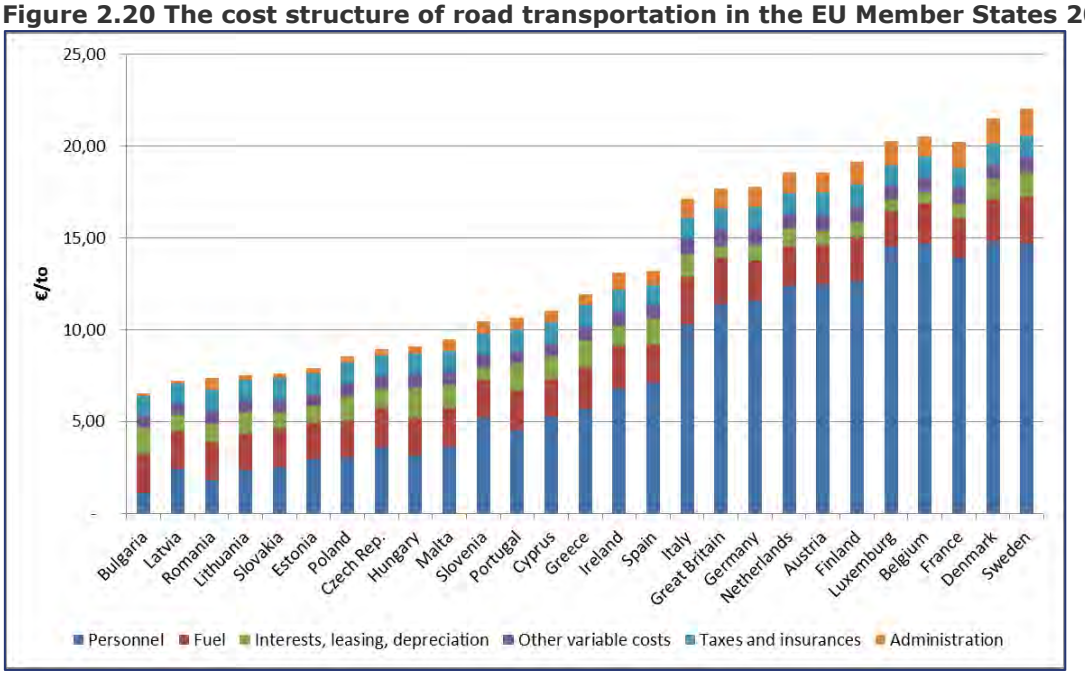
Due to the comparatively high rate of personnel expenditure of up to 72% in the road transport sector, the differences concerning total costs between the European countries appear relatively high. For example, an average road transport operation in Sweden is more than three times more expensive than a comparable shipment in Bulgaria.

Also while the fuel share of the total costs varies from 9%-32%, it remains the subordinate factor compared with personnel expenditure, even with the evident price increase in more recent years. Only in Bulgaria and Romania does the fuel share represent the most important cost factor.

[30] Germany was used as reference country for which adequate data considering cost structures is available. On this basis, the gap between Germany and the other countries in respect of the different cost elements was derived from business data from different market players and several studies. Costs factors with relatively small shares of the total costs, such as taxes, administration and other variables, were kept at constant values. The assumption is that these costs change only marginally over time and thus don't affect the development of total costs significantly.

[31] The remaining small-share cost factors "taxes and insurances", "administration" and "other variable costs" were updated by approximation by applying the respective inflation rates in each country.

Figure 2.20 The cost structure of road transportation in the EU Member States 2012



Source: Fraunhofer SCS, based on project results, questionnaire and studies.

Even with their relatively small cost share, the interests on capital had a big impact on total cost development. Countries with stable financial markets had a clear advantage here. This difference is made clear when comparing Italy and the UK, where capital costs play a much smaller role in the overall cost mix.

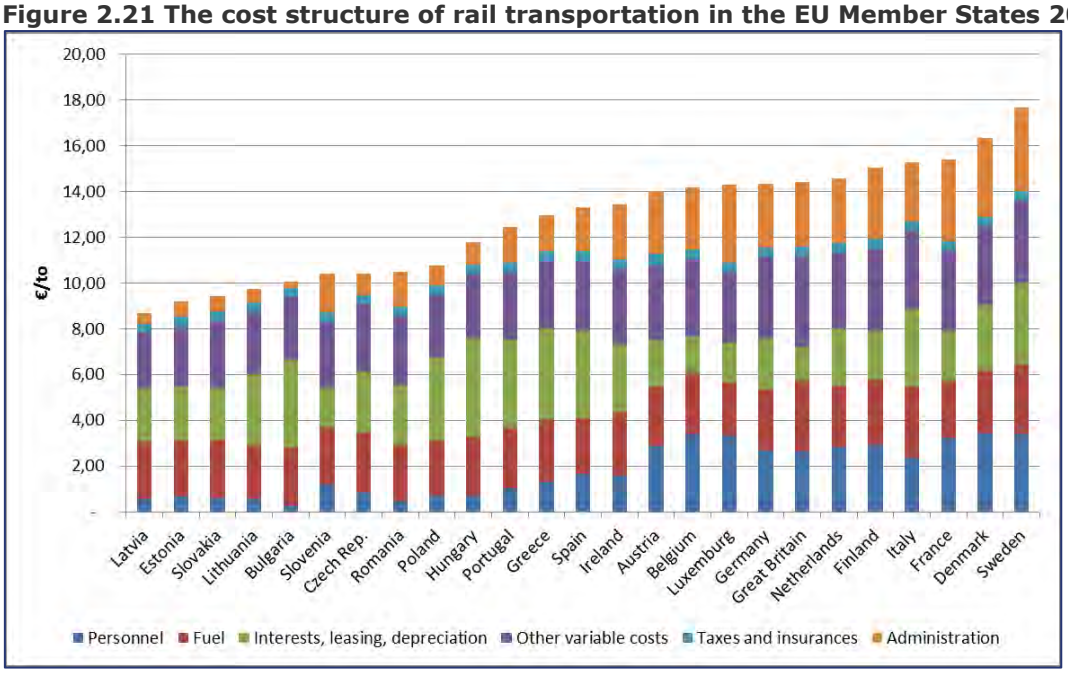
Road transport costs rose by an average of 19% in the EU Member States between 2006 and 2012, which marks a relatively big increase compared to the other transport sectors. Again, the high share of personnel costs and their significant growth, especially in the "low cost" countries of Central and Eastern Europe, together with steadily rising fuel costs and road tolls, are the main reasons for this enduring trend.

2.4.4 Rail

In the rail transport sector, labour costs are the clearest distinguishing characteristic concerning total costs. These are reflected both where driving staff are concerned, and in the administration, which can make quite a significant share of the cost. Accordingly, the absolute costs in Sweden are approximately twice as high as in Latvia, where personnel costs represent only a marginal proportion of the total costs.

In the case of asset-heavy rail transport, the higher capital costs in Southern and Eastern Europe are reflected in the now higher position of these countries compared to 2006. For example, Bulgaria was at the very bottom of the list in 2006. The comparison between Bulgaria and Sweden shows how differently the cost structure can appear due to the shift of this single cost factor.

Figure 2.21 The cost structure of rail transportation in the EU Member States 2012



Source: Fraunhofer SCS, based on national statistics, annual reports and studies.

Compared to 2006, the average increase in total costs is about 13%. This lower development of road transport is mainly driven by the rise in fuel/energy prices, which is only partially counteracted by the decline of the more substantial capital costs.

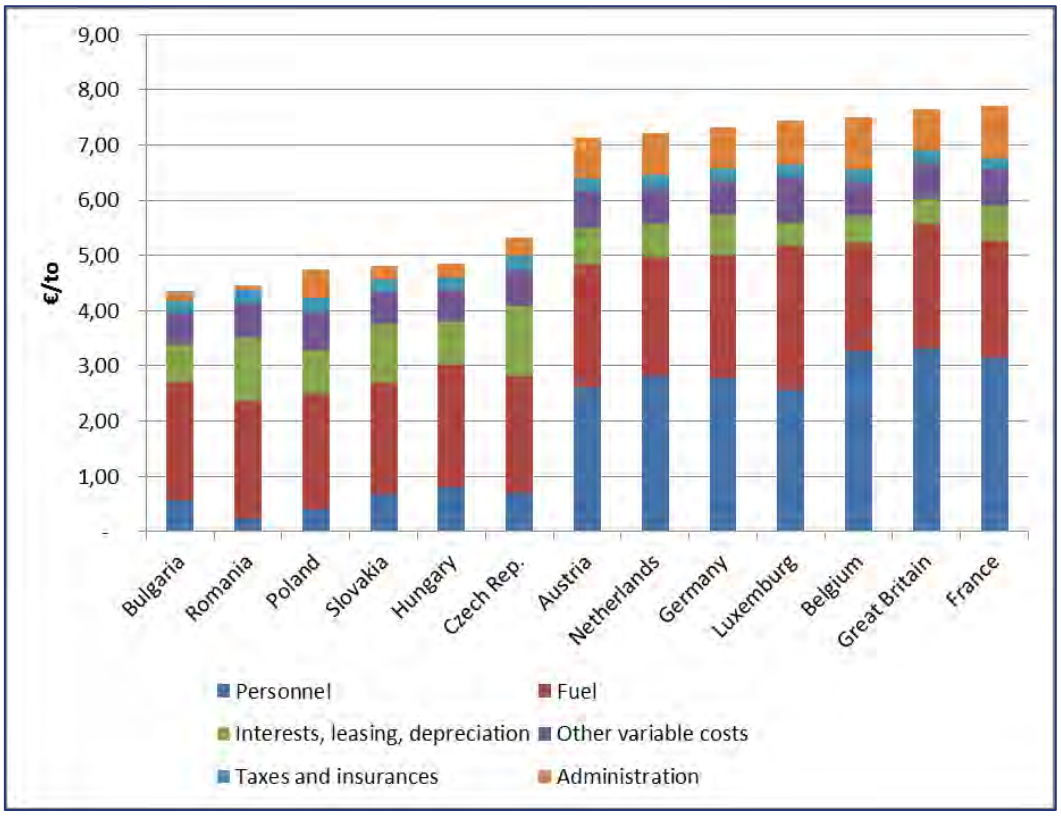
2.4.5 Inland waterways

With only a few European countries having an adequate infrastructure for inland waterway transportation, only those EU Member States which have a domestic and export volume of more than 100,000 tonnes are included in the analysis. These 13 countries have significant traffic on their inland waterways, while the other Member States show only marginal or no transport volumes here.

The share of the personnel costs in the inland waterway segment lies between its equivalent in rail and road transport and varies between 6% and 44%. The gap between the Western and Eastern European countries remains significant, but has declined compared to the results of the first SEALS report.

The other cost factors show relatively slight deviations. While the Western European countries benefit from somewhat lower capital costs, this advantage is nearly nullified by higher administration expenses.

Figure 2.22 The cost structure of inland waterway transportation in the EU Member States 2012



Source: Fraunhofer SCS, based on national statistics, annual reports and studies.

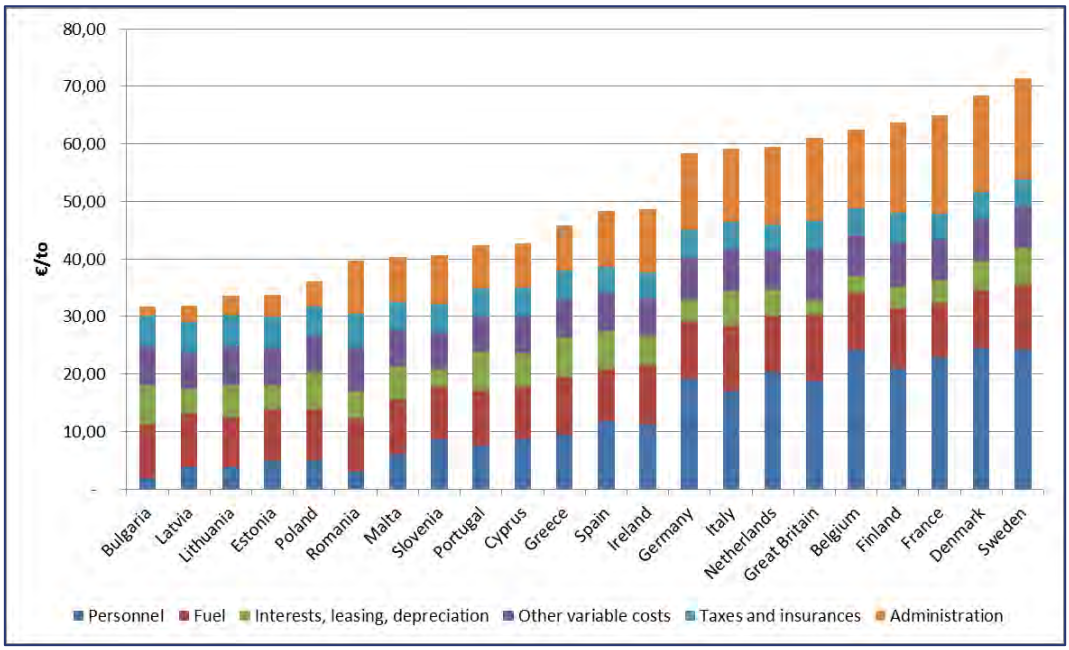
With an average of 18%, cost increases seem similar to the road sector. But there is an obvious difference considering the starting positions. While in the Central and Eastern European countries the costs rose by an average of 25%, the costs in the more established markets of Western Europe showed much lower increases from around 11 to 13%.

2.4.6 Sea

Sea freight, similarly to air freight, is a market that is hard to capture as it is globally oriented. Therefore the results of both this chapter and the following one have to be understood as very rough indications.

With nearly the same absolute costs for fuel, interests, taxes and other variable costs, personnel and administration costs amount to the most significant cost drivers here. Therefore the differences between Member States are mainly attributed to deviations in labour costs. In Bulgaria and the Baltic states these factors have only a marginal share of the total transport costs.

Figure 2.23 The cost structure of sea/ocean freight transportation in the EU27 Member States 2012



Source: Fraunhofer SCS, based on national statistics, annual reports and studies.

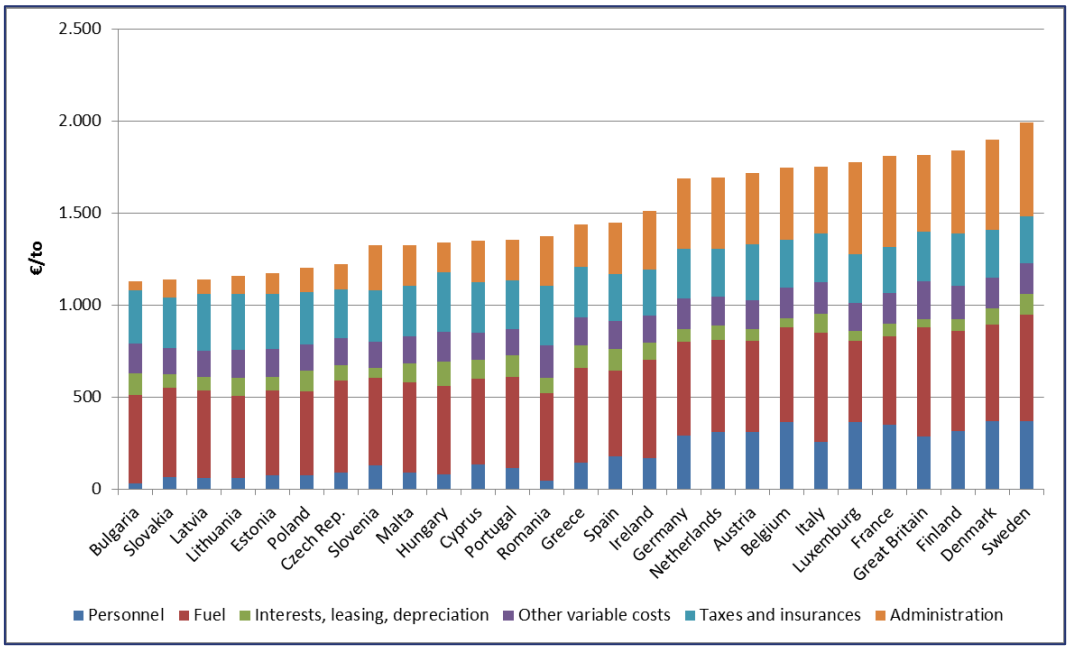
With comparably low share capital costs as the only declining cost factor, the increases for this sector amount to an average of 19% between 2006 and 2012. The ranking of countries is nearly the same as in the first SEALS report, which indicates a very stable competitive position for the given countries in this sector.

2.4.7 Air

As with sea transport, the cost shares of international air freight could only be roughly estimated.

The global orientation of this sector induces higher shares of administration costs, which amount to 24% of the total costs. Another specific aspect is the high importance of fuel costs, which do not show big variances between the Member States. This is why the air freight sector shows relatively few differences in absolute cost levels between the least and most expensive countries. Again, varieties occur mainly due to personnel and associated administration costs.

Figure 2.24 The cost structure of air freight transportation in the EU27 Member States 2012



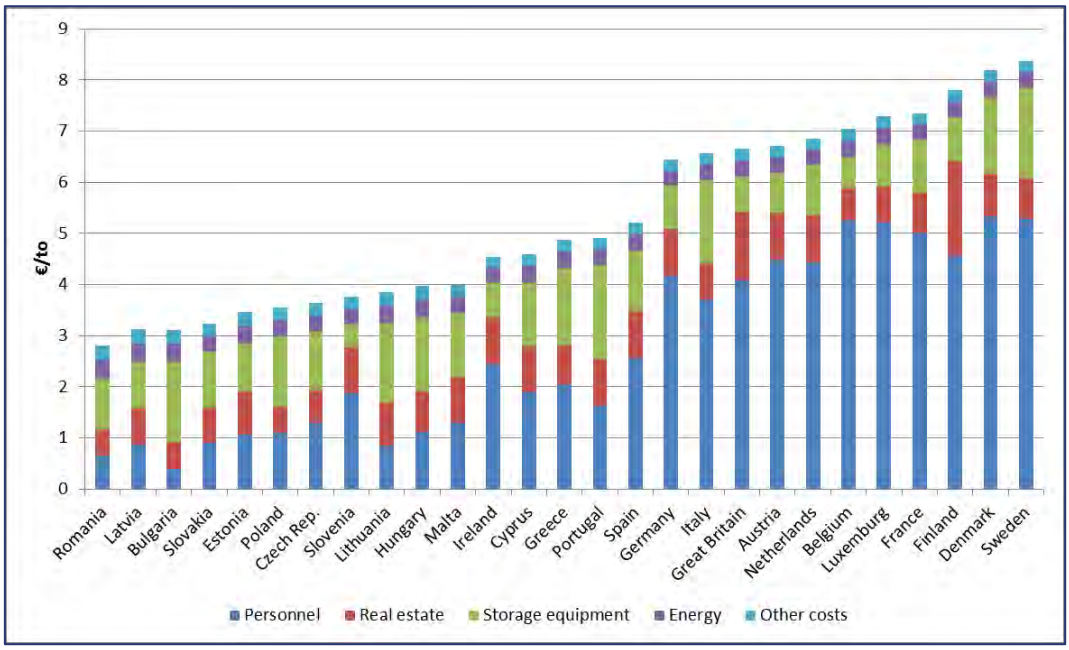
Source: Fraunhofer SCS, based on national statistics, annual reports and studies.

The cost levels in the year 2012 have increased significantly compared to 2006. With an average growth in total costs of 23%, this sector shows the biggest increase of all reviewed transport modes. Rising personnel and fuel costs play a large part, while reduced interests and capital costs have only a small impact on total costs here.

2.4.8 Warehousing

Considering warehousing costs, there is a distinct three-part division between European countries. While the most expensive countries all rank over 6 EUR per tonne and year because of relatively high shares in personnel costs, the least expensive ones stay under 4 EUR for the same service. Cost structures are very diverse in this sector and depend heavily on each country's personnel and capital costs. Due to low labour costs in countries like Romania and Bulgaria, the construction and maintenance of warehouse buildings, as well as the purchase of forklifts, etc., is by far the biggest cost driver here. On the other hand, this is nearly a marginal factor in Germany or the United Kingdom, where personnel costs are the most important cost component.

Figure 2.25 The warehousing costs per year per m² in the EU27 Member States in 2012



Source: Fraunhofer SCS, based on project results and studies.

In comparison to the SEALS results for 2006, there is generally only a small increase in total warehousing costs. The reason for this lies in the decline of warehouse rents and capital costs in most countries, while personnel costs were on the rise.

2.4.9 Conclusions for the European logistics cost structures

The European logistics market can be divided into three sections in terms of cost structures: the "low labour cost countries", the "struggling economies" and the "mature and established markets". Even though the "low labour cost countries" recorded distinct rises in wages and salaries (see figure 2-20), the differences from the high-wage countries are still severe. Administration costs are therefore significantly lower in these Central and Eastern European countries. Compared to wages, the other cost factors vary less from one another, with fuel costs in particular taking a relatively similar proportion in all Member States.

The development of individual cost factors in the "low labour cost countries" and the "mature and established markets" goes mostly in the same direction, even if the cost increase in less developed markets are much more pronounced. Therefore, in recent years there has been, in general, a convergence of cost structures and of the absolute logistics costs between the cheapest and most expensive markets.

However, the "struggling economies" have taken on a special role, where labour costs remained constant or even decreased. On the other hand, due to the difficulty in obtaining financing conditions, the cost of capital partially increased, which has led mainly to strongly disproportionate shares of this type of cost in asset-intensive logistics areas such as rail transport or warehousing. In total, logistics costs have only slightly increased in the "struggling economies" in recent years.

The relative comparison between the total costs of all Member States shows that, in particular, the mature logistics markets of Germany and the United Kingdom have been able to improve their competitiveness over the last six years. Capital costs also played a decisive role in this. Due to the low interest rates, the refinancing of vehicles

and equipment can be realised much more cheaply in Germany and the United Kingdom than in neighbouring countries.

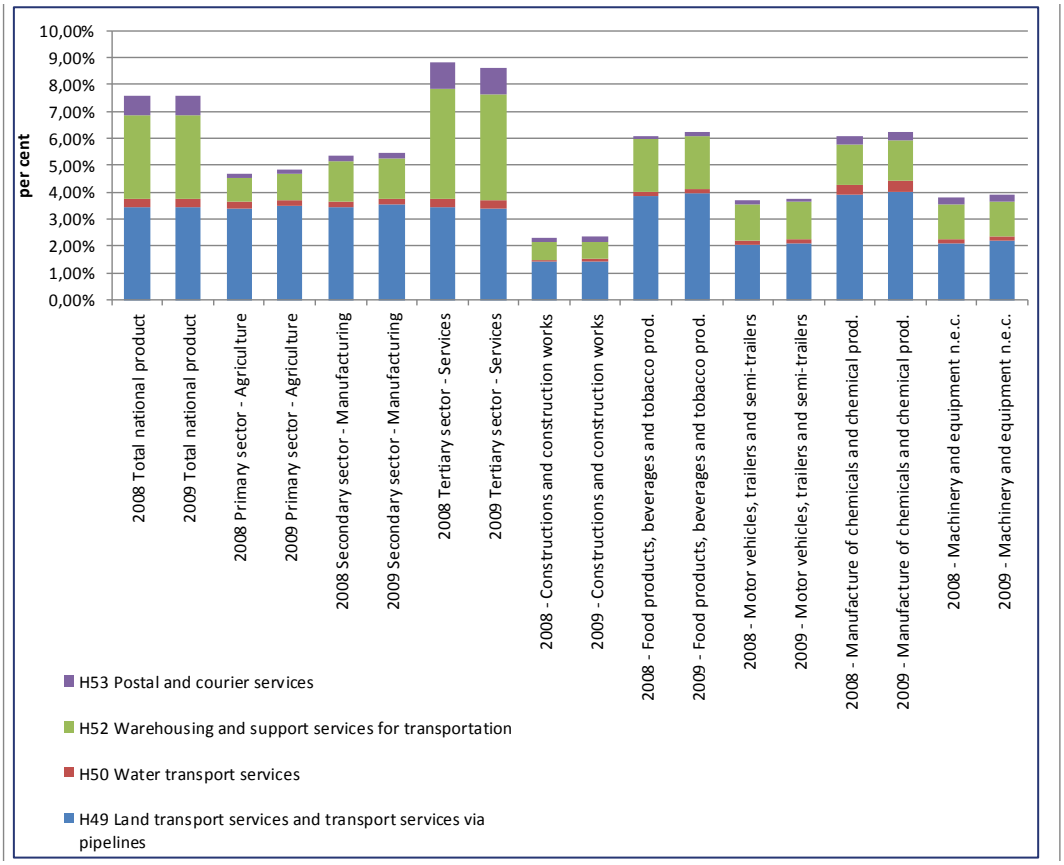
2.5 Evaluation of the economic added value of logistics

The following section evaluates in detail the added value of logistics services. The question was: What share of the total product of the economy (or its subsectors, industries) can be attributed to the logistics sector? Consequently, the evaluation identifies the economic relevance of the logistics sector in other economic sectors and in the economy as a whole.

2.5.1 Economic added value from logistics service activities on the economies of the EU and Member States

An overview of the absolute amount and added value at current prices of the outsourced logistics activities is given in Figure 2.26. It shows the sector comparison for the sector aggregates and branches for EU27 and the years 2008 and 2009[32].

Figure 2.26 Added value of outsorced logistics activities in total nationa product in the EU27 in 2008 and 2009



Source: Fraunhofer SCS / based on data from Eurostat.

For the year 2008, the total gross added value of the EU27 Member States of the whole economy accounted for € 11,445.40 bn (current prices). The comparable value of 2009 accounted for € 10,110.9 bn in 2009[33]. The added value produced by the outsourced logistics services decreased by the same amount as the GDP in 2009. This

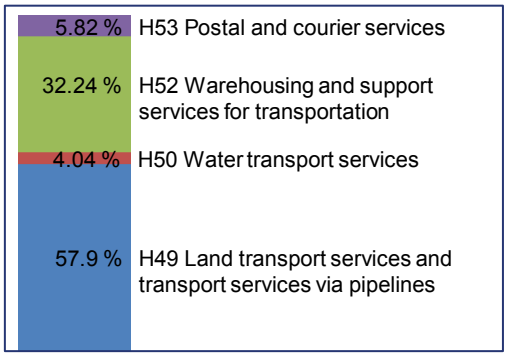
[32] Latest availability check for more recent data in July 2014.
[33] Constant price level for 2009/2008 comparison; Inflation 2009: 1.0% (EU27).

shows the logistics sector's scalability and adaptability to growing or shrinking markets. An apparent reason for this harsh decrease is the worldwide economic crisis that hit the world economy in late 2008 and mostly showed its effects in 2009.

Compared overall, the shares of the different types of logistical activities show similar structures over the different aggregates. Also, the absolute and relative shares do not show extensive deviation at all. The highest deviation is found in the tertiary sector or services sector, which includes the logistics services (see the highest bar stack in the middle of the diagram), which decreased by about -0.2%. The services sector turns out to make the most use of logistical services. Besides the logistical activities itself, this is to be explained on the basis of businesses like wholesale and retail trade, which are using logistical services in distribution as well as sourcing. In addition, all service industries (accommodation, food services, publishing, telecommunication, architecture, research, etc.) make use of the postal and courier services sector[34]. Consequently, the share of postal and courier services added value in the tertiary sector stacks are the highest compared to the other economic sectors.

The average figure is illustrated by the following stacked graph. The comparison for the two years is very stable with hardly any deviation.

Figure 2.27 Share of types of logistics services at overall added value – EU27 mean 2009



Source: Fraunhofer SCS, based on Eurostat.

Land transportation represents the most important part of outsourced logistical activities, with just under 60% of the overall contribution of added value. Warehousing and support services for transportation, which are the second biggest contributors, account for half of the abovementioned land transportation sector. Postal and courier services (H53) and waterborne transport (H50) represent minor shares at around 5% each.

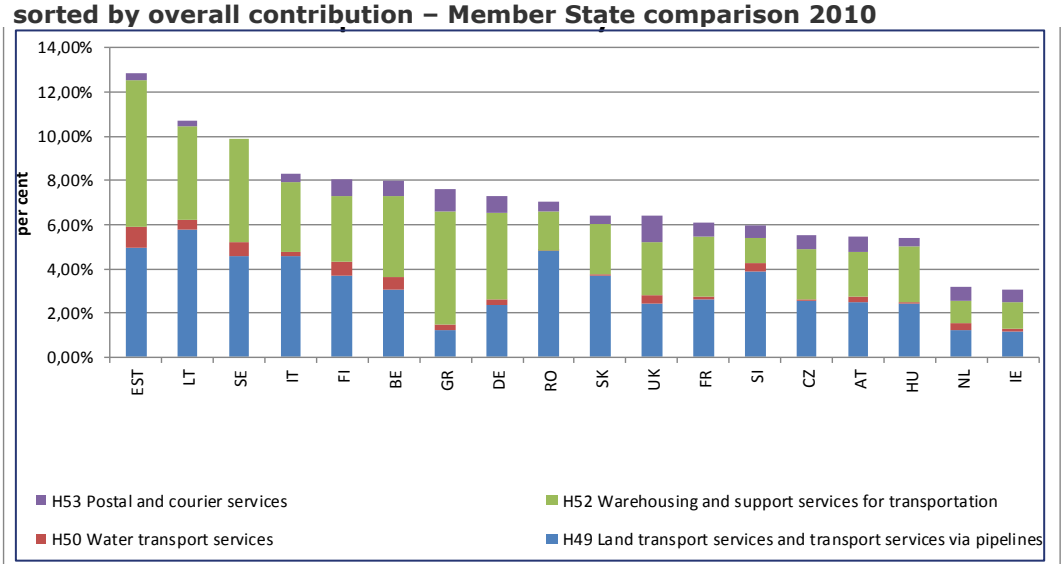
The outsourced logistics activities contribute with 7.57% of added value to the total national product in both years. The logistics activities produce the highest share of added value in the services sector at 8.84% in 2008 and 8.63% in 2009 respectively. The services sector itself accounts for 67% of the total national product. Additionally, this sector holds the logistics service activities and the wholesale sector (G45-G46). The outsourced logistics activities, with a share of 6% of the total national product, turn out to be highly interconnected and draw about 42% of inputs from themselves. Wholesale trade (G45-G46) holds a share of 6.5% of the national product and receives logistical input of about 18% of its overall product. The added value of outsourced logistics activities is far above average in the tertiary sector, which lies at 8.63% in 2009.

[34] Aggregation of logistics sectors within input output matrices does not allow for subtraction of postal services out of class H53, which includes postal as well as couriers services.

The next step of the analysis goes into detail about the structure of logistical added value (logistics service activities) for the year 2010. Afterwards, the changes from 2008 to 2010 are evaluated.

Figure 2.28 shows an evaluation of the total contribution of logistics services into the total national product for 18 EU Member States that analysable data could be retrieved for. With the highest value being 12.85% for Estonia and the lowest value being 3.06% for Ireland, the span is just under 10%. The average of all countries included is 7.08%.

Figure 2.28 Added value of outsourced logistics activities in total national product – sorted by overall contribution – Member State comparison 2010



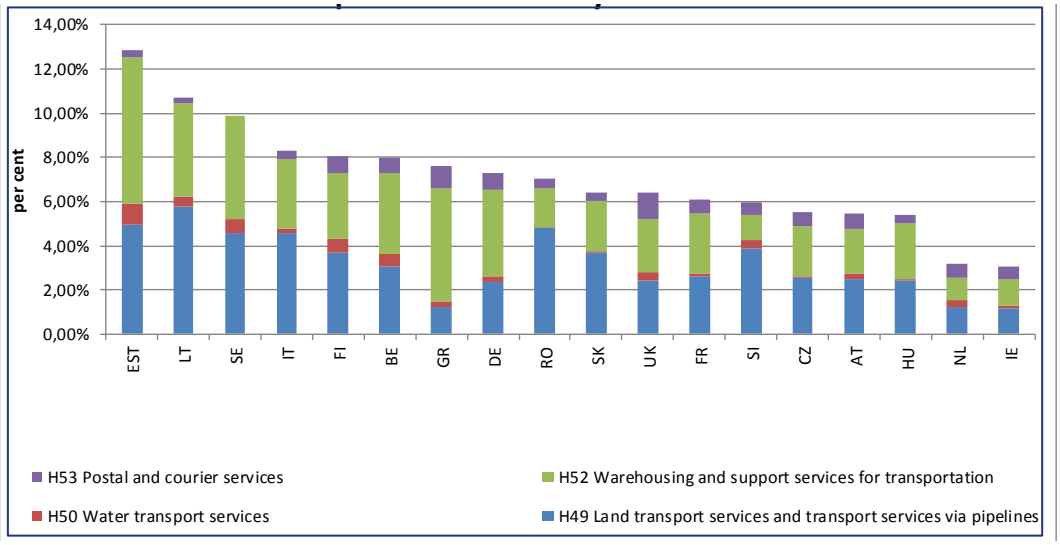
Source: Fraunhofer SCS / based on data from Eurostat.

The evaluation shows that the contribution of logistics services varies significantly. With a standard deviation of 2.43%, further assessment shows that the values for Estonia, Lithuania and Sweden are above the arithmetic mean plus standard deviation measure of 9.51% (7.08% + SD). The Netherlands and Ireland are below the arithmetic mean minus standard deviation measure of 4.65% (7.08% - SD). The high relevance of Estonia and Lithuania as logistical transit countries for Russia can explain a higher share[35]. The fact that Sweden does not show a value for H53 Postal and courier services is surprising. Structural business statistics consist of 436 enterprises in Sweden in this sector in 2011, even though no turnover information has been reported for these. Also Sweden's input-output tables for 2008 show no values for H53.

To gain a better insight into the shares of the logistical subsectors, further results are presented in Figure 2.29.

[35] See "Top 100 in European Transport and Logistics Services 2013", p. 108 and p. 116.

Figure 2.29 Composition of outsourced logistics activities input sorted by H49 Land transport services and transport services via pipelines for selected Member States in 2010



Source: Fraunhofer SCS / based on data from Eurostat.

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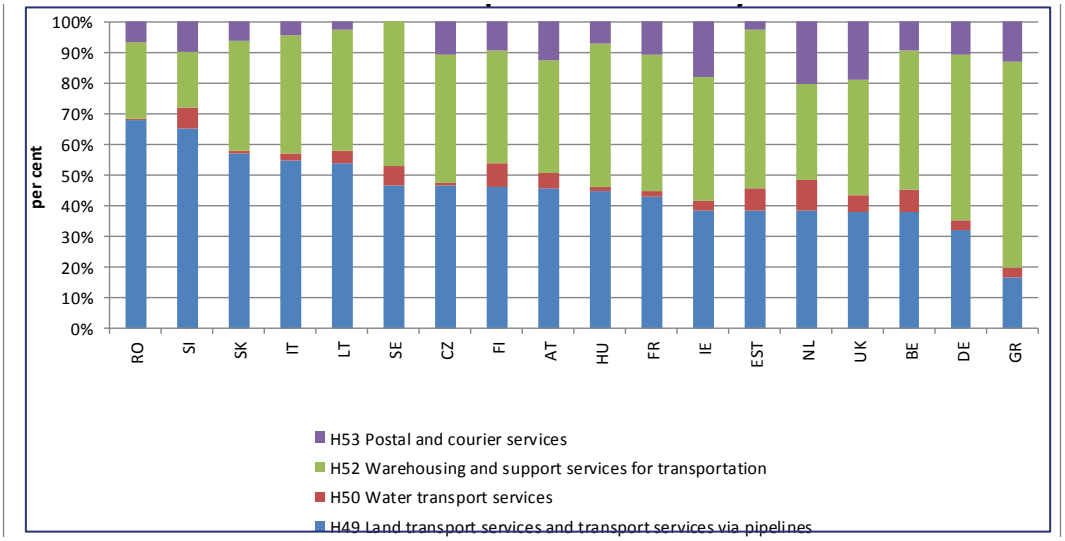
To gain a better insight into the shares of the logistical subsectors, further results are presented in Figure 2.30.

[36] See "Top 100 in European Transport and Logistics Services 2013", p. 108 and p. 116.

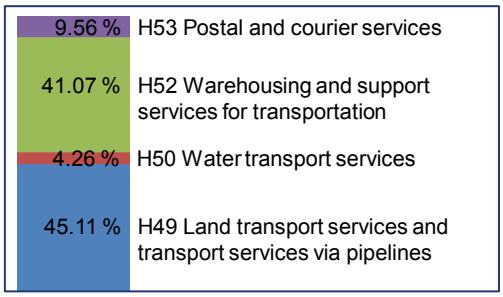
Figure 2.30 Composition of outsourced logistics activities input sorted by H49 Land transport services and transport services via pipelines for selected Member States in 2010



Source: Fraunhofer SCS / based on data from Eurostat.

The average values for the four logistics services subsectors are shown in Figure 2.31.

Figure 2.31 Share of types of logistics services at overall added value – 18 Member States mean 2010



Source: Fraunhofer SCS.

Similar to the EU27 shares from Figure 2.32, the order of the subsectors remains the same, with land transportation (H49) holding the highest share, followed by warehousing activities (H52). Postal and courier services (H53) and Water transport services (H50) hold shares of under 10% each. The shares of land transportation and warehousing are of comparable size. The combined concentration results in more than 85%. These sectors represent the fundamental logistics services, whereas H53 and H50 are much smaller sectors. This assessment shows that the sectors have different relevance in the different countries.

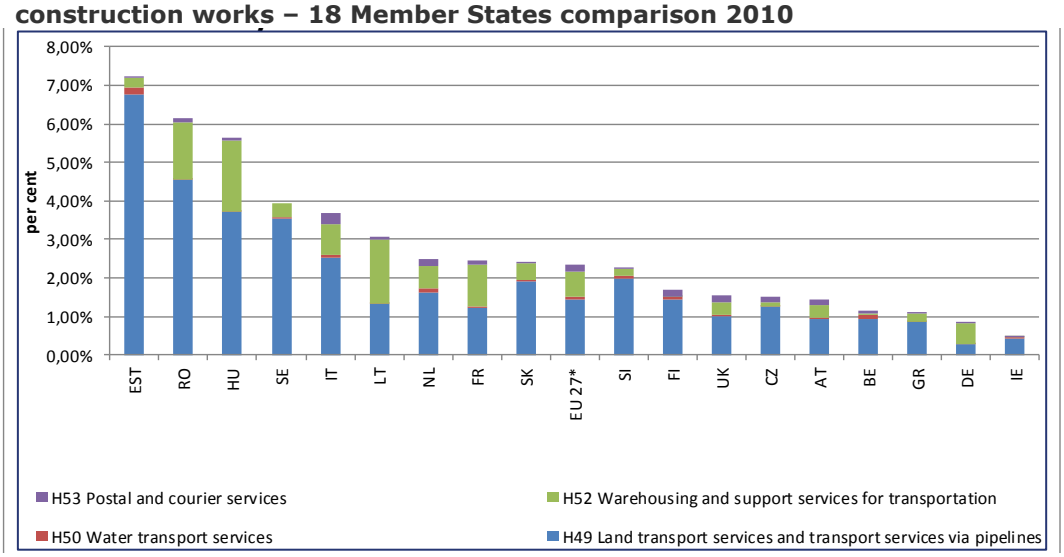
2.5.2 Economic added value from logistics service activities on industry sectors of the EU Member States

The evaluations above show that the added value of logistics turns out to be quite different in the different countries, but not so much in the different industry sectors. This section shows more detailed analyses of the industry sectors in 2010 – the most recent year for which data exists. In addition, developments from the year 2008 to 2010 are shown.

The first industry sector addressed is the construction and construction works sector (NACE Rev. 2 Section F). The sector accounts for 14.3% of the services sector (EU27

– 2009). Figure 2.36 sorts the shares of logistics services in construction and construction works by overall percentage.

Figure 2.32 Added value of outsourced logistics activities in construction and construction works – 18 Member States comparison 2010

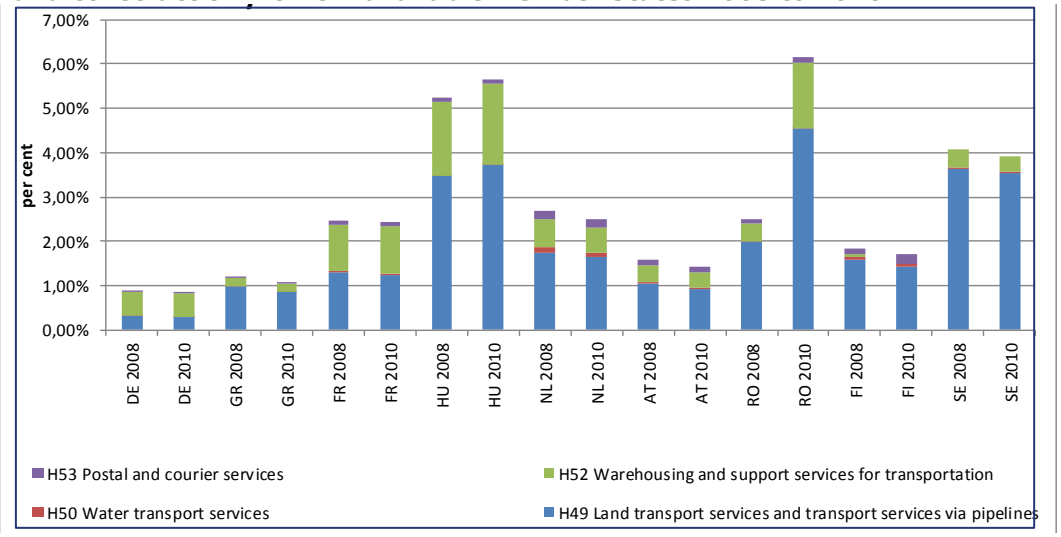


Source: Fraunhofer SCS / based on data from Eurostat; data for 2010, *EU 27 for 2009.

In general, land transportation (H49) contributed the most logistical added value in construction and construction works in 2010. For four Member States (HU, LT, FR and DE), the input from warehousing is over the EU27 (2009) average. H53 (Postal/courier services) and H50 (Water transport) play minor roles.

Figure 2.33 visualises the changes for the years 2008 until 2010. In two cases (CZ and SI) there is no data available for the year 2008 and therefore these two Member States are included with their 2009 and 2010 data only. The absolute height of the bars show the added value of logistics (as measured in this assessment).

Figure 2.33 Changes in added value of outsourced logistics activities in construction and construction works – available Member States 2008 to 2010



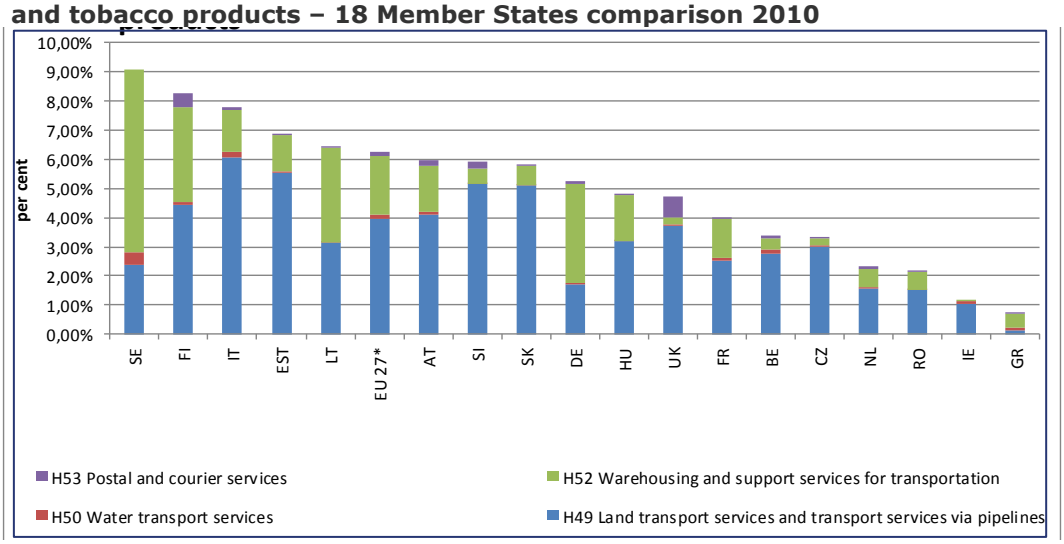
Source: Fraunhofer SCS / based on data from Eurostat.

The bar diagram does not show severe or harsh changes in structure or absolute values except for in Romania, where the input from logistics services in 2010 grew by a factor of just under 2.5 times the value of 2008, while the structure in both years remains similar. The construction sector itself grew by about 15%, and the total

national product decreased by over 6% in the same timespan. The private sector tends to withhold investments in construction in times of crises and there are no obviously reasons known for the contrary developments in. In fact, compared to the other Member States, the values seem to be highly doubtable. Moderate changes in the structure, as measured for all the other Member States, are more plausible.

Secondly the food products, beverages and tobacco products sector is looked at (NACE Rev. 2 Section C10-C12). The sector accounts for 19.3% of the manufacturing industry (EU27 – 2009). Due to the supply of the population with goods for daily consumption, the sector generally represents an industry sector of high importance. Figure 2.34 sorts the shares of logistics services for the analysed sector by their overall percentage of contribution.

Figure 2.34 Added value of outsourced logistics activities in food products, beverages and tobacco products – 18 Member States comparison 2010



Source: Fraunhofer SCS / based on data from Eurostat; data for 2010, EU 27 for 2009.

The graph above shows a very different picture from that of the construction sector (Figure 2.32 and Figure 2.33). For the construction sector, the land transportation (H49) input turned out to be of highest importance.

The food sector shows the following: The land transport sector bars (blue) are the highest in the majority of countries, meaning that road transportation contributes a high share of input. But the green warehousing sector bars (H52) hold the higher share in Sweden, Finland, Lithuania and Germany. This means that in these countries, the warehousing sector is of high importance for the food industry. Sweden and Finland's very low population densities with 18 (Finland) and 23 (Sweden) people per square km respectively, which are among the lowest in Europe and far below the European average of about 114 people per square km, could explain the high relevance of the warehousing sector compared to other countries[37]. A reason for Germany's high share could lie in the relevance of the food industry and connected retail trade.

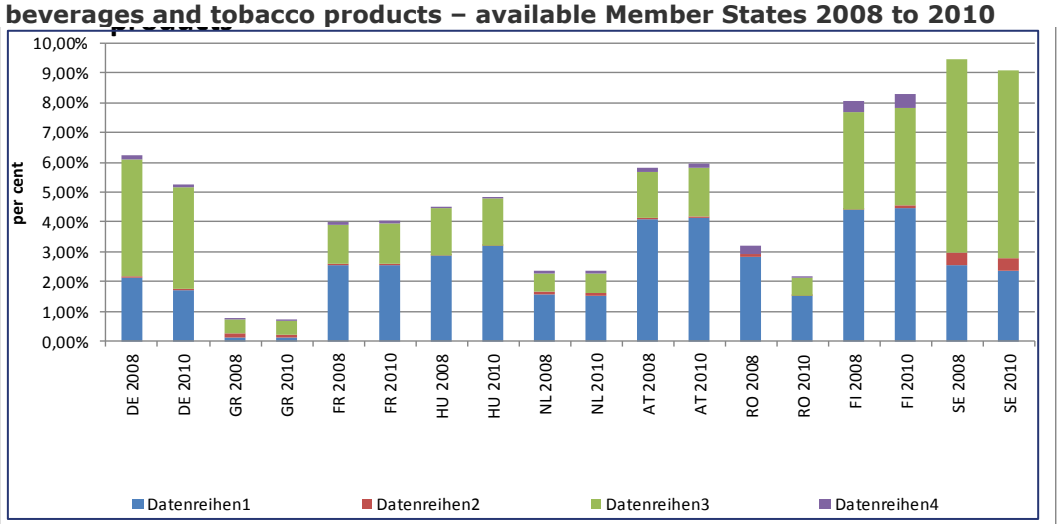
Overall, the highest value for the logistics services sector contribution is measured in Sweden with 9.08% and shown with the highest bar stack in the diagram. The lowest value of Greece accounts for only 0.71%. The span between these extremes is more than 8%. The low value for Greece seems to be doubtable, although the sighting of the figure for 2008 confirms it. Due to Greece's struggling economy (since 2008) and

[37] Fraunhofer SCS / "Top 100 in European Transport and Logistics Services 2013-2014", see country profiles from p. 104-226.

low labour costs, structural deviation is plausible, but not to this extent. Values for Greece are suggested to not be compared directly to the others Member States' values.

Figure 2.35 visualises the changes for the years 2008 to 2010.

Figure 2.35 Changes in added value of outsourced logistics activities in food products, beverages and tobacco products – available Member States 2008 to 2010



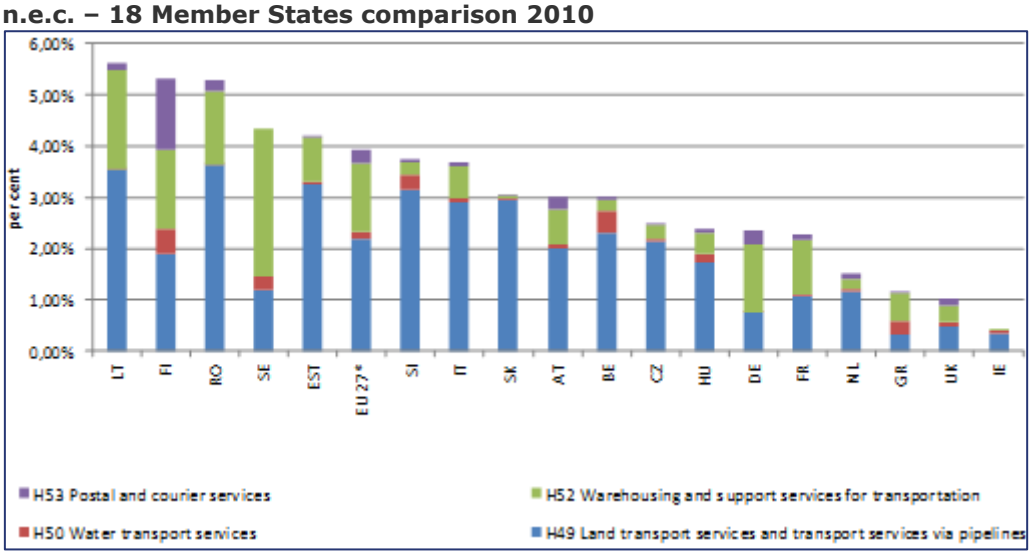
Source: Fraunhofer SCS / based on data from Eurostat.

The biggest deviation between the structure and/or the absolute height of the bars for the years of one country can be found for Romania, where the statistics show no value for warehousing H52 in the year 2008. An internal change of calculation methods or the assignment of values to subsectors in the course of the compilation of the input output matrix for Romania could be reason for this. Therefore, no conclusions follow this finding.

Figures for all of the other Member States are relatively stable in the structure. The composition stays very similar for the two years compared. For changes in the absolute height of the bars, market dynamics are supposed to be the basic driver. Above all, data shows that structures are hardly changing over the short timespan observed. Individual Member States seem to have an individual signature or composition. Land transportation and warehousing are mainly used within the food sector. As food goods are perishable to a high degree, a special demand of part of food supply chains are cold chains, i.e. the transported goods need to be chilled or frozen (e.g. vegetables, fish, frozen food, etc.). Cold chains need to be maintained beyond transhipment points, which means that warehouses need to be chilled as well and transhipment processes need to be carried out very efficient to not risk the food warming up while being transhipped or delivered.

The third sector analysed is the machinery and equipment industry (NACE Rev. 2 Section C28). The sector accounts for 8.6% of the manufacturing industry (EU27 – 2009). Figure 2.36 shows the inputs of the logistics services landscape by overall percentage in the Member States, sorted from highest to lowest.

Figure 2.36 Added value of outsourced logistics activities in machinery and equipment n.e.c. – 18 Member States comparison 2010

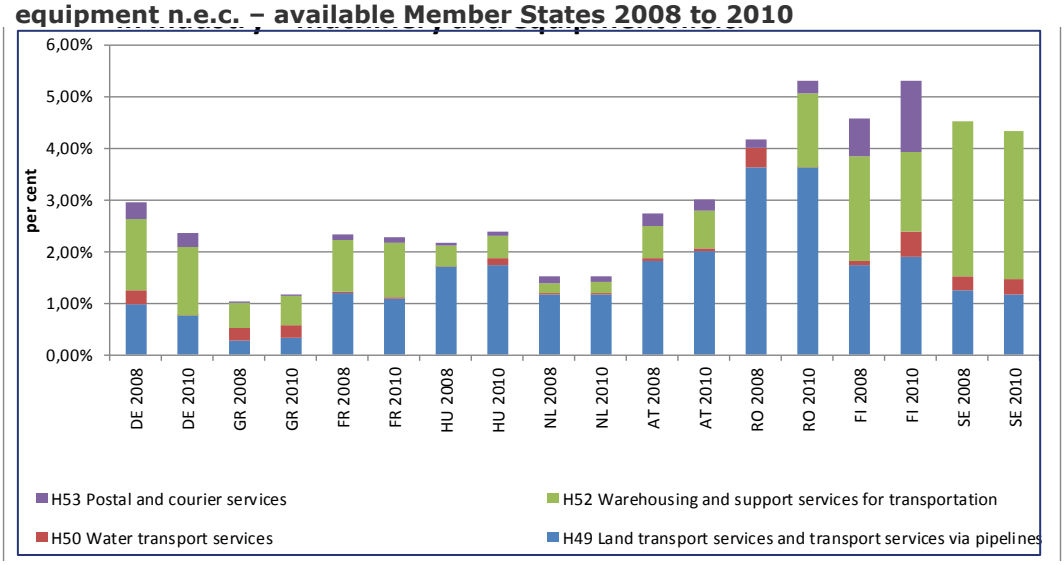


Source: Fraunhofer SCS / based on data from Eurostat; data for 2010, EU 27 for 2009.

The highest percentage is found for Lithuania at 5.6%, with the lowest value for Ireland at 0.44%. The span is 5.2%, which is relatively small compared to the food and chemicals sectors. The structure of inputs from logistics services varies significantly among the Member States. Land transport (blue bars) holds the highest share in the majority of cases. In three Member States (SE, DE and GR) the share of warehousing activities (H53) is higher than that of land transportation. Particularly noticeable as well is Finland's postal and courier services sector (H53), which holds a share of over 25% of the Finnish input in machinery and equipment n.e.c.

Figure 2.37 shows the changes for the years 2008 to 2010.

Figure 2.37 Changes in added value of outsourced logistics activities in machinery and equipment n.e.c. – available Member States 2008 to 2010



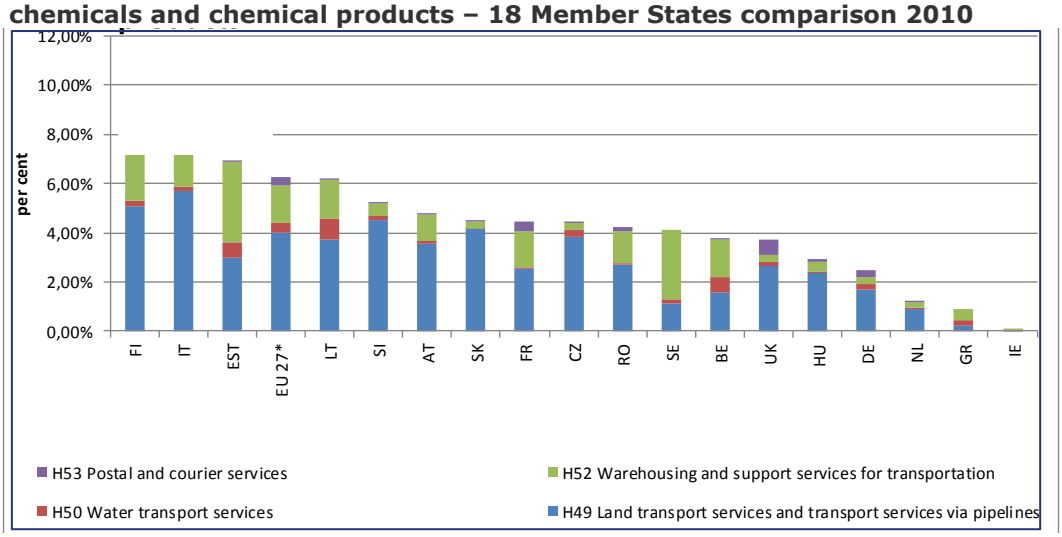
Source: Fraunhofer SCS / based on data from Eurostat.

In the machinery and equipment sector, the composition of the four logistics service subsectors varies in Romania and Finland. In the other Member States, comparisons between the structures remain similar and one core observation is a relatively stable structure over the countries. The H53 subsector's share in Finland rose by 61% during the observed period, which seems to be an exception. Measured against each other, there are countries whose logistics services' added value rose, while in others it

declined or stagnated. Whether it rose or declined, the structures in most of the cases remain stable.

The fourth analysed sector is the manufacture of chemicals and chemical products industry (NACE Rev. 2 Section C20). The sector accounts for 8.5% of the manufacturing industry (EU27 – 2009). Figure 2.38 shows the added value of logistics services per country, sorted by the absolute share in the chemicals and chemical products industry.

Figure 2.38 Added value of outsourced logistics activities in the manufacture of chemicals and chemical products – 18 Member States comparison 2010

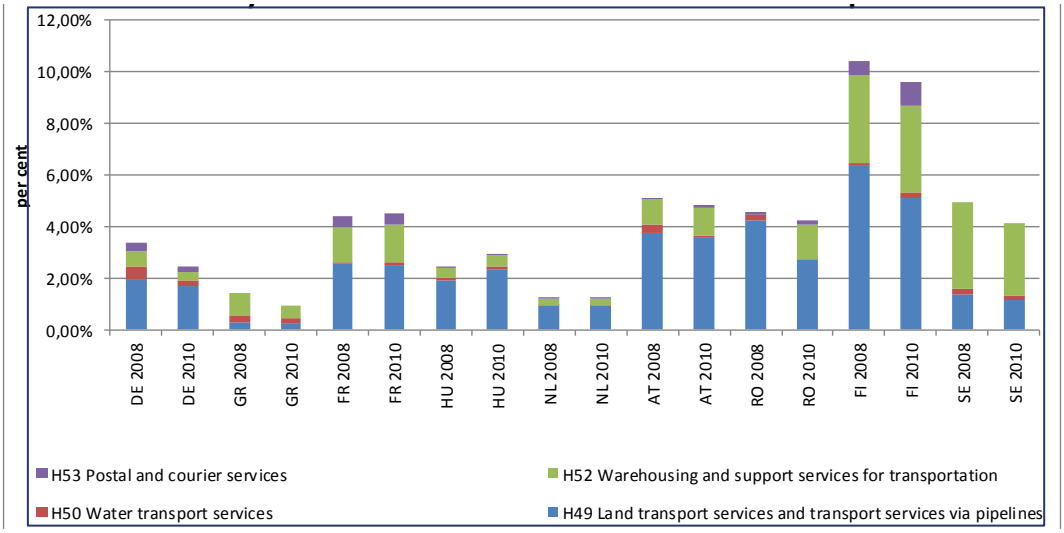


Source: Fraunhofer SCS / based on data from Eurostat; data for 2010, EU 27 for 2009.

The bar stacks vary between the highest value of 9.6% for Finland and the lowest for Ireland with only 0.1%. In most of the cases (15 countries) land transportation turns out to be the most relevant services sector for chemicals and chemical products. Once again, the high relevance of the postal and courier services sector in Finland stands out with a total share of 9.5%. In fact, the UK's share is even higher with 16.5% and Germany's share amounts to 10.4%. In the arithmetical mean overall observations, the structure shows the land transportation sector (H49) with a share of 62%, followed by warehousing (H52) with 26%, water transportation (H50) with 9% and the postal and courier sector (H53) with 4% (rounded figures).

Figure 2.39 illustrates the changes in the added value of the logistics services sector for the years 2008 to 2010.

Figure 2.39 Changes in added value of outsourced logistics activities in the manufacture of chemicals and chemical products – available member states 2008 to 2010

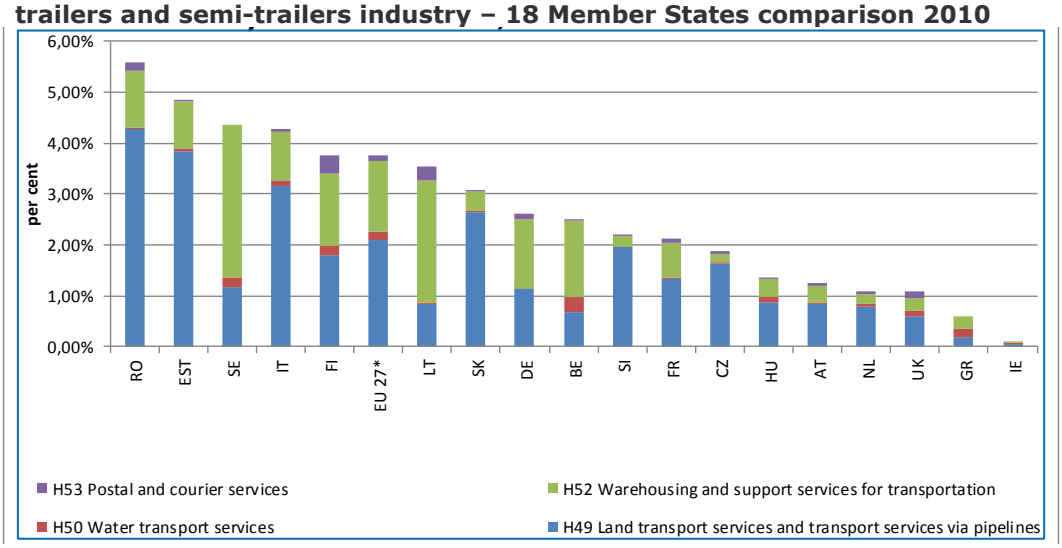


Source: Fraunhofer SCS / based on data from Eurostat.

The structure once again shows the high relevance of sector H49 land transportation (share of 64%), followed by warehousing with 27% (H52). Water transport (H50) with 6% and postal and courier services with 4% (rounded figures) follow. Except for in France and Hungary, all overall shares declined from 2008 to 2010.

The final analysed sector is the motor vehicles, trailers and semi-trailers industry (NACE Rev. 2 Section C29). The sector accounts for 11.1% of the manufacturing industry (EU27 – 2009). Figure 2.40 illustrates the added value by logistics services sorted by overall percentage of the industry's product.

Figure 2.40 Added value of outsourced logistics activities in the motor vehicles, trailers and semi-trailers industry – 18 Member States comparison 2010



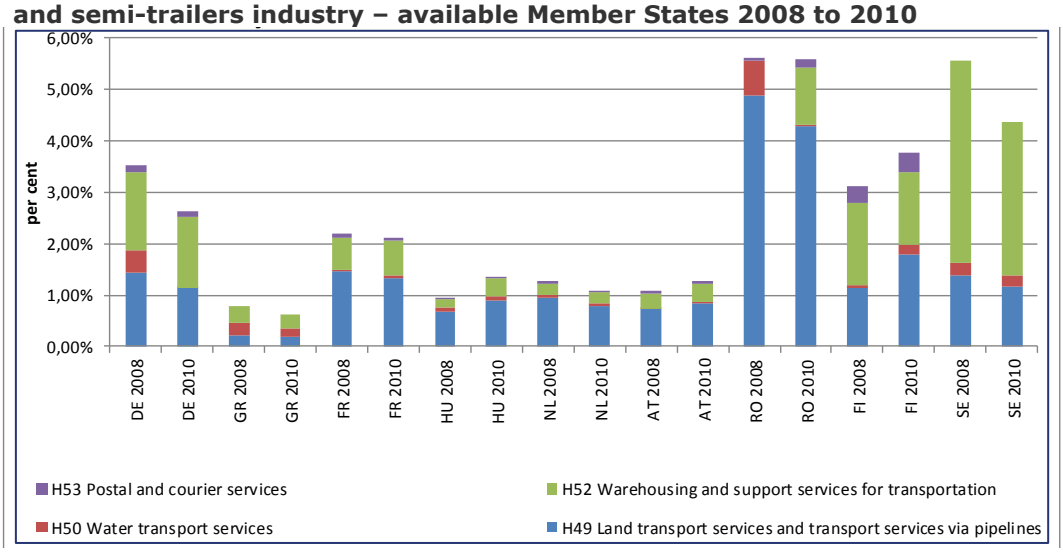
Source: Fraunhofer SCS / based on data from Eurostat.

The highest percentage is found for Romania at 5.6%, with the lowest value for Ireland at 0.12%. The span is about 5.5%, similar to that of the machinery and equipment n.e.c. sector. The European mean (sixth position in the diagram) is also very similar to that of the machinery and equipment n.e.c. sector. These similarities should not hide the fact that there still are many differences. In general, the order of logistic service subsectors is in accordance with all of the industry branch evaluations:

land transport (H49) contributes the highest share of the added value (59%), while warehousing (H52) contributes 32%. Of minor relevance are the water transport sector (H50) with 6% and the postal and courier services sector (H53) with 3%.

Figure 2.41 illustrates the changes for the years 2008 to 2010.

Figure 2.41 Changes in added value of logistics services in the motor vehicles, trailers and semi-trailers industry – available Member States 2008 to 2010



Source: Fraunhofer SCS / based on data from Eurostat.

As concluded above, the changes in Romania might have occurred due to methodological shifts. Similar structure changes are to be found in all observed sectors for Romania. Harsh decreasing percentages over the timespan from 2008 to 2010 can be found in Germany and Sweden. A structural change could have been swayed by the economic crisis of 2009 that had harsh effects on the automotive industry in Germany at least. The overall products of the motor vehicles, trailers and semi-trailers sector in Germany was € 223.2 bn in 2008 and € 199.5 bn in 2010. Independent from this, the industry sector reduced inputs from the logistics services sector by more than 25%. The comparable value for Sweden lies at -21%; for Greece this value is -22%. The highest increases in logistics services sector inputs are to be found in Hungary and Finland.

2.5.3 Conclusions from the economic added value analysis

The logistics industry, more specifically the logistics service providers industry, contributed the same added value to the GDP in the analysed years, although 2009 was a year of crisis for the world economy and therefore the EU Member States too. This shows the relevance of added value from logistics services that did not decrease in the year of the crisis.

Although exceptions can be found for single countries, the structure of logistical services is very similar across the sectors and industry branches. The absolute contribution, on the other hand, varies strongly in the different industry sectors. The logistics services for food, beverages and tobacco products, and for the manufacture of chemicals and chemical products, are of the highest importance. Lower importance can be attributed to logistics services for the machinery and equipment n.e.c. sector and motor vehicles, trailers and semi-trailers sectors. This might be due to the higher value of the products. In industries with a high value density of the finished goods, the tonne of product holds a very high statistical value. A car that might have a weight of just a tonne might have a value of more than € 30,000, while a tonne of beverages (exclusive wines and liquor excluded) might have a value of € 1,000. Still, the

logistical effort and above all, the costs are not 30 times higher than costs for the transport of a car, no matter if the product costs differ 30 times. So, the percent share of costs for logistical service at industry level can vary strongly and is dependent of the goods transported or the process steps.

Besides the logistics service industry, which is highly interconnected to itself and draws about 42% of inputs from its own industry, the wholesale and retail trade sector is highly dependent on running logistics infrastructure. 18% of the wholesale and retail trade sectors added value is contributed by logistics services, and the logistics component in wholesale and retail trade businesses is noticeable. The lowest contribution of logistics services is measured in the construction and construction works sector. Firms in this sector often have their own assets (transport vehicles) to carry out transportation, resulting in a low share of outsourced logistics services.

The assessment shows that land transportation (including road freight as well as rail freight) and warehousing activities are of the highest relevance and together are responsible for over 90% of value added contribution to the EU national product. The postal and courier services and water transport services do not show a comparable relevance with a combined share of fewer than 10% put together. In general, the logistics sector is highly interconnected to all sector aggregates that were assessed and a rating of the logistics sector as critical infrastructure would seem appropriate from a researcher's perspective.

The cost structure assessment of the previous chapter shows that personnel costs are the most diverging cost factors across the EU's Member States. Therefore, administration (which is personnel intensive) and the personnel cost shares in the well developed countries are noticeably higher than that of less developed countries (mainly Eastern and South-Eastern European countries). Personnel-intensive activities with road transportation leading the way can be provided more cheaply by companies in the Eastern and South-Eastern Member States. The pressure to reduce personnel costs by finding other ways of handling goods in logistics systems is high in the high personnel cost countries, especially Sweden, Belgium, Denmark, France and Germany. Here, the economic added value analyses show that warehousing activities are of higher importance and contribute a higher share of added value in general (Figure 2.29). The industrialisation of logistics processes is of higher relevance, also driven by highly competitive industries like automotive (Germany and France), machinery and equipment (Denmark) and chemical (Belgium) that demand fast, effective and cost-optimised services. Of course, the influence of geographic situation (size of countries, strategic position as transit country or having important ports) must not be ignored.

2.6 Evaluation and comparison of the performance of logistics systems

The previous sections provided numerous indicator comparisons to evaluate the structure of the logistics market, the cost aspects and economic added value. The following section focuses on key indicators, which were selected to give an overview of the transport performance of the EU Member States by means of absolute as well as relative indicators.

2.6.1 Framework conditions – infrastructure

Logistics need infrastructures as a basis for effective transportation via all modes. The infrastructural conditions differ across the Member States of the EU.

The following comparison shows the results of the Logistics Performance Index which has been carried out by the World Bank since 2007. The question-based survey delivers cross-country comparisons between 160 countries in its latest available

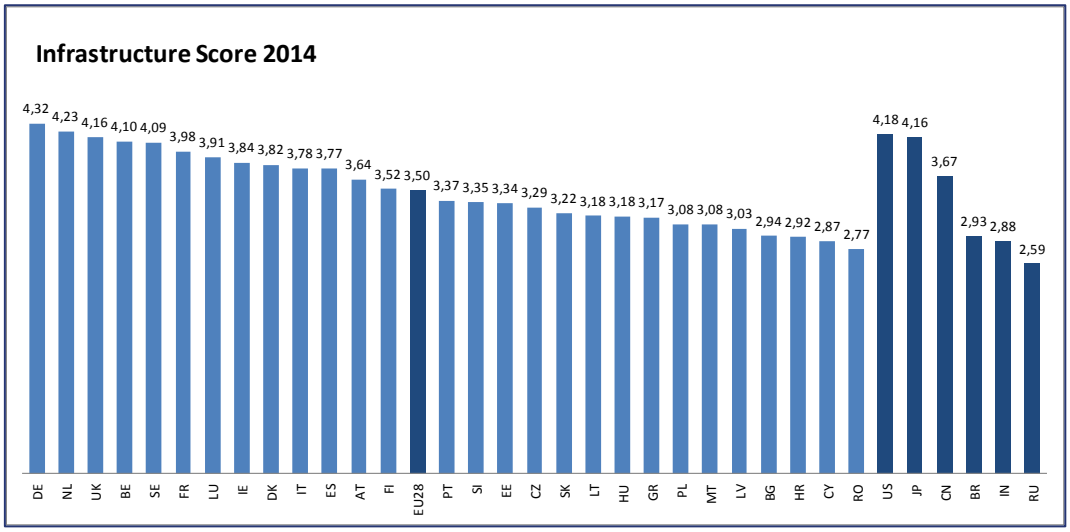
edition for 2014. The reports provide an index called "logistics performance index[38], which is calculated on the basis of the following six sub-indicators:[39]

- **Customs**: The efficiency of customs and border clearance;
- **Infrastructure**: The quality of trade and transport infrastructure;
- **Ease of arranging shipments**: The ease of arranging competitively priced shipments;
- **Quality of logistics services**: The competence and quality of logistics services—trucking, forwarding, and customs brokerage;
- **Tracking and tracing**: The ability to track and trace consignments;
- **Timeliness**: The frequency with which shipments reach consignees within scheduled or expected delivery times.

EU Member States are selected for assessment in the graph. As the database provides data for countries all over the world, Brazil, China, India, Japan, Russia and the USA have been added in the diagram for information.

The infrastructure figures of the perception-based survey score the quality of infrastructure in the countries on a scale of 1 (worst) to 5 (best).

Figure 2.42 World Bank – Infrastructure quality score 2014 for the EU28 and selected extra-EU nations



Source: Fraunhofer SCS / based on data from World Bank 2014.

Infrastructural conditions vary hugely among the Member States. The figures spread between 4.3 for Germany and 2.77 for Romania, which is the same as the overall mean for the 160 observed nations. Very good values are found for Germany, the Netherlands and the UK, among other Western European countries. These are also among the best six countries with regards to the "infrastructure" sub-indicator.

The graph shows that lower values are mainly reached by Eastern European countries. The average value for the 28 EU Member States is 3.5 (shown in the graph), a number 15 countries fall short of. Comparing the unweighted European mean to the other countries (dark blue bars on the right-hand side of diagram), the EU28 only reaches a figure below the lowest of the compared countries. Taking into account that most of the economic strength in Europe is concentrated in Germany, France, the UK, Italy and Spain (which generate more than two thirds of the European GDP combined), the

[38] World Bank 2014: Data and reports available via: http://lpi.worldbank.org/.
[39] See Connecting to Compete 2014 by the World Bank, p. 7.

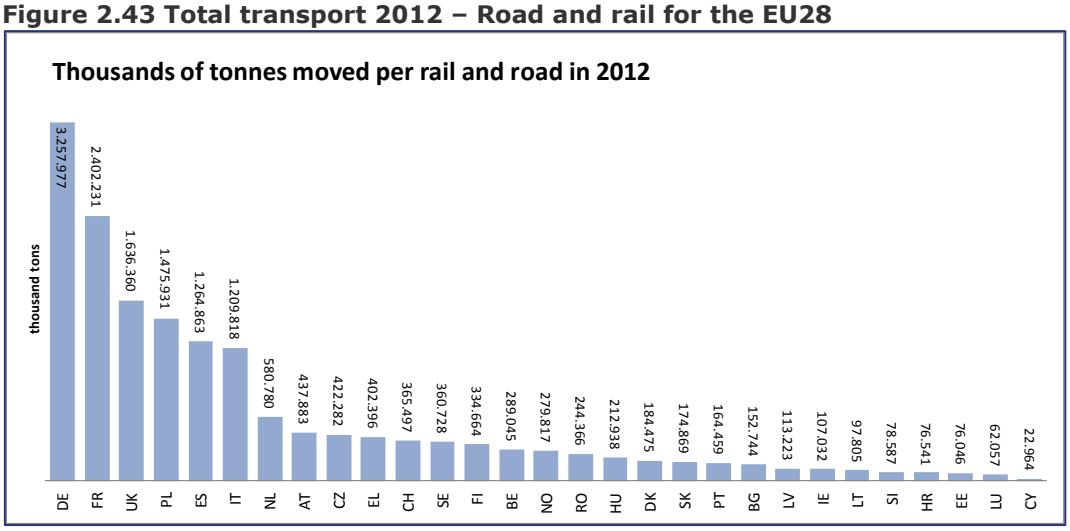
mean for their infrastructural score is 4.0 and therefore comparable to the EU's global competitors.

The better infrastructural conditions are, the more effectively goods can be moved over large distances. Further comparisons go into detail about different areas of indicators.

2.6.2 Absolute performance indicators – tonnage-oriented view

The KPI **transport volume** represents the total amount of goods transported in tonnes within one year and is the most common figure for comparisons of performance.

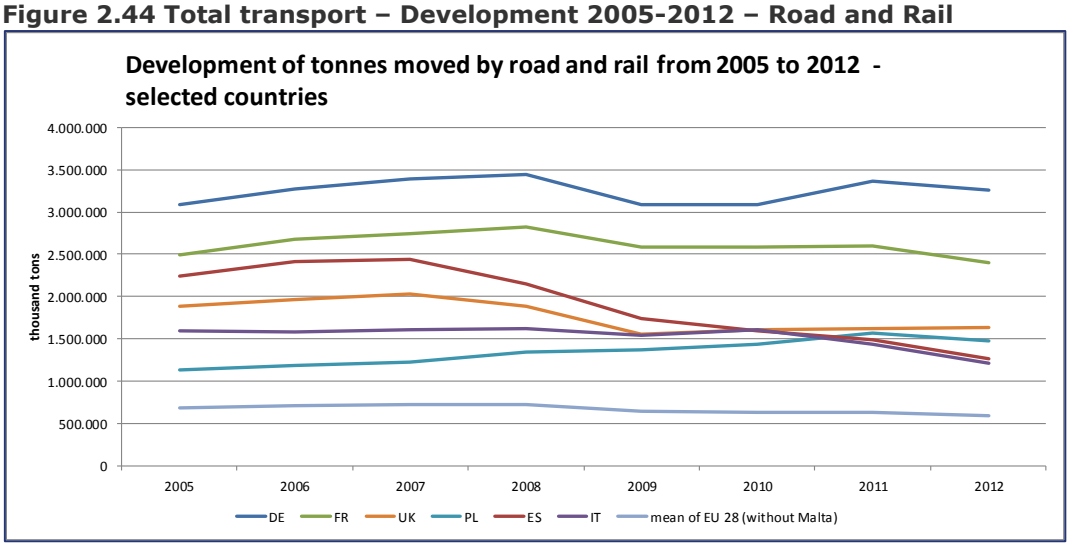
Figure 2.43 Total transport 2012 – Road and rail for the EU28



Source: Fraunhofer SCS / based on data from Eurostat.

The illustrated country comparison is based on road and rail tonnages, as these means of transportation are the most common and of highest relevance in all the EU Member States. Road and rail represent the backbone of the transportation systems. The figures clearly indicate that a small number of large economies dominate the overall tonnages moved within the EU Member States. Tonnage figures highly correlate to GDP figures and consequently the conclusion could follow that large economies have a higher transport and logistics performance. Indeed, the demand for logistics services is driven by consumption of private and industrial demanders and therefore shows a high correlation. The development of the tonnes moved by road and rail for the six countries with the highest volumes are given in the following figure. The Member States displayed represent more than 70% of the tonnes moved in 2012 by the EU28. Germany, France, the UK and Spain all show decreasing figures in the year 2009 when the economic crisis hit the markets.

Figure 2.44 Total transport – Development 2005-2012 – Road and Rail

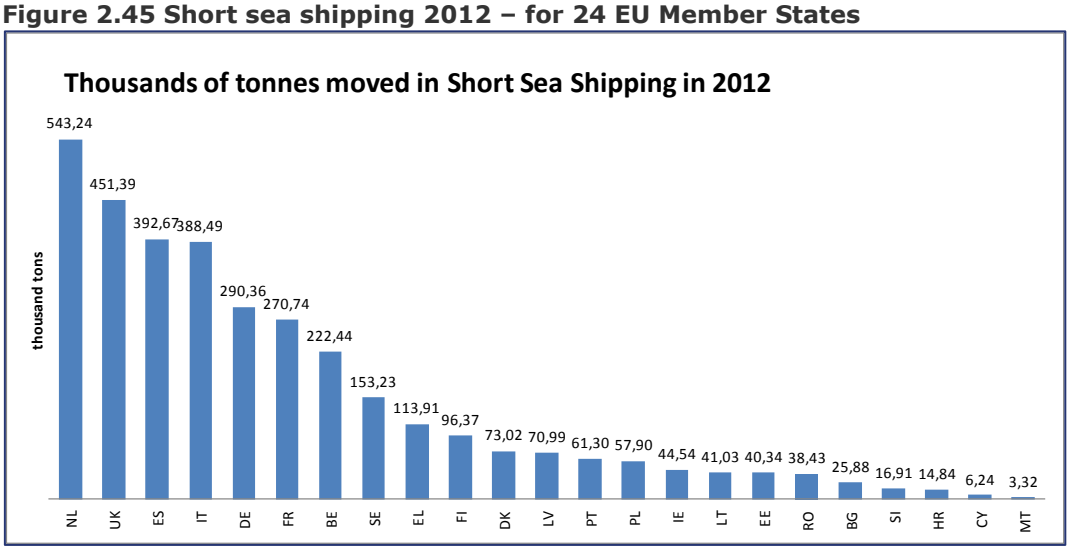


Source: Fraunhofer SCS / based on data from Eurostat / own estimates (EU28 aggregate calculated for timeline comparison).

Italy shows declining tonnages and from 2005 to 2012 the tonnes moved shrank by more than 24%. The UK reports a decline of 13% in the same period of time. The most dramatic development is found in Spain, where tonnes dropped by 43% from 2005 to 2012. Poland, on the other hand, was able to grow volumes by 30% over these years. Figures for Germany and France are relatively stable, with small variations between the years.

The short sea shipping figures for 24 EU Member States are shown in Figure 2.45. Western Member States in particular have high figures regarding their short sea shipping tonnages moved.

Figure 2.45 Short sea shipping 2012 – for 24 EU Member States



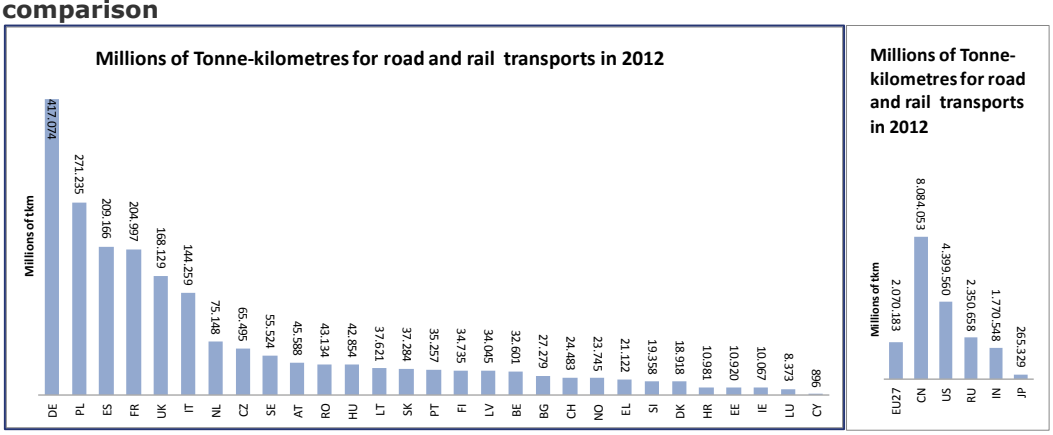
Source: Fraunhofer SCS / based on data from Eurostat.

For some countries with good access to sea via long coastlines, short sea shipping can be an alternative to land-oriented transports. The figures for the Netherlands show that the amount of tonnes carried by this mode is comparable to road and rail freight tonnages. For the UK, the short sea shipping accounts for about 27% of the road and rail freight tonnages. For Germany, less than 10% of the land transportation tonnage is transported via short sea shipping. This is plausible due to Germany's much shorter coastline compared to the Netherlands, the UK, Italy or Spain.

In terms of a functional definition, transportation systems are defined as a transfer in place. Therefore transport volumes cannot be the only criteria of a transportation system's performance. For this reason the additional KPI transport performance, which is measured by the tonne-kilometres per year, represents a combination of the amount of goods transported and the distance over which the goods were moved. A value of 150 billion tonne-kilometres might reflect a performance of 1 billion tonnes over an average distance of 150 km, as well as 500 million tonnes over 300 km distance.

The KPI tonne-kilometres is the classic figure for comparison and statement of transport performance. The graph looks similar to the previous one, which depicted the tonnes moved: high figures for some of the largest economies lead the sorted graph and are followed by the smaller Member States, which do not reach an absolute amount near that of the large economies.

Figure 2.46 Tonne-kilometres in 2012 – Road and Rail – EU28 and extra-EU countries comparison



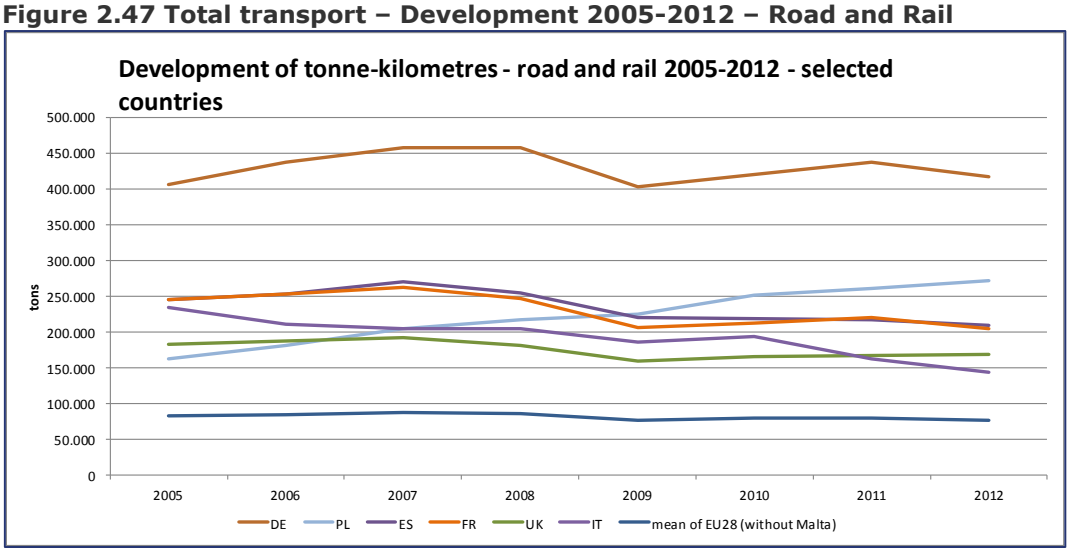
Source: Fraunhofer SCS / based on data from Eurostat and OECD / own estimates.

A detailed look at the countries on the left reveals that Germany stays in first place. However, it is followed by Poland in second place regarding its tonne-kilometre performance (according to tonnage, Poland reaches the fourth rank – Figure 2.43). For Spain, a similar finding can be stated. With a fifth rank regarding tonnes moved, it is third in terms of tonne-kilometres. The reasons for this changed picture are higher transport distances over which the loads are transported in these countries. As the UK is a group of islands with specific geographical conditions, relatively lower tonne-kilometre figures are plausible due to the size of the landmasses.

For China, Russia and Japan, comparable figures for 2012 could be retrieved and/or estimated. As the total amounts exceed the absolute volumes of the single European countries, they are shown in an extra diagram in Figure 2.46. China shows values that are almost four times higher than that of Europe. Also the USA holds a much higher figure, more than twice as high as that of Europe. Russia and India are nearest to the Europe figure.

The development of the tonne-kilometre figures for the six Member States with the highest absolute values is illustrated in the following graph. The developments for Poland show a steady growth that contradicts the volatile pathways of the other countries. In all of the timelines, except for that of Poland, a negative effect can be seen. The economic crisis had palpable effects on the logistics businesses, as demand and consumption declined in the years of crisis.

Figure 2.47 Total transport – Development 2005-2012 – Road and Rail



Source: Fraunhofer SCS / based on data from Eurostat / own estimates (EU28 aggregate calculated for timeline comparison).

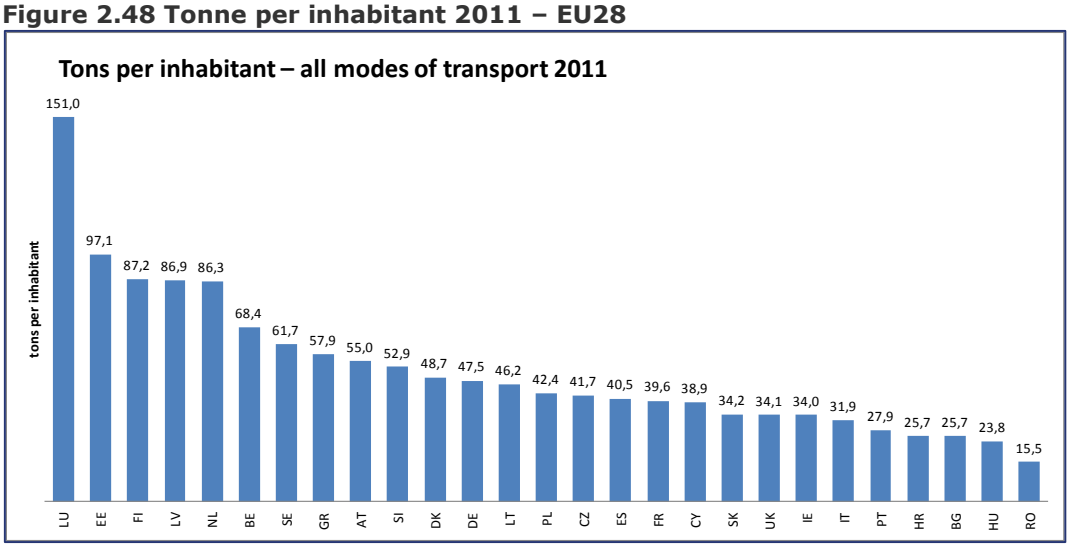
2.6.3 Relative performance indicators

Absolute indicators like those above show that tonnes and tonne-kilometre are higher for countries that have a larger economy, as domestic demand and industry strength are drivers for the flow of goods. These figures do not allow for direct comparison of countries that are of a different size (geographical, population or economic). Therefore, additional comparisons take relative figures into account that relate absolute numbers to each other. The following deliberations go into detail with the assessment of tonnes per inhabitant of a country, tonne-kilometres per inhabitant, the share of transports that are run empty and the productivity of single employees in the field of logistics services.

Tonnes per inhabitant comparison

To enable a better comparison of small and large countries, the following bar diagram shows the tonnes per inhabitant relation that is calculated from the total tonnages that are transported by all modes of transport (road, rail, inland waterways, sea cargo, air cargo) divided by the population per country.

Figure 2.48 Tonne per inhabitant 2011 – EU28



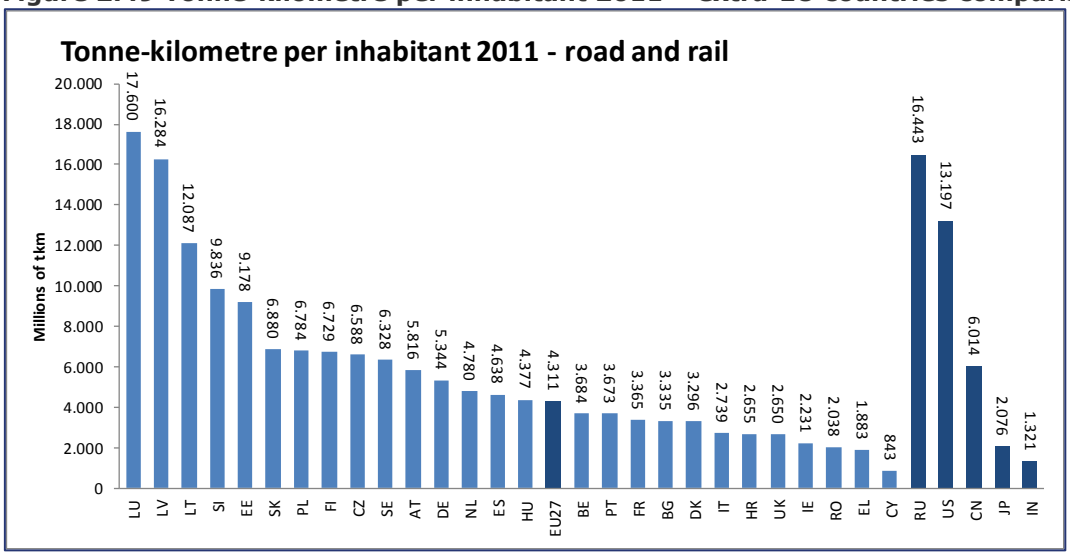
Source: Fraunhofer SCS / based on data from Eurostat / own estimates.

Luxembourg, Estonia, Finland, Latvia and the Netherlands lead the graph. Except for Finland, the countries have high transit tonnages that propel a high overall figure. The Baltic states handle high tonnages of different commodities in transit between Russia and the rest of the world. Finland has a mining and quarrying sector with over average relevancy and an important wood and paper products industry. Both of them are contributing to high tonnages. The population in the Scandinavian country is not very dense, which can also explain the high figure. The big economies (DE, FR, ES, UK, IT) are all to be found in the midfield, with tonne per head values between 30 and 50 tonnes. Croatia, as the Member State that joined the EU in 2013, is among the countries with the lowest tonne per inhabitant value.

Tonne-kilometre per inhabitant comparison

Comparable values for tonne-kilometre performance for extra-EU countries could be retrieved (estimated partly) for the countries shown in Figure 2.49. The 5.344 tonne-kilometres for Germany say that per inhabitant there are 5.344 kilometres of transport distance necessary for road and railway transportation.

Figure 2.49 Tonne-kilometre per inhabitant 2011 – extra-EU countries comparison



Source: Fraunhofer SCS / based on data from Eurostat, OECD / own estimates.

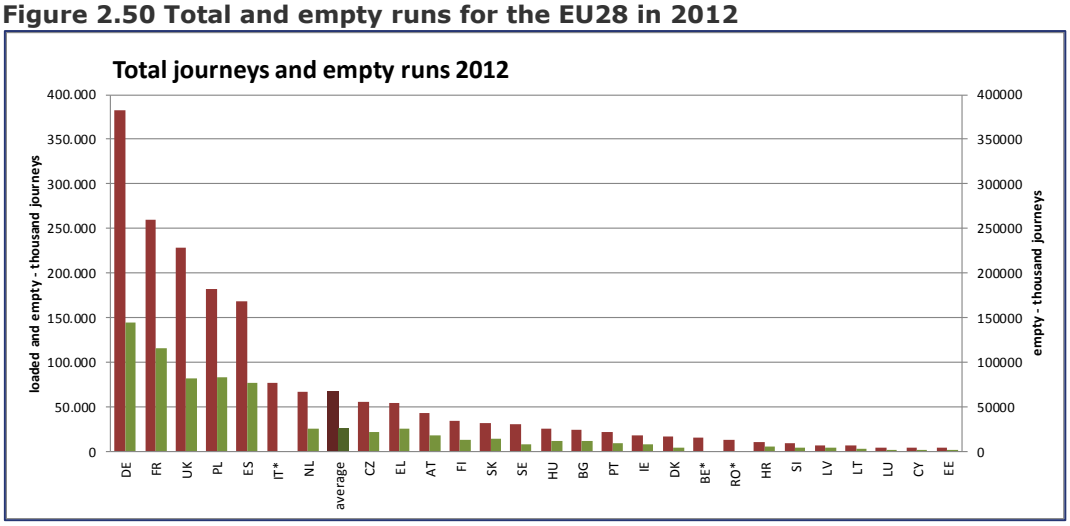
The relative figures are best suitable for direct comparison and show that Russia and the USA reach the highest extra-EU values, comparable directly only to those of Luxembourg and Latvia. The EU average turns out to be far below that of Russia or the USA. China's figure is also far higher than that of the EU average. With 1.450 tkm per head of population in India, it holds a very low value that is only larger than Cyprus.

Total journeys and empty runs – utilisation aspects of road transport

Beyond performance indicators that show the amount of tonnes moved, it is necessary to take into account some more qualitative aspects of the kind of transports used. The comparison of total run and empty run figures in the road transport sector in particular can serve for assessment.

The following figure illustrates the number of journeys that are produced in 2012 (dark red bars). The green bar on the right-hand side of each dark red bar indicates the number of empty runs.

Figure 2.50 Total and empty runs for the EU28 in 2012



Source: Fraunhofer SCS / based on data from Eurostat / own estimates / * value missing for empty journeys.

An unweighted average comes to lie at 40% of journeys that are performed empty. The weighted average calculates to just above 38% and is shown in the dark green bar of the average record. The highest figures are calculated for Greece, Bulgaria, Latvia, Hungary, Poland, Spain, Croatia and Cyprus. All of these countries can be identified as Member States with lower than average cost levels by the logistics cost analyses. The connection to costs levels seems plausible.

The pressure to avoid empty runs to spare resources seems not to be as high as in the high cost countries like Sweden, Denmark, Luxembourg, Germany or the UK, which lie under the average share of empty runs. The longer the transport distances, the higher fixed costs or transports are, which plays a role in avoiding empty runs. International transports with much higher distances need to be made efficient by consolidation of loads to fill capacities and to generate return on invest (fixed costs).

Eastern European Member States' companies carry out transports to other countries. Backloads are not always available for the trip back to the point of origin, so drivers are forced to make empty trips even if cabotage restrictions[40] were relieved substantially in the past years.

Productivity of logistics service providers

So far, performance has been shown by absolute numbers for tonnes and tonne-kilometres, and relative figures for tonne per inhabitant performance and the utilisation of transports in the EU Member States. In addition to that, the productivity of personnel shows a high deviation among the countries of the EU.

The following table shows the productivity of the persons employed per logistics service sector. Productivity shows the gross value added per unit of labour in thousand euros. As added value can be negative through loss, the productivity can reach negative values as well.

[40] Cabotage is the term for transports in a country that are carried out by a vehicle that is registered in another country.

Table 2.7 Data table – productivity per person employed in thousand € in 2011 for selected Member States

Productivity per person employed	H492 Freight rail transport	H494 Freight transport by road and removal services	H495 Transport via pipeline	H502 Sea and coastal freight water transport	H504 Inland freight water transport	H512 Freight air transport and space transport	H521 Warehousing and storage	H522 Support activities for transportation	H532 Other postal and courier activities
EU 27	40	34	316	141	70	64	54	68	30
Czech Republic	30	15	c	c	14	120	42	33	19
Germany	74	40	702	236	81	171	47	61	24
Estonia	42	20	nc	c	nc	c	50	56	18
France	47	40	317	28	65	93	61	106	c
Croatia	23	15	c	67	16	c	22	27	15
Cyprus	nc	25	nc	-85	nc	nc	47	64	24
Latvia	C	15	c	32	11	19	18	27	10
Lithuania	27	14	nc	33	c	24	17	30	11
Hungary	31	16	333	5	-7	42	66	32	12
Netherlands	c	60	2.037	126	C	c	93	101	c
Austria	65	47	967	nc	43	80	134	107	c
Poland	25	15	181	71	45	36	20	24	15
Portugal	c	23	951	63	nc	153	61	87	26
Romania	15	10	c	27	19	50	18	24	c
Slovenia	c	23	c	50	c	94	207	77	c
Finland	c	49	c	91	52	c	51	58	34
Sweden	80	51	nc	57	52	c	76	69	c
United Kingdom	68	43	1.306	360	68	122	47	109	c
Norway	88	68	1.145	249	c	88	91	129	c
Switzerland	103	77	c	c	81	85	104	108	25

Source: Fraunhofer SCS calculations and table / based on data from Eurostat for 2011.[41]

The highest productivity is reached in the transport via pipeline segment. The UK and the Netherlands in particular hold high values here. As the comparability to the other transport sectors is not directly given, these values should not be over interpreted[42].

The second highest values are to be found in the sea and coastal freight water transport sector. Surprisingly, this sector also holds one of the very few negative values in Cyprus. Values of about € 50 – € 70 are reached in the sectors inland freight water transport (H504), freight air transport (H512), warehousing and storage (H521) and support activities for transportation (H522). Except for the last mentioned sector, these sectors carry out hub-oriented services, i.e. for the operation in these fields, a physical hub or port is of high relevance.

Going down the rows, there are nations with far below average[43] values like Latvia and Lithuania in the warehousing sector. The lowest overall productivity figures are reached in freight rail transport, road freight sector and other postal and courier services. These sectors carry out the physical transports via road and rail infrastructures, which are labour-intensive. In general, the figures show the relation of the overall productivity per person employed, i.e. high figures result from a low workforce or a low overall productivity. Sea and coastal freight water transport and inland freight water transport show one negative value for the most recent year each.

The following figure displays the development of the productivity of the transportation and storage sector for the EU27 (gross added value per person employed).

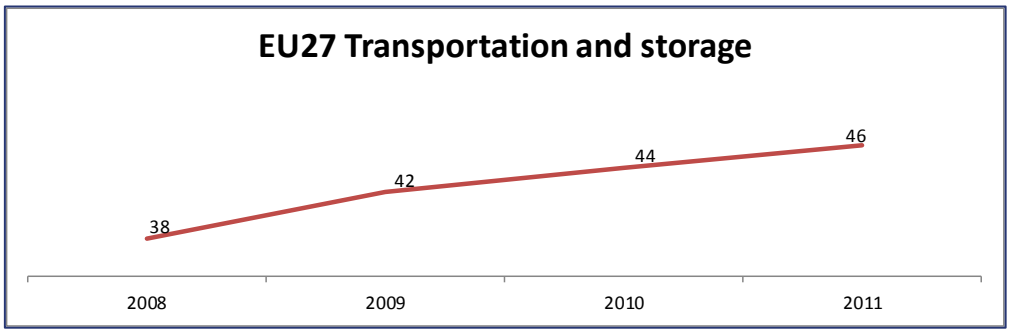
41 Last availability check for more recent data in July 2014. "C": value confidential "nc": "no company" - no business activities in this field.

42 The extraordinarily high figure for Slovenia with over € 200,000 of gross value added per employee in the warehousing and storage sector, which exceeds all other values by far, is doubtable. A look at the timeline shows that the value rose from under 20 in the years 2008 and 2009 to over 200 in 2011. But turnover and production values also rose in this period of time.

43 Averages drawn from Eurostat.

The average productivity for the transportation and storage sector grew from € 38,000 in 2008 to a value of € 46,000 for 2011.

Figure 2.51 Development of productivity in the transportation and storage sector from 2008 to 2011



Source: Fraunhofer SCS / based on data from Eurostat, 2010 value estimated as mean from 2009 and 2011.

The EU averages in the nine subsectors in the table are given in the first row of the table. The lowest values are reached in the courier services sector and the road transportation sector. First of all, the road freight sector consists of very small companies (by the number of persons employed per enterprise) and in addition, shows productivity of the lowest level. Regarding the performance issues, some countries turn out to have all comparable values under the level of the European mean. Among them are Croatia, Cyprus, Latvia, Lithuania, Poland and Romania. On the contrary, there is no Member State that has above average values in every sector and the productivity topic turns out to be multi-layered[44].

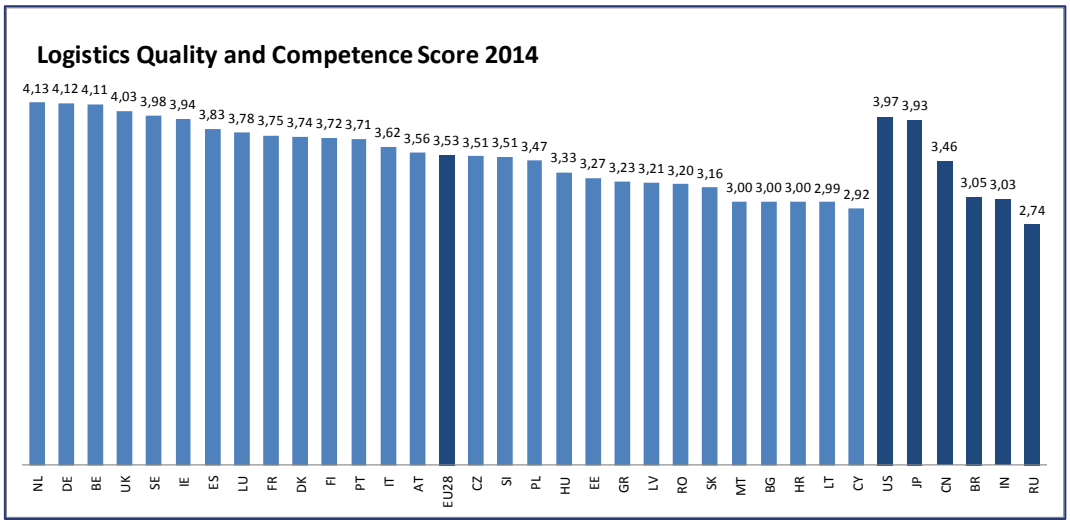
2.6.4 Conclusions on performance of logistics systems

The overall performance of the logistics sector is not easy to determine. All aspects shown in the sections above play their part in estimating the performance of logistics and transports carried out within the Member States of the EU.

Figure 2.52 displays results of the World Bank study of 2014 for the indicator logistics quality and competence. As the survey is perception-based and therefore a bias through subjective rating cannot completely be ruled out, the objectivity cannot be fully guaranteed. However, the reports are repeated since 2007 and provide harmonious datasets for countries worldwide and comparisons can easily be drawn. One of the indicators for which ratings are collected by the World Bank study is the Logistics Quality and Competence that is seen by the respondents.

[44] Recommendation for further reading: Tanning, T.; Tanning, L. "Labour productivity analyses of gross value added and turnover per person employed of transportation companies of European countries in 2005 – 2011." Int. Journal of Economic Theory and Application, 2014, 1(1), p 9-18.

Figure 2.52 World Bank – Logistics Quality 2014 for the EU28 and selected extra-EU countries

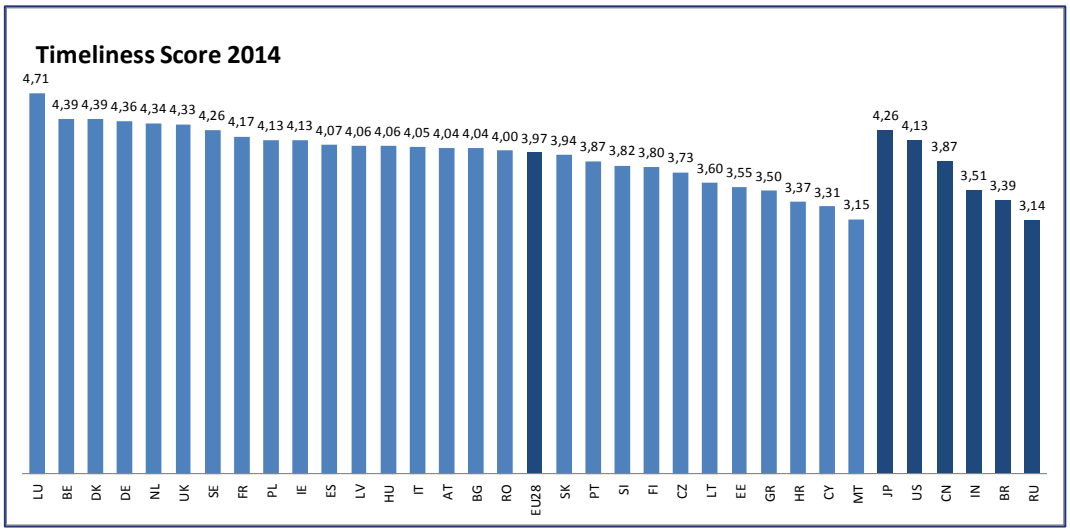


Source: Fraunhofer SCS / based on data from World Bank 2014.

The graph seems very similar to that of the infrastructural comparison in Figure 2.52. The content of the question is the quality of logistics and competence in logistics. With a mean of 3.53, half of the EU28 Member States are above, while the other half are below that value. With an overall average of 2.85 for the 160 countries assessed by the study, the European logistics sector is above average. Compared to the extra-EU countries on the right, the EU28 (unweighted average) is perceived as providing logistics quality that is comparable to China. Combining the average for the five largest economies (DE, FR, UK, IT, ES) gives an average of 3.87, which is above the score for China, Brazil, India and Russia, but below Japan and the USA.

The following Figure 2.53 shows the World Bank "Timeliness" score. This indicator is used to measure the "frequency with which shipments reach consignees within scheduled or expected delivery times". It is striking that the best three European countries in the diagram are very small countries but, of course, this condition makes delivery easier for them than it does for Member States with much larger landmasses like Romania, Hungary, France or Spain.

Figure 2.53 World Bank – Timeliness score 2014 for the EU28 and selected extra-EU nations



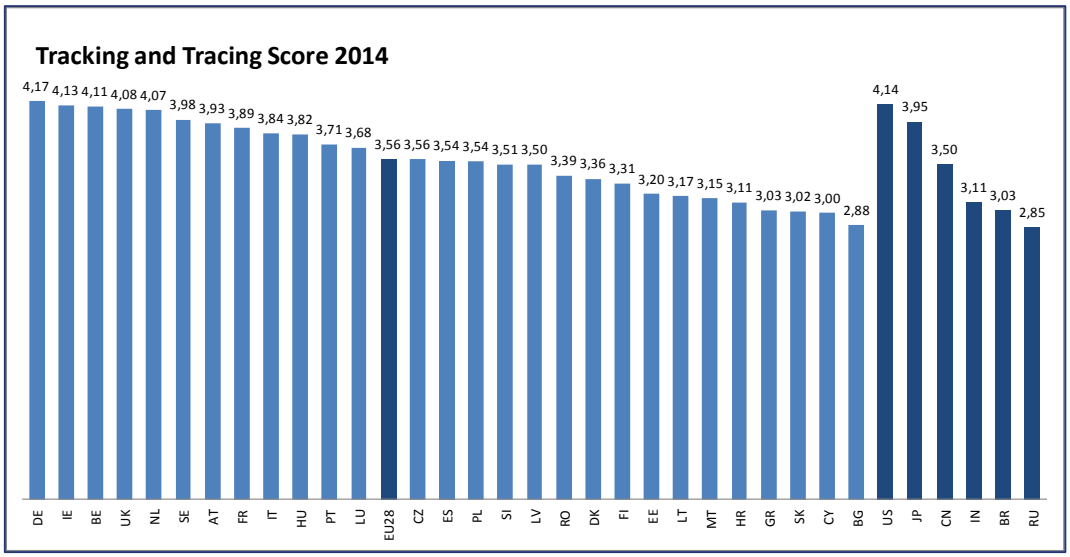
Source: Fraunhofer SCS / based on data from World Bank 2014.

Luxembourg turns out to hold the maximum score within the whole sample (160 countries have been assessed by the World Bank). The European average of 3.97 is far above the general average of all the countries assessed (3.25).

The European average score is also above the scores for China, India, Brazil and Russia, but falls short of reaching the USA or Japan's scores. Seven of the EU Member States can compete with the score of Japan, at least.

Figure 2.54 complements the intra-EU/extra-EU comparisons with the indicator "Tracking and tracing", which measures the ability to track and trace the consignments within the countries logistical systems. Tracking and tracing is an innovative service that tracks where consignments are – giving customers the possibility to monitor their goods flows – and enhances planning.

Figure 2.54 World Bank – Tracking and tracing score 2014 for the EU28 and selected extra-EU nations



Source: Fraunhofer SCS / based on data from World Bank 2014.

The maximum value is found for Germany. Compared to the average for the complete sample of 160 countries with 2.90, only Bulgaria falls short of reaching this score. The mean of the EU28 exceeds the scores for China, India, Brazil and Russia. The USA and Japan show scores above the EU28 average. Japan (ninth rank among the 160 observed nations) and the USA (second rank regarding tracking and tracing score) turn out to be the best performers according to the World Bank report. The USA score is only exceeded by Germany, while the Japanese score is exceeded by six European Member States. Among them are Germany and the UK – two of the biggest economies in the EU.

2.6.5 General conclusions

In general, it can be stated that the performance of the European logistics sector is varying. The performance of Member States varies regarding different aspects like economic strength, strength of industrial sectors, geographical conditions, infrastructural quality or population density. This is reflected by the logistics sectors, which shows high variance between the highest and lowest values. The comparison to the EU mean value can show that not every country is competitive compared to the EU's best scores (or to extra-EU countries). Starting with the infrastructure, which is fundamental for effective services, the average value for the EU28 divides Europe into Western (above average infrastructure condition rating) and Eastern (below average rating) parts.

Strongly depending on the economic strength and size of the Member States, the absolute figures in tonnes and tonne-kilometres are very different across Europe. 2009, when the economic crisis affected markets worldwide, is noticeable in almost every timeline assessed in the analysis.

A general distinction between large economies, mainly in Western Europe, and smaller economies with much less tonnes moved can be derived from the tonnes and tonne-kilometres assessment. Poland and the Czech Republic turn out to be the Central and Eastern European Member States with the highest figures. The tonnes per population evaluation is the first that shows changed insights. Luxembourg, Estonia and Finland, as well as Latvia, turn out to be smaller countries that handle high amounts of tonnes per head of population. Spain, France, the UK and Italy show values below average here, although absolute figures on tonnes moved are higher in these large economies.

40% of road transports are performed with empty runs. The pressure to avoid empty runs seems to be higher in countries with higher wages. Productivity varies in the multi-layered economies of Europe. Observable is the fact that none of the Member States has the above average figures for all of the nine subsectors that have been taken into account in this analysis. The markets are complex, but general learnings are that the road transportation sector holds the lowest productivity figures for persons employed.

The performance of Europe regarding the general comparison in terms of logistics quality and competence to the rest of the world shows that all the EU28 Member States are slightly above average. But compared to important economies like the USA, China and Japan, many of the Member States have a backlog to be reviewed.

3. Logistics trends and scenarios

3.1 Introduction

The aim of this chapter is to provide insight into the current and future trends of the European logistics sector, with a view of supporting the identification of relevant policy options.

The structure of this chapter is as follows:

Firstly, the **external factors** (please see the definition box below) are described, which impact the logistic sector but remain beyond the area of influence of the transport and logistic industry (cf. chapter 3.2).

The logistic sector partially adapts to these changing external factors with **logistic (business) strategies** (see the definition box below). These strategies, when broadly and consistently implemented, result in identifiable **industry trends** in the logistics sector (see the definition box below). These industry trends are identified and described (cf. chapter 3.3) on the basis of analytical work conducted in the earlier part of the study.

One main objective is to assess the major factors shaping the industry. These factors were assessed in terms of their effects on the freight transport and logistics sector, as well as their economic, social and environmental impacts in the context of an abridged impact assessment (cf. Chapter 4). The assessment was conducted with the support of criteria that aim to characterise specific trends in terms of their positive or negative impacts and whether or not the associated problems will be addressed by the industry[45]. The outcome of this assessment indicates future problems regarding the overall European transport policy objectives (as outlined in the White Paper or other relevant EU documents), which the industry is unable or unwilling to address and which could be considered by the EU transport policy. These topics will be discussed within the subsequent chapter.

Finally, possible future scenarios for the EU logistics sector were developed based on the assessment of the combination of external factors and logistic trends (cf. paragraph 3.5).

Definitions

External factors
An external factor is a development beyond the area of influence of the transport and logistics industry, which may have a direct/indirect effect on the freight activities related to logistics and transport and thus on logistic procedures, field of activity or intensity.

Logistic (business) strategies
Companies react to the external factors with relevant logistics strategies. As external factors are continuously changing, logistic strategies also have to continuously develop. Logistic strategies can be considered as a procedure, activity field or change of intensity, which is a business reaction to the development of one or more external factors (cf. above).

Logistics trends
A logistic strategy that is used permanently and widely by the logistics sector is termed as a logistic trend.

[45] The terminology "positive impacts", "negative impacts" and "problems" are subsequently used regarding the overall European transport policy objectives as outlined in the White Paper or other relevant EU documents.

Scenario
A scenario is based on a conceivable overall ("global") development, which assumes a more or less likely development over time. A scenario implies the change of one or more external factors, which may impact one or more future logistic trends. Thus a scenario comprises a modification of the overall logistical procedure of production and/or transportation as a result of logistical reaction(s). Hence, a scenario consists of a variation of the development of external factors over time and the subsequent reaction of the logistic system i.e. variation of logistic trends.

Baseline scenario
The baseline scenario comprises the most probable/likely future development of external factors. Within the EU fact finding project Lot1, it is assumed that the EU Reference Scenario 2013 (European Commission (2013a) is the most current, reliable, reasonable and sufficient scenario to further build upon.

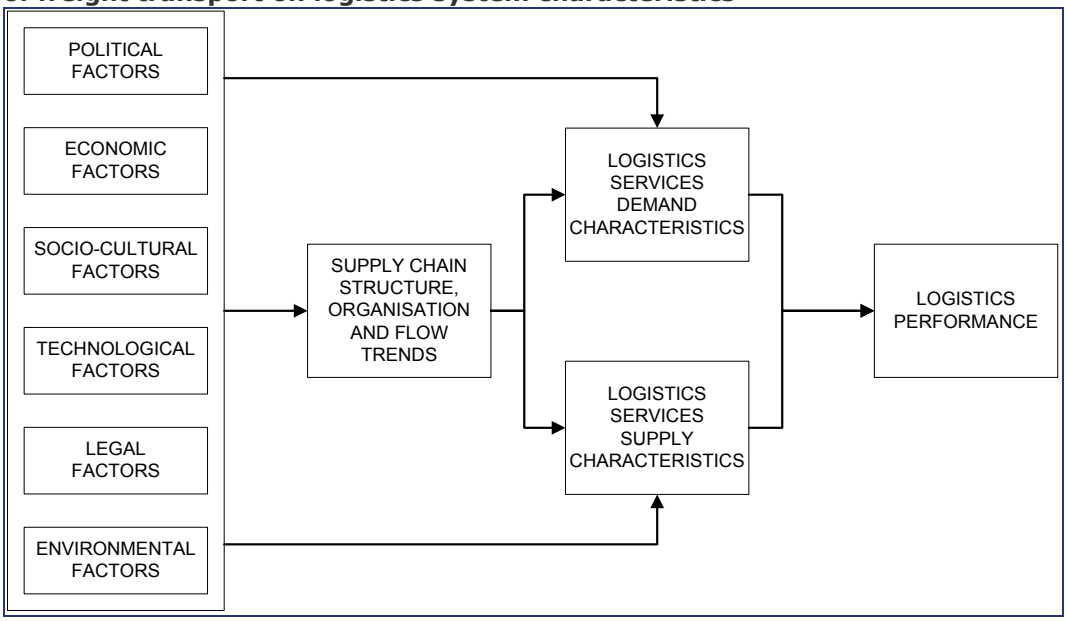
Policy option
A policy option consists of a package of various policy measures that addresses the developments within the specific field of interest (transport/production/logistic).

3.2 Identification of external factors

To support the identification of external factors, a comprehensive desk research exercise was carried out to obtain insights from existing case studies, essential background information, best-practices and surveys relevant for ranking current, emerging and possible external factors influencing the logistics sector and associated supply chain. The literature researched is indicated in Annex I. This section presents the results of this research.

The conceptual framework (adapted from BE LOGIC; 2009) for examining the impact of the external factors on the characteristics of the logistics system is presented in Figure 3.1. The same framework is used within the chapter on performance indicators.

Figure 3.1 Analytical framework for assessing the impact of the external environment of freight transport on logistics system characteristics



Source: Based on BE-LOGIC 2009.

The PEST analysis (Political, Economic, Socio-cultural and Technological) is a widely used strategic framework for the systematic evaluation and analysis of the external (macro-) environment of complex dynamic systems/organisations. This study adopts

an extended version of the PEST framework, entitled PESTLE[46] (Political, Economic, Socio-cultural, Technological, Legal, Environmental factors) in order to consider legal and environmental factors impacting the logistics sector. The PESTLE analysis classifies the external environment of the logistics system in six dimensions and identifies specific factors under each of them. PESTLE drivers influence the development of strategies and trends determining the way in which supply chains are structured, organised, and operated ().

The six dimensions of PESTLE comprise:

1. Political factors - encompassing national and supranational (EU) interventions in the market, such as taxation, tariffs, trade barriers, market (de-)regulation, as well as issues related to public infrastructure;
2. Economic factors - such as GDP, market development, interest rates, cost of capital, exchange rates, price levels (inflation rates);
3. Socio-cultural factors - aspects which affect the demand side and concern demographic growth and structure, cultural aspects, consciousness (health, environmental), etc.;
4. Technological factors - comprising developments such as R&D activity, automation, information and communication technologies (ICT), technology development, innovation dissemination;
5. Legal factors - including consumer and social laws, health and safety regulation, as well as competition rules;
6. Environmental factors - covering ecological and environmental aspects such as climate change, transport externalities (noise emissions and air pollutants), energy and environmental legislation.

The application of this analytical framework leads to the identification of dependencies between external environment factors, supply chain trends and logistics system characteristics. The time horizon of the analysis of the external environment factors is 2050 (depending on data availability).

Through a process of identifying, collecting and aligning the external factors by means of the abovementioned framework, the following external factors were selected, impacting the future logistic sector as relevant for the further assessment. Table 3.1 provides an overview of selected factors and resulting logistics sector strategies and trends. In addition, the first column (values in brackets [ ]) comprises the results from the online survey concerning the average level of relevance (1 – no relevance; 5 – very high relevance) of the main external factors impacting the development of the logistics sector.

Table 3.1 Overview of external factors and resulting logistic strategies and trends

External factor	Resulting logistic strategies and trends
Political factors	
EU level policies (partly assumptions of EU Reference Scenario 2013)	
Transport industry deregulation	Global sales channel, flexible supply base, consolidation, outsourcing, agility, multimodality
Privatisation/deregulation of railways [Relevance 3.51]	Centralisation, consolidation
Energy/environmental taxation	Off- /nearshoring, global sales channel, consolidation, outsourcing, reverse logistics, multimodality
Transport infrastructure development [Relevance 4.10]	On- /nearshoring, global sales channel, centralisation, multimodality

[46] Numerous other variations of PEST analysis have been developed (e.g. including legal and ethical issues) according to the specific analytical requirements of the problem at hand).

External factor	Resulting logistic strategies and trends
Trade barriers (Extra-EU) [Relevance 3.80]	Near-/offshoring, global sales channel, flexible supply base, outsourcing, supply chain integration
Economic factors	
European development	
Economic activity/GDP growth	On-nearshoring, global sales channel, centralisation, outsourcing
Wealth gap	Global sales channel, flexible supply base
EU Market enlargement [Relevance 3.48] A. Candidate countries B. Associated countries with DCFTA	On-/nearshoring global sales channel, flexible supply base, centralisation, outsourcing
Global development	
Globalisation of the economy (industries/services) [Relevance 4.20]	Off-/nearshoring, global sales channel, centralisation, flexible supply base, outsourcing, supply chain integration, agility
Shift of financial market power	Offshoring, global sales channel, centralisation
Socio-cultural factors	
Demographic structure and composition	
EU population development [Relevance 3.50]	Centralisation, consolidation, search for talents/staff retention
Ageing society [Relevance 3.66]	Centralisation, E-commerce/E-procurement, search for talents/staff retention
Urbanisation [Relevance 3.88]	Centralisation, consolidation, Search for talents/staff retention
Change in social/market behaviour	
Proliferation of electronic business	Offshoring, E-commerce/E-procurement, global sales channel, centralisation, flexible, supply base, postponement, supply chain integration, agility, ICT logistics
Environmental awareness [Relevance 4.28]	Onshoring, global sales channel, reverse logistics, E-commerce/E-procurement, multimodality
Changes in social and consumer behaviour characteristics [Relevance 2.98]	Global sales channel, centralisation, Flexible supply base, E-commerce/E-procurement, consolidation, postponement, agility
Technological factors	
Vehicle and cargo handling technology advancements	
Vehicle and transport technologies (Cleaner vehicles)	Offshoring, global sales channel, flexible supply base, outsourcing, multimodality
3D printing	Onshoring, E-commerce/E-procurement, flexible supply base, global sales channel, postponement, supply chain integration, agility, ICT logistics
Advancements in ICT	
IC Technology (ITS)	Global sales channel, centralisation, flexible supply base, consolidation, postponement, supply chain integration, agility, E-commerce/E-procurement, ICT logistics
R&D and innovative solutions for logistics	ICT logistics, agility, consolidation, supply chain integration
Supply chain resilience	Global sales channel, centralisation, flexible supply base, consolidation, postponement, agility, supply chain integration
Legal factors	
Social regulation	Off-/nearshoring, search for talents/staff retention
Safety and security regulations	Off-/nearshoring, centralisation, consolidation
Administrative procedures	Off-/nearshoring, global sales channel, centralisation, supply chain integration
Environmental factors	
Natural deposits	
Fossil fuel scarcity [Relevance 4.42]	Onshoring, global sales channel, flexible supply base, consolidation, multimodality, ICT logistics

External factor	Resulting logistic strategies and trends
Energy costs [Relevance 4.55]	Offshoring, global sales channel, centralisation, flexible supply base, consolidation, outsourcing, multimodality, reverse logistics
Raw material scarcity [Relevance 3.98]	Flexible supply base, reverse logistics
Ecological consequences	
Transport-related emissions and climate change [Relevance 3.89]	Flexible supply base, supply chain integration
Transport-related emissions and climate change [Relevance 3.89]	Consolidation, multimodality, reverse logistics
Internalisation of external costs [Relevance 3.96]	ICT logistics, multimodality

Remark: Numbers in [ ] represent results of questionnaire dated 06.02.2014; * not conclusive, ** weighted average 1: no relevance, 2: low relevance, 3: average relevance, 4: high relevance 5: very high relevance; Due to the tight project time plan of the project and the respective early stakeholder survey, not all external factors have been assessed. Some were amended at a later project phase.
Source: ProgTrans; AUEB, Ecorys.

The questionnaire results stated above indicate that the external factors assessed are of relevance to the logistic sector, in particular: fossil fuel scarcity (relevance 4.42), energy costs (4.55), environmental awareness (4.28), globalisation of the economy (4.2) and transport infrastructure development (e.g. TEN-T) (4.1).

In subsequent sections, the above mentioned external factors are discussed in detail, with the descriptions indicating the results of the LogMan and BE-Logic projects.

3.2.1 Political factors

Transport industry deregulation

Description:

- The deregulation of transport modes constitutes the most important policy development in European transport since the mid-1980s. The degree of deregulation varies across transport modes, e.g. cabotage rules, "railway packages", Single European Sky initiative, or initiatives for "European maritime transport space without barriers";
- An ongoing process for improving the institutional framework of European transport is underway, aiming to strengthen competition, both within and between transport modes, to improve the efficiency levels of the transport modes and the subsequent introduction of international players.

Legal basis:

- Cabotage rules are described by Regulation 1072/2009/EC of 14 May 2010[47]. This regulation replaced Regulations (EEC) 881/92[48] and (EEC) 3118/93[49], as well as Directive 2006/94/EC[50] and allows the national carriage of goods for hire or reward carried out by non-resident hauliers on a temporary basis in Member States. In particular, the haulier must have entered the host Member

[47] REGULATION (EC) No 1072/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 on common rules for access to the international road haulage market (recast).
[48] COUNCIL REGULATION (EEC) No 881/92 of 26 March \ 992 on access to the market in the carriage of goods by road within the Community to or from the territory of a Member State or passing across the territory of one or more Member States.
[49] COUNCIL REGULATION (EEC) No 3118/93 of 25 October 1993 laying down the conditions under which non-resident carriers may operate national road haulage services within a Member State.
[50] DIRECTIVE 2006/94/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 December 2006 on the establishment of common rules for certain types of carriage of goods by road.

State with a laden vehicle, carrying and delivering goods in the course of the incoming cross-border transport. Cabotage transport is limited to an overall duration of seven days and to a maximum of three operations. The aim of the new Regulation is to improve the efficiency of road freight transport by reducing empty trips after the unloading of international transport operations;

- Railway packages: The White Paper of March 2011 proposes a strategy to revitalise the Community's railways by creating a sound financial basis, ensuring freedom of access to all traffic and public services, and promoting the integration of national systems and social aspects. In January 2013, the Commission adopted its proposals for a Fourth Railway Package covering the issues of rail governance, market opening for domestic passenger rail transport, competitive tendering for Public Service Obligations contracts and interoperability ensured by harmonisation of technical authorisations and safety certificates by the European Railway Agency;
- Single European Sky (SES) initiative: The SES legislative framework consists of four Basic Regulations (549/2004[51], 550/2004[52], 551/2004[53] and 552/2004[54]) covering the provision of air navigation services (ANS), the organisation and use of airspace, and the interoperability of the European Air Traffic Management Network (EATMN). The four Regulations adopted in 2004 (the SES I Package) were revised and extended in 2009 with Regulation 1070/2009/EC[55], which aims to increase the overall performance of the air traffic management system in Europe;
- The Communication (COM(2009)10 final[56]) and action plan aim to establish a European maritime transport space without barriers (non-binding) and extends the scope of the internal market to intra-EU maritime transport by eliminating or simplifying administrative procedures in intra-EU maritime transport. The aim is to make intra-EU maritime transport more attractive, more efficient and more competitive, and to increase efforts in protecting the environment.

Relevance for the logistic market:

- Transport industry deregulation is expected to continue, leading to a reshaping of the modal split and an increase in the supply of freight transport services, while increased competition will change the performance of the freight transport system (e.g. fleet utilisation, freight rates, lead-times, service quality/reliability);

  However, considering the modal split development of freight transport for inland modes between 1995 and 2012 it is evident that the share of road freight transport increased slightly to a peak of 73.4% in 2009, but subsequently decreased by 1.8%by 2012. In contrast, the share of rail freight transport declined between 1995 and 2009 from 20.3% to 15.7%, but has increased by 1.5% points since then. For the most part, the share of inland waterway transport stagnated during this period. When trying to put these developments into the context of transport industry deregulation, one should expect that, in general, deregulation would lead to increased competition (thus

[51] REGULATION (EC) No 549/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 10 March 2004 laying down the framework for the creation of the Single European Sky.

[52] REGULATION (EC) No 550/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 10 March 2004 on the provision of air navigation services in the Single European Sky.

[53] REGULATION (EC) No 551/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 10 March 2004 on the organisation and use of the airspace in the Single European Sky.

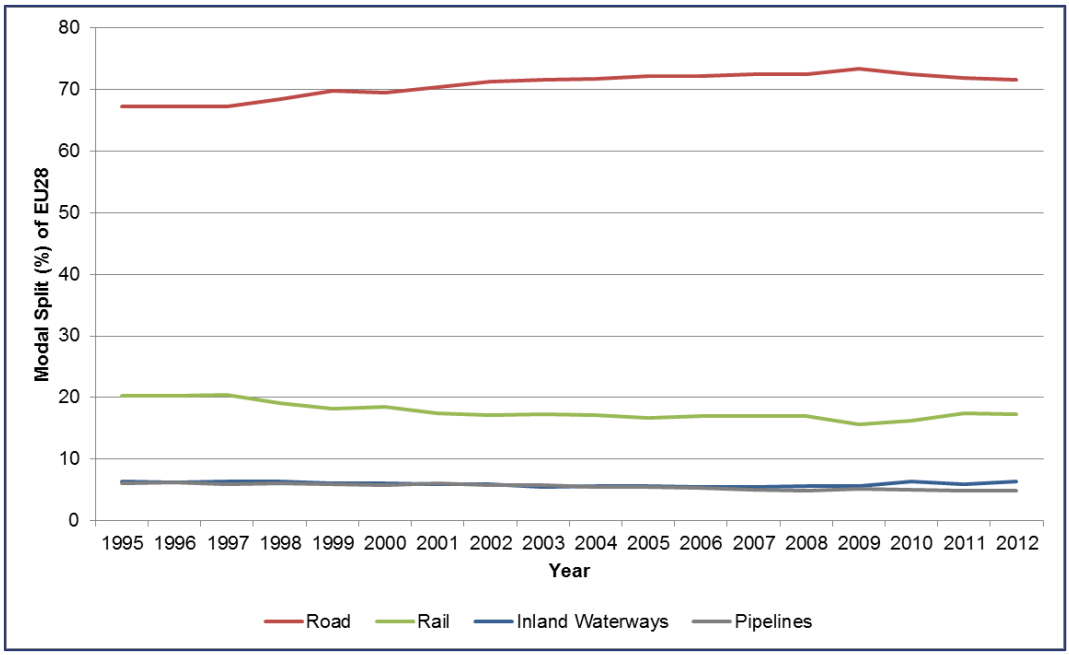
[54] REGULATION (EC) No 552/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 10 March 2004 on the interoperability of the European Air Traffic Management Nnetwork.

[55] REGULATION (EC) No 1070/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 amending Regulations (EC) No 549/2004, (EC) No 550/2004, (EC) No 551/2004 and (EC) No 552/2004 in order to improve the performance and sustainability of the European aviation system.

[56] Communication and action plan with a view to establishing a European maritime transport space without barriers.

the more deregulated the mode, the higher the modal share of this mode). Interestingly, this anticipated outcome seems to be reflected in the modal share figures in particular for road transport. Nevertheless, it is obvious that the deregulation of the transport industry is not impacting the freight transport sector alone. Thus a simple comparison of modal shares will not allow identification of the full extent of the impact of deregulation. In fact there are further transport related factors (e.g. cost/price, technology, etc.), which affect the development of inland freight transport in the EU. In particular, economic development is the most important factor influencing the transport and logistics sector, as clearly indicated by modal split developments since 2009.

Figure 3.2 Modal split development of EU28 freight transport for inland modes 1995 – 2012



Source: Eurostat 2014d.

- Nonetheless, the rail freight sector in particular has proven that deregulation leads to substantial advantages (see quantitative analysis for 'Privatization/Deregulation of railways in the subsequent paragraphs). It is critical that transport industry deregulation continues to proceed as part of future policy-making.

Privatisation/deregulation of railways

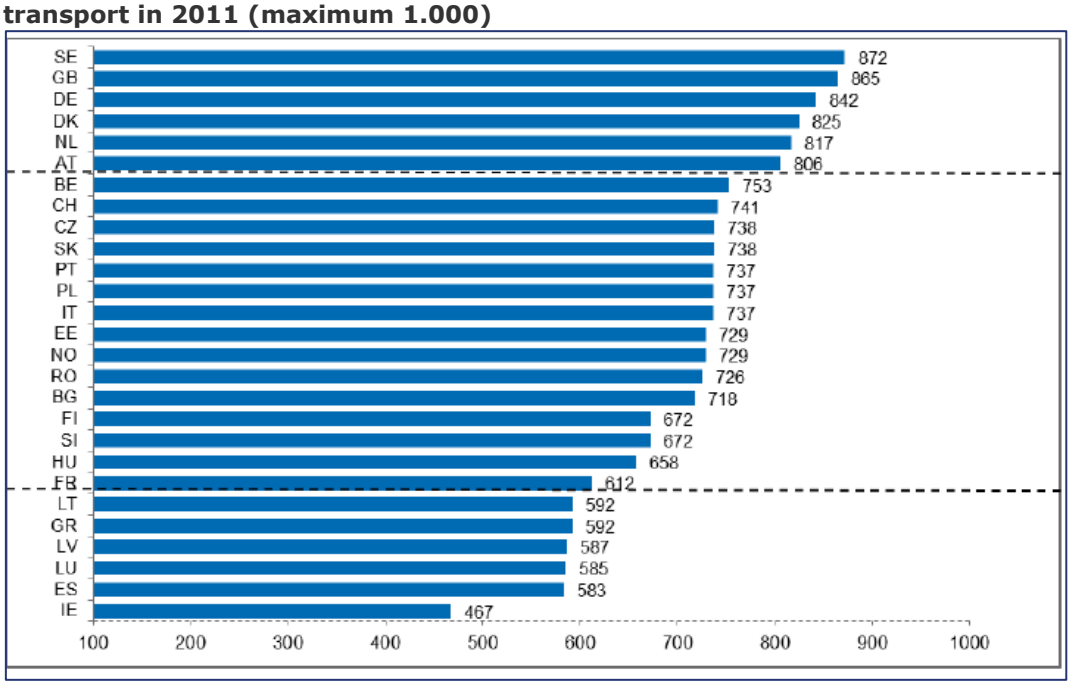
Description:

- One key aspect of deregulation aims to promote the use of (comparatively environmentally friendly) railway transport and improve the attractiveness and competitiveness of railway transportation. Furthermore, deregulation aims to improve railway transportation service quality via liberalisation of national and intra-EU cross border rail transport markets, increasing the share of rail transport, reducing financial burdens/state contributions, and enhancing the integration of Europe-wide railway system management and operations;
- The liberalisation of national markets in the EU for freight and passenger railway transport has been widely supported by EU legislation since 2007 (by Directive 91/440/EEC[57] on the development of the Community's railways). The opening of the Europe-wide railway market encourages greater competition for

[57] COUNCIL DIRECTIVE of 29 July 1991 on the development of the Community's railways.

different railway companies in order to strengthen service quality. The international rail freight market within the EU has been deregulated since 2007. However, fundamental differences remain regarding the openness of European markets e.g. between Germany (Rail liberalisation Index (LIB) Index of 842 out of 1,000) compared to Spain (LIB Index 583), as illustrated by the figure below.

Figure 3.3 Index of rail liberalisation (LIB Index) for rail passenger and freight transport in 2011 (maximum 1.000)



Source: Institut der Deutschen Wirtschaft Köln 2014: Markt und Staat im Schienenverkehr, Gutachten. Im Auftrag der Deutschen Bahn AG.

- The opening of the national and intra-EU cross border transport markets and integrated Europe-wide railway network reduces travel time and costs of transport and has positive effects on environment and health.

Legal basis:

- Since 2001, the EU has established four railway packages, based on targets communicated within the White Paper[58]. The first railway package enabled rail operators to have access to the trans-European network on a non-discriminatory basis. The second package accelerated the liberalisation of rail freight services by fully opening the rail freight market to competition from 1st January 2007. The third package, which was adopted in 2007 and remains relevant today, should complete the European regulatory framework for the rail sector. It concerns the opening of the market for rail passenger services and contains important directives for the deregulation of the rail market, such as Directive 2007/58/EC[59] on the development of the Community's railway, the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure;

[58] WHITE PAPER Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system (COM(211)144 final.

[59] DIRECTIVE 2007/58/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 October 2007 amending Council Directive 91/440/EEC on the development of the Community's railways and Directive 2001/14/EC on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure.

- Directive 2012/34/EU[60], establishing a single European railway area, recasted and merged several previous directives in particular, Directive 91/440/EEC[61] on the development of the Community's railways, Directive 95/18/EC[62] on the licensing of railway undertakings, and Directive 2001/14/EC[63] on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure;
- At the beginning of 2013, the Commission adopted a proposal for the fourth railway package. Currently, several regulations and directive are in discussion, e.g. the proposal for a regulation amending Regulation EC No 1370/2007[64] concerning the opening of the market for domestic passenger transport services by rail, and the proposal amending Directive 2012/34/EU[65] establishing a single European railway area, as regards the opening of the market for domestic passenger transport services by rail and the governance of the railway infrastructure. Furthermore the fourth railway package covers the issues of competitive tendering for Public Service Obligations contracts and a new role for the European Railway Agency.

Relevance for the logistic market:

- Liberalisation and the resulting increases in competition within railway markets, in particular within freight transportation, are expected to advance further. This implies positive effects on the logistic market, as service offerings become more flexible and the costs decline due to a broader supply of rail transport services (for example, through growth in international train operating companies, pre-arranged train paths and one-stop-shops on the core network corridors);
- One can estimate the market share of private rail freight operators in Europe increased from 0% in 2001 to 25% in 2011 (International Railway Journal 2013) and 28% in 2012 (Verkehrsrundschau 27/2014). This is even more important since the total rail freight performance in the EU28 decreased by 2.1% in the period 2005-2012. By examining the countries that are ranked highly in the index of rail liberalisation one can see that, for instance, in Germany (3rd rank) the total rail freight market share of inland transport increased by 2.8% and Sweden (1st rank) by 3.7% in the same period. In contrast, Ireland (which is at the bottom of the liberalisation index and ranked 27th) experienced an overall rail freight share decrease by 0.8%, while the Spanish rail freight share (ranked 26th) stagnated between 2005 and 2012 at 4.6%.

Energy/environmental taxation

Description:

- Energy and environmental policies aim to reduce emissions and influence consumer behaviour, to encourage the industry to select low-energy products and to enhance the use of renewable energy;

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60 DIRECTIVE 2012/34/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 November 2012 establishing a single European railway area (recast).

61 COUNCIL DIRECTIVE of 29 July 1991 on the development of the Community's railways.

62 COUNCIL DIRECTIVE 95/ 18/EC of 19 June 1995 on the licensing of railway undertakings.

63 DIRECTIVE 2001/14/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2001 on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certification.

64 REGULATION (EC) No 1370/2007 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 October 2007 on public passenger transport services by rail and by road and repealing Council Regulations (EEC) Nos 1191/69 and 1107/70.

65 DIRECTIVE 2012/34/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 November 2012 establishing a single European railway area (recast) (Text with EEA relevance).

- Directive 2003/96/EC[66] on energy taxation plays a key role in supporting these objectives. Based on a community framework proposal for taxation of all competing sources of energy, the Directive widens the scope of the European rating system for energy products, previously limited to mineral oils, to all energy products including coal, natural gas and electricity. It introduced the highest minimum tax rates for oil fuels (excluding international aviation and shipping), and coal and electricity minimum tax rates, which were introduced at extremely low levels.

Legal basis:

- The existing Energy Tax Directive 2003/96/EC[67] establishes the Community framework for the taxation of energy products and electricity, and defines the fiscal structures and levels of taxation to be imposed. It aims to reduce competition distortions between Member States as a result of divergent tax rates, as well as reduce competitive distortions between mineral oils and other energy products. It targets the efficient use of energy and allows Member States to offer companies tax incentives with respect to emissions reduction;
- Council Directive 2008/118/EC[68] concerning the general arrangements for excise duty and repealing Directive 92/12/EEC[69], entered into force in 2009 and concerns the general arrangement for excise duty levied directly or indirectly on the consumption of energy products and electricity covered by Directive 2003/96/EC.

Relevance for the logistic market:

- The Energy Tax Directive negatively affects the logistics by raising the prices of transportation services. Furthermore, but to a comparatively lesser extent, it negatively impacts energy consumption in the logistics sector;
- The following figure presents a comparison of fuel prices from 2005 to 2012 between selected Member States and the EU28. One can clearly observe that there are no significant deviations. This is also true for other Member States analysed but not integrated in the data represented by the graph below. This finding is not surprising since national fuel prices without taxes are based on world market prices.

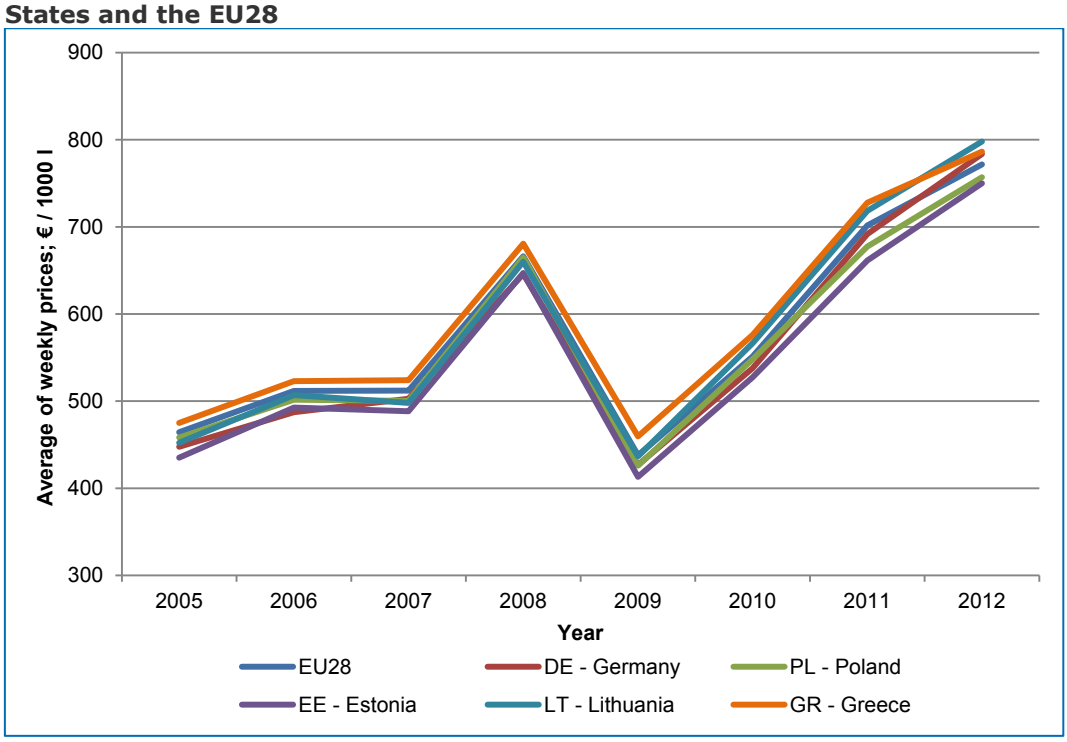
66 COUNCIL DIRECTIVE 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity (Text with EEA relevance).

67 COUNCIL DIRECTIVE 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity).

68 COUNCIL DIRECTIVE 2008/118/EC of 16 December 2008 concerning the general arrangements for excise duty and repealing Directive 92/12/EEC.

69 Council Directive 92/12/EEC of 25 February 1992 on the general arrangements for products subject to excise duty and on the holding, movement and monitoring of such products.

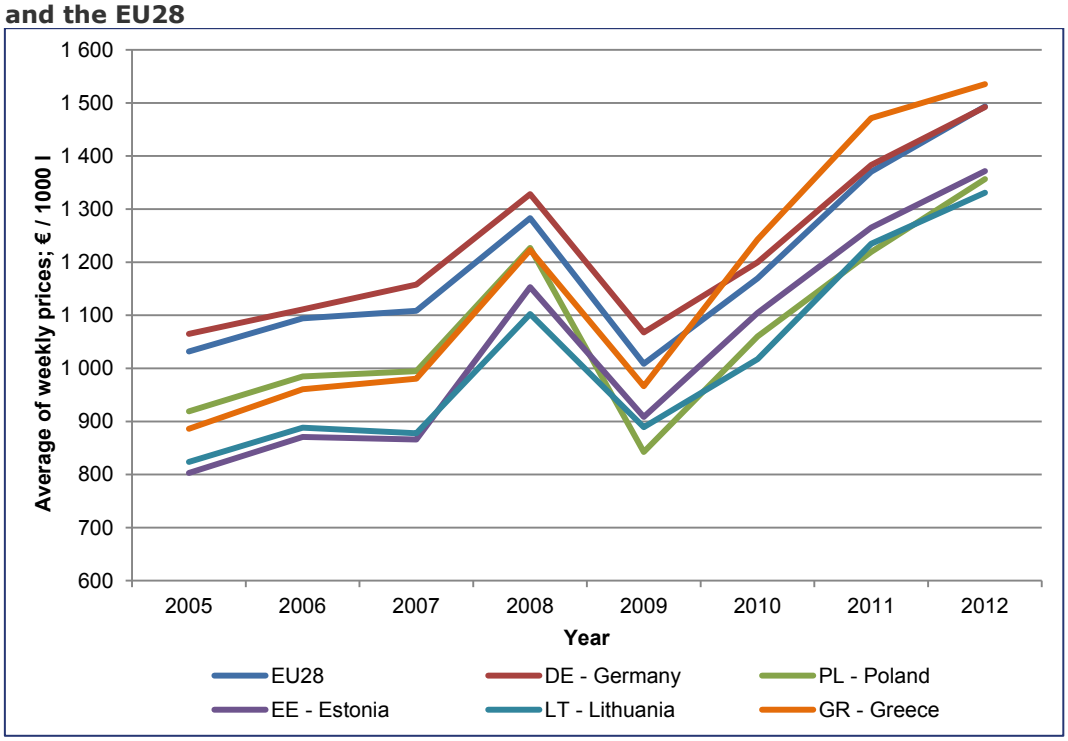
Figure 3.4 Comparison of fuel prices (without taxes) between selected EU Member States and the EU28



Source: Fraunhofer, http://ec.europa.eu/energy/observatory/oil/bulletin_en.htm.

- Examination of fuel price costs is quite different, when comparing fuel prices that incorporate taxes (cf. Figure 3.5): Here one can detect important differences between high taxed countries (e.g. Germany) and low taxed countries (e.g. Poland), which may to a certain extent explain the shift of market shares in the road haulier's industry in Europe. Moreover, this external factor feeds into the assessment regarding cabotage liberalisation.

Figure 3.5 Comparison of fuel prices (with taxes) between selected EU Member States and the EU28



Source: Fraunhofer, http://ec.europa.eu/energy/observatory/oil/bulletin_en.htm.

Transport infrastructure development (TEN-T)

Description:

- The new transport infrastructure policy of the EU comprises: The TEN-T core network, comprising nine major corridors ("core network corridors") which will connect ports, airports, intermodal terminals, railway lines, road axis, inland waterways and cross-border projects, and will ensure full coverage of the EU and accessibility of all regions. While the fairly dense "Comprehensive Network" of rail, road, inland waterways, ports and airports, made up of significant parts of corresponding national networks, would be maintained as the basic layer of the TEN-T, the "Core Network", as a subset of the Comprehensive Network will overlay it and give expression to a genuine European planning perspective. The core network is to be completed by 2030; the comprehensive network by 2050.

Legal basis:

- The respective Regulation 1315(2013)[70] defines the qualitative and quantitative targets of the core and comprehensive network in 2030 and 2050 respectively. The core network should constitute the backbone of the development of a sustainable multimodal transport network and should stimulate the development of the entire comprehensive network. It concentrates on those components of the TEN-T with the highest European added value, in particular cross-border sections, missing links, multimodal connecting points and major bottlenecks serving the objective, as set out in the White Paper on transport 2011 (COM (2011)144 final[71]). The additional target is to reduce carbon emissions from transport by 70% below 2008 levels until 2050.

Relevance for the logistic market:

- The development of the European transport infrastructure is an essential pre-condition for enhancing supply chain resilience. The development of adequate infrastructure is furthermore important for the improvement of cross border transport, the elimination of missing links and bottlenecks, and to foster multimodality. The growth of infrastructures is expected to continue in the future, as traffic is also expected to increase.

Trade barriers (extra-EU)

Description:

- Today the multilateral liberalisation of global trade only progresses slowly, which is obviously visible in the currently frozen negotiations of the Doha Development Agenda (DDA). Launched in 2001, the DDA never successfully finished due to disagreements concerning agricultural trade and politics. This decelerating pace of the liberalisation certainly did not strengthen the multilateral system and bilateral arrangements;
- Although the DDA is partly on hold at the moment, the EU remains a strong proponent of multilateral systems, which in particular can be seen from the Trade in Services Agreement (TiSA) negotiations. This future TiSA is based on the General Agreement on Trade in Services (GATS) and is meant to advance the stalled multilateral negotiations carried out under the umbrella of the World Trade Organisation (WTO) with those countries willing to continue negotiations to liberalise trade in services. The main elements of the TiSA agreement with respect to the logistic sector are: international maritime transport services,

[70] REGULATION (EU) No 1315/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU.

[71] WHITE PAPER Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system.

Information- and Communication Technology (ICT) services (including cross-border data transfers), e-commerce, computer related services, and postal and courier services;

- The results of the Public Survey on the TiSA conducted in 2013 identified several barriers to cross-border trade in countries participating in the TiSA. Namely the respondents identified discriminatory measures benefiting domestic services or service suppliers and establishment requirement to supply a service as the main barriers encountered in cross-border services trade. Furthermore, the respondents pointed to the lack of transparency in statutes and regulations, complex compliance requirements and licensing/registration requirements, data protection regulatory issues, discriminatory and excessive prudential capital requirements, and fiscal and tax implications when services are performed remotely, as problematic in cross-border services trade (results of the public survey on the Trade in Service Agreement, 2013);
- "The aim of the EU's trade and development policy is to put trade at the service of development and poverty reduction" (European Commission 2013f). Therefore, the EU considers trade openness as one necessary condition to enable economic development in emerging economies. On the other side, EU Free Trade Agreements are aiming to open new markets for goods and services, increase investments, reduce trade costs and accelerate trade by customs improvements, etc. Although current trade barriers between developing countries are much higher than between developed and developing countries, the EU economy and GDP would grow by 2.2% or € 275 m, assuming that it completes all its current and ongoing negotiations on free trade immediately;
- At the moment, the EU has 12 trade negotiations underway, e.g. U.S. (TTIP), Agreement on investments with China, Canada (CETA − Comprehensive Economic and Trade Agreement) Japan (FTA), MERCOSUR; 10 negotiations finished but not yet applied, e.g. Ukraine (DCFTA), Singapore (FTA), Eastern Europe (DCFTA with Moldova, Armenia and Georgia)[72];
- The most important free trade agreement currently negotiated between the EU and US is the TTIP (Transatlantic Trade and Investment Partnership). By removing trade barriers the TTIP aims to enhance economic growth, reduce unemployment and increase the average income in the participating countries (EU, US and some third countries). Once implemented, it is expected that TTIP will bring some € 119 bn to the EU economy;
- The Agreement on Investments with China is important due to the fact that merely 2.1% of the overall EU Foreign Direct Investments (FDI) are spent in China, despite both regions representing two of the most important economic blocks on the planet. The main purposes of the agreement are the progressive abolition of restrictions on trade and foreign direct investment, as well as promotion of the overall objectives of EU policy in the world. The EU-China investment agreement will improve access to the Chinese market and provide a high level of investment protection for EU investors in China (European Commission 2013f).

Legal basis:

- The EU trade policy is based on the Treaty on the Functioning of the European Union (TFEU) establishing the common commercial policy as an exclusive competence of the EU (Article 207). This treaty sets out the commercial policy on uniform principles, particularly with regard to changes in tariff rates and the conclusion of tariff and trade agreements relating to trade in goods and services.

[72] European Commission 2013f.

Relevance for the logistic market:

- One of the main technical/physical trade barriers affecting the logistic sector concerns the delivery time. Delivering time delays due to administrative procedures for exporting or importing, delays on the domestic leg of the transport route − including waiting time for shipment − and delays related to testing and certification of goods have negative effects on the possibilities of exporting goods to external markets;
- Lengthy and complicated (administrative) procedures, in particular for trade with third party countries outside the EU, will affect the exchange of products. Given the ongoing proliferation of modern supply chains with increasing manufacturing and retailing processes, trade barriers become more and more obstructive, especially for the increasing amount and importance of time-sensitive products (e.g. clothing, consumer electronics, etc.);
- The future development of European trade barriers and their effect on the logistics sector are hard to foresee. Although several agreements have been put in place in the past, recent developments indicate that protectionism gains more importance in the mid- to long-term future.

3.2.2 Economic factors

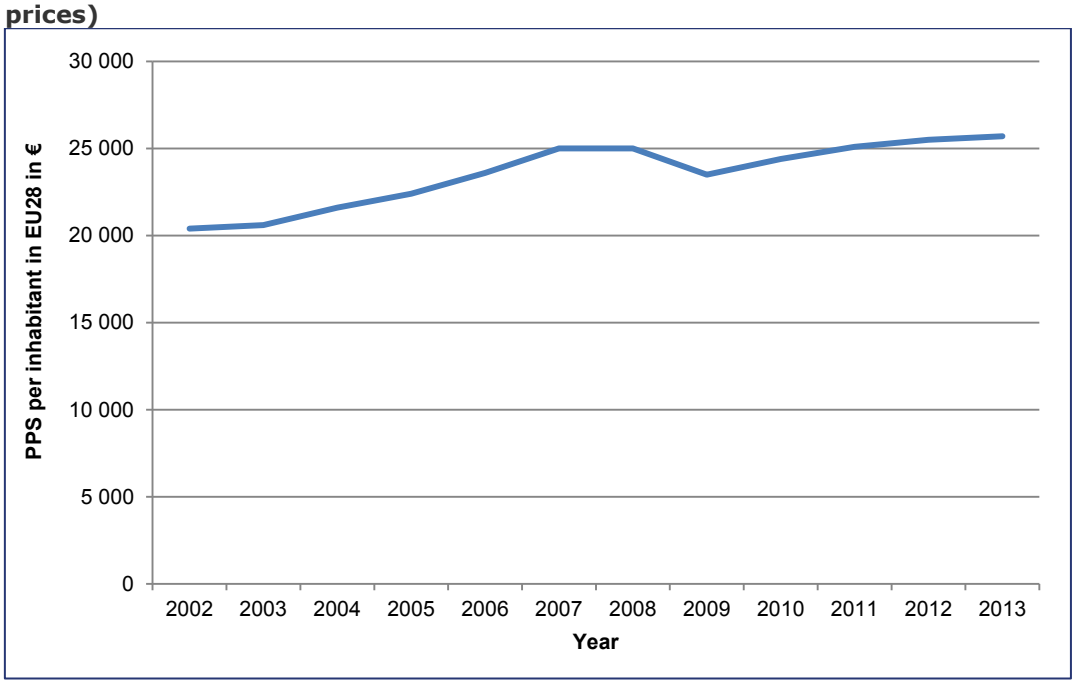
Growth and structure of economic activity (Economic activity/GDP)

Description:

- The unprecedented expansion of the European economy between 1997 and 2006 (GDP increased by more than 57% in the EU27)[73] was halted between 2007 and 2009 due to the global financial and economic crisis which also affected Europe. In 2010, the GDP of the EU27 partly recovered from the effects of this crisis, increasing by approximately 4.2% between 2009 and 2010. This development continued, albeit at a slower pace, with 3.0% in 2011[74];
- Significant differences in GDP growth exist among almost all Member States of the EU. In 2011, economic growth resumed in 25 of 27 EU countries whereas the economies of only two Member States − Portugal and Greece − contracted. Greece, in particular, was the only Member State in which the recession deepened between 2009 and 2011;
- The GDP for the EU28 (expressed in Purchasing Power Standard per inhabitant in constant prices) shows the following development, illustrated in below. Since 2011, the total GDP in PPS for EU28 Member States have again reached the pre-crisis level. The recovery starting in 2009 was ongoing until 2013, but with lower growth rates as in the period 2002-2007.
- Figure 3.6 reflects the 2013 GDP Index (in PPS) of selected countries compared to the EU28 average. As can be seen from this figure, 15 of the 39 selected countries reach a GDP per capita (in PPS) above the EU28 average, whereas 24 countries don't reach the EU28 average. Amongst the latter are new Member States (which joined the EU after 2004) but also Italy, Spain and Greece.

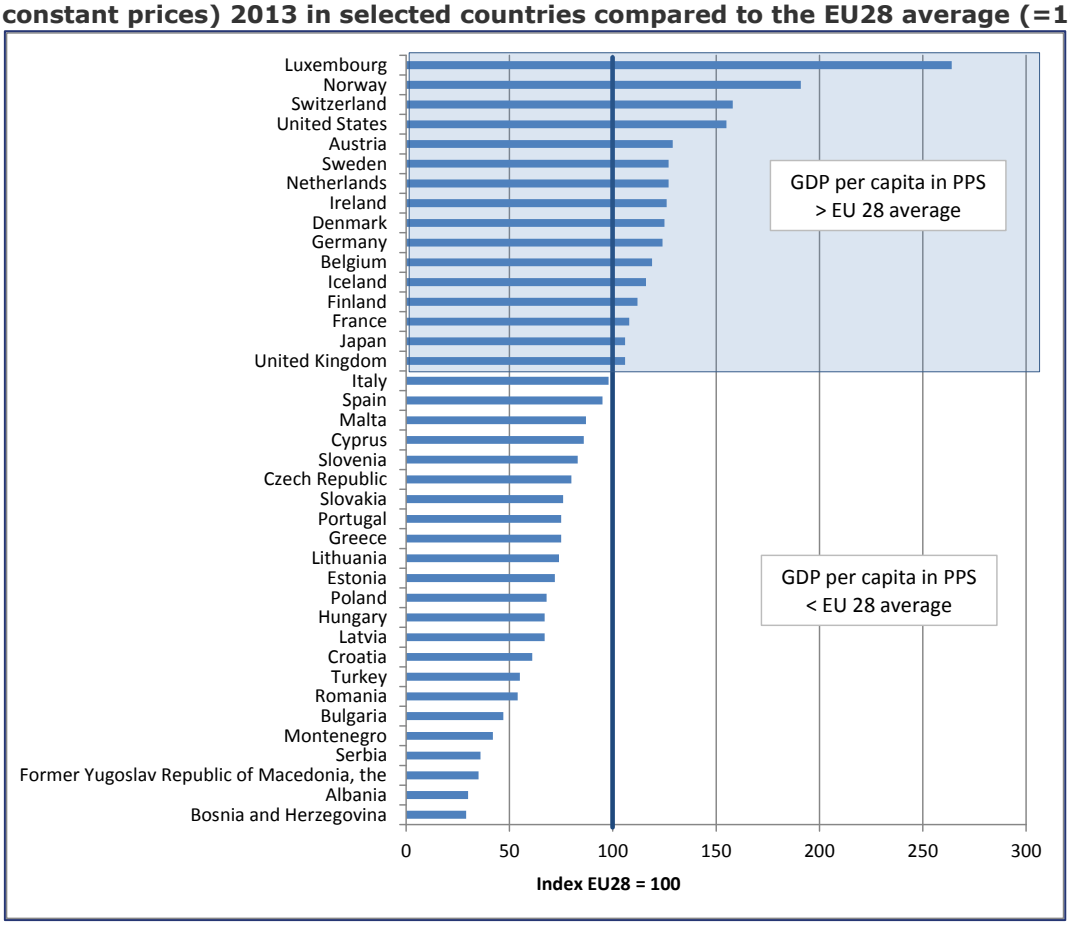
[73] Eurostat, 2008.
[74] Eurostat, 2012, Eurostat 2013b.

Figure 3.6 EU28 GDP in PPS (Purchasing Power Standard per inhabitant in constant prices)



Source: EUROSTAT 2014.

Figure 3.7 Index of GDP in PPS (Purchasing Power Standard per inhabitant in constant prices) 2013 in selected countries compared to the EU28 average (=100)



Source: EUROSTAT 2014.

Legal basis:

- Not applicable.

Relevance for the logistic market:

- The logistic industry currently plays and will continue to play a substantial part within the overall economy (app. 7% of GDP; c. f. Figure 2.6). It is a sector with a strong dependence on most manufacturing industries, while simultaneously being an important component for the overall economic system. Thus, the logistic sector, its activities and the added value is strongly connected with the development of the remaining productive sector and industries;
- The disparities between the EU28 Member States will equalise in the mid-term future. This will have an impact on the type of goods consumed and consequently on the logistic sector. A possible change could concern purchasing behaviour, as an increasing share of household income may be spent on less fast moving consumer goods (FMCG). Accordingly the economic structure and subsequently the logistics sector are expected to change;
- In addition, one can expect that this situation impacts the goods flows and the logistics in the EU28, i.e. high-valued products between the "rich countries" and low value consumer goods between the "poorer" countries.

Wealth gap

Description:

- The wealth gap (economic and income inequality) concerns interregional (Europe/Asia) or intraregional divergences (within Europe) of wealth levels due to the distinct growth of individual income, social security systems or the differences in educational systems, etc. While the average income per capita in emerging countries like China significantly increased over the last decades, there is still a significant absolute difference to the average European income per capita. In addition, and although the average income level might increase, one should keep in mind that especially in rapidly growing countries like China, an increasing wealth gap decreases the social cohesion;
- The Gini index measures the extent to which the distribution of income or consumption expenditure among individuals or households within an economy deviates from a perfectly equal distribution. While the Gini coefficient of the equalised disposable income for the new EU12 Member States decreased between 2005 and 2012 by 2.9 points (showing that the wealth gap within these countries significantly decreased), the Gini index for the EU15 slightly increased by 0.8 (Eurostat 2014c). Furthermore, from 2010 onwards the Gini index of the new EU12 Member States (30.2) fell under the index of the EU15 with 30.5. It becomes obvious that the European intraregional wealth gap further closed.

Legal basis:

- Not applicable.

Relevance for the logistic market:

- The decreasing divergences of wealth levels at inter- and intraregional scope is expected to influence the logistic sector by changing the demand patterns of consumer goods and the spatial structure of production. It is conceivable that the basic demand for consumer goods and hence the provision of basic supplies will increase. Assuming that emerging markets (globally) will gain more importance concerning the demand for consumer goods, the production and the related logistic activities will increase, which enhances the need to broaden and change the emphasis of regional and global supply chains.

EU market enlargement (A. candidate countries, B. associated countries)

Description:

- The enlargement of the European market during the previous decade has been extensive, with the addition of 13 new Member States since 2004, which has increased the population of the EU by approximately 28%;
- Current and future candidate countries for accession constitute small countries mostly in South Eastern Europe (i.e. FYROM - Former Yugoslav Republic of Macedonia, Montenegro, Serbia and Albania). The accession of these candidate countries (assuming that it is successful for all countries) will increase the population of the integrated European market by approximately 18%[75]. Bosnia and Herzegovina as well as Kosovo have applied for official EU candidate status but have not received it yet (potential candidates);
- One notable exception is the candidate country Turkey, which ranks among the 15 largest economies worldwide in terms of GDP and has almost the same number of inhabitants (approximately 77 m in 2014) as Germany. However, Turkey's potential accession still constitutes an issue of debate across Europe, not least due to recent developments concerning the domestic policy and human rights violations;
- As the integrated European market is not expected to witness a significant enlargement, the EU initialised several Association Agreements (AA) with its neighbours. Based on Regulation (EU) No 374/2014[76] (Regulation on the reduction or elimination of customs duties on goods originating in Ukraine), the EU and the Ukraine completed an AA in June 2014. In addition, in the previous two years Georgia and Moldova signed an Association Agreement (AA) with the EU[77]. A DCFTA (Deep and Comprehensive Free Trade Agreement) is about the mutual opening of markets for goods and services[78].

Legal basis:

- Starting with the proposal COM(2014)166[79] in March 2014, the regulation 374/2014[80] on the reduction or elimination of customs duties on goods originating in Ukraine was signed by the EU Parliament and Council on 16th June 2014. It is based on increasingly close relationship between the EU and Ukraine and goes beyond mere bilateral cooperation, encompassing gradual progress towards political association and economic integration.

Relevance for the logistic market:

- The EU enlargement by the above-mentioned candidate and potential candidate countries is expected to have a significant effect for the EU logistics sector, due to the enlargement of population and the European economic area. These parameters will induce to widen the European economic markets, the demand, the exchange of goods and services, the possibilities to relocate production and, consequently, the overall logistics area of activities;
- The following Table presents the absolute growth 2005-2012 in road transport in selected new Member States compared to the total of the EU27. As can be clearly seen from this figure, the new Member States' growth is by far higher than the average of the EU27 states.

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75 Population of candidate countries as from 01.01.2014 (incl. Turkey).

76 REGULATION (EU) No 374/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 on the reduction or elimination of customs duties on goods originating in Ukraine.

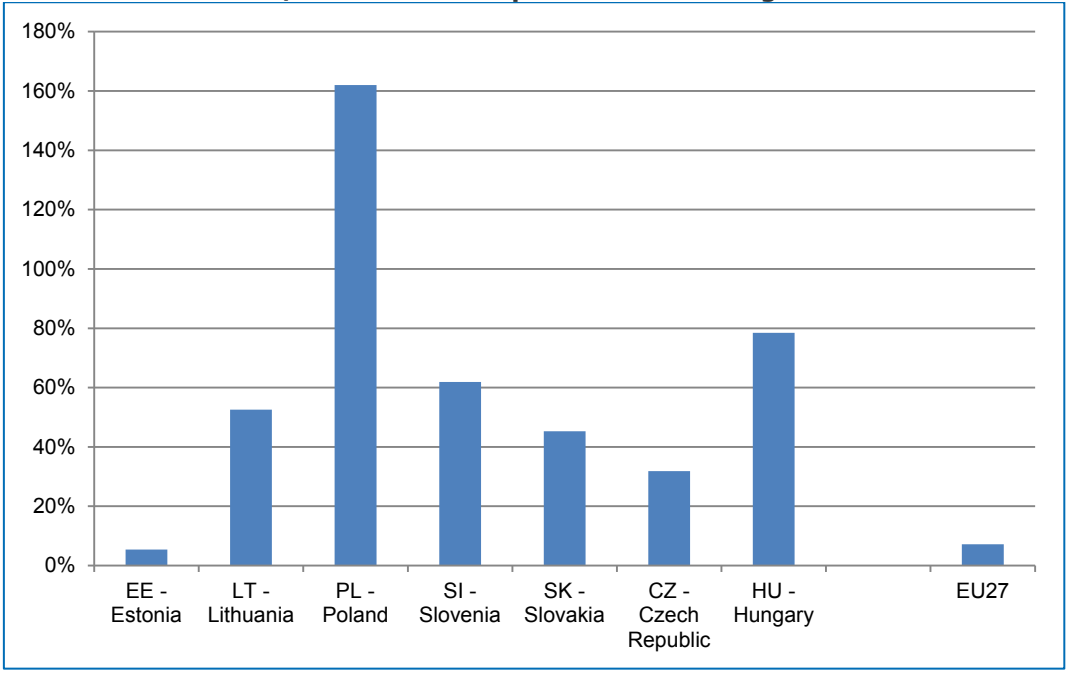
77 European Commission 2014a.

78 European Commission 2014a, c.

79 Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the reduction or elimination of customs duties on goods originating in Ukraine.

80 REGULATION (EU) No 374/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 on the reduction or elimination of customs duties on goods originating in Ukraine.

Figure 3.8 Absolute growth (in %) 2005-2012 of road transport in selected new Member States 2005/2006-2012 compared to the average of the EU27



Remark: Base year for RO/ BG 2006 (valid for EU27).
Source: Fraunhofer, EUROSTAT.

- In particular, Poland grew between 2005 and 2012 by + 160%, whereas the average growth of the EU27 Member States only reached + 7% in this period. Although this figure clearly shows the effects of the enlargement on road transport, it has to be kept in mind that a part of the growth in the new Member States stems from a shift of market shares, e.g. from Dutch and German to Polish road hauliers. Nevertheless, it becomes evident that the transport industry of the new Member States benefits from the EU enlargement;
- Another aspect in this context is the development of the turnover of the logistic sector. For example the total logistic turnover (defined as the turnover of the NACE codes H492, H494, H495, H502, H504, H512, H521, H522, H532) in Poland grew from 2008-2011, where comparable figures are available, by 8.1%, whereas the total of the EU27 countries saw a decline of 1.5%;
- General GDP figures also confirm these findings: Whereas GDP in absolute figures for the new 12 EU Member States grew by 49% in the period 2000 - 2012, the comparable figure for the old 15 Member States reached a growth of 15% in the same period. (ProgTrans World Transport Reports 2012/2013);
- According to the forecasts for 2012=2030 of the ProgTrans World Transport Reports 2012/2013, the absolute GDP of the 12 new EU Member States will grow by 49% and the external trade by 104%. Contrarily to that, the old EU15 Member States GDP will grow by 33% and the external trade by 71%, hence at a considerably lower pace.

Globalisation of the economy (industries/services)

Description:

- The economic globalisation means increased flows of trade and foreign direct investments between countries thanks to a decrease in import barriers, taxes and capital restrictions;
- When estimating the further development of globalisation, it seems appropriate to take a look at the future development of world economics. The latest release of the Prognos Deutschland Report 2014 gives some insight into its

development 2012-2040. According to these forecasts, the contribution of the five strongest economic regions in the world to the global growth will be as follows:

- China will contribute with 31.8%;
- US with 22.9%;
- Europe with 16.8%;
- India with 8.4%;
- Brazil with 4.9%.

- Given these developments, in particular the dominance of China, it seems obvious that the economic growth of China could not only be based on foreign trade, but on China/Asia internal trade to a growing extent;
- The EU participation in the global economic development will decrease in the long run, mainly due to the negative development of population leading to reduced GDP growth rates (e.g. the EU will grow by an average of 1.7% per year 2012-2040 compared to 3.0% in the past (2000-2012), whereas the US will grow by 2.2% over the whole forecasting period;
- In addition to that, the degree of openness defined as Imports + Exports/GDP of the EU will lose its dynamic in the future;
- To conclude, one can assume that globalisation in the sense of international trade will most probably continue in the future, but will not reach the dynamic growth of the past anymore.

Legal basis:

- Not applicable.

Relevance for the logistic market:

- The logistics and transport sector, and its related activities, significantly depend on globalisation, especially the globalisation of production. Assuming that the division of global work and demand of market enlargement will increase globally, the global logistics sector will also benefit from it. Global supply chains and the trade of intermediary products, which are inevitably based on the global division of work, are expected to increase accordingly. Nevertheless, given the above discussed developments, it is mostly presumed that this growth will slow down in the future;
- One prerequisite for participating further in the effects of globalisation will be the abolition of trade barriers and constraints to trade and market access (cf. external factors 'Trade barriers'). These will further incite the division of global work and foster the demand for market enlargement.

Shift of financial market power

Description:

- In the course of globalisation and economic growth, the shift of financial market power based on the dislocation of economic strength and economic market power becomes increasingly evident. In comparison to most European countries, the Asian countries – especially ASEAN (Association of South-East Asian Nations) and China – are expected to form an increasingly important economic region within the globalised world, imposing global changes within trade patterns and freight flows. This will be, in part, a consequence of the trade agreement between ASEAN and China (ACFTA - ASEAN China Free Trade Agreement) for almost all goods, which entered into force in 2010 when it was ratified by all ASEAN countries and represents the third largest free trade area in the world (measured by economic power). However, this geographical area constitutes the greatest trade area in the world regarding inhabitants (1.8 bn), whereas the advance of the economic and financial market power of the US and the EU is still considerably higher.

Legal basis:

- Not applicable.

Relevance for the logistic market:

- In spite of the trade volumes and values between the US, the EU and China being considerably higher than the trade between ASEAN and China, the growth of economies and hence the financial market power is expected to increase, especially in the Asian region. From the European perspective, this development indicates that the European logistic service providers are facing intense competition within and outside Europe, because of the comparatively increasing competitiveness of Asian LSP in Europe and, respectively, a shift of market power towards Asia.

3.2.3 Social and cultural factors

EU population development

Description:

- In the past, the EU population grew from 406.7 m inhabitants in 1960 to 504.5 m inhabitants in 2012. In 2012, the natural increase of population added 0.22 m inhabitants to the EU population. Net migration was much more positive, with 0.90m inhabitants contributing to population growth in the EU. At a national level, negative net migration occurred in Latvia, Hungary and Bulgaria, while the United Kingdom, Luxembourg, Sweden, and Belgium recorded the highest population growth rates, the latter three due to positive net migration (Eurostat, 2014b);
- The total population of the EU28 is expected to increase by approximately 2.2% between 2013 and 2030 (from 507.2 m to 518.5 m inhabitants);
- The EU28 countries with the highest rate of population increase are located in Western Europe (Luxembourg, Belgium, Sweden, United Kingdom), whereas the countries with the highest rate of population decrease are Eastern European countries (Lithuania, Latvia, Bulgaria, Greece), which indicates a shift of population from East to West (Eurostat, 2014a).

Legal basis:

- Not applicable.

Relevance for the logistic market:

- The relevance for the logistic sector caused by population developments is mainly based on the spatial shift of demand and supply markets (see also "EU market enlargement" above). The comparatively lower overall growth of the European population and the spatial differences are expected to have an impact on the EU logistics sector. The latter has to react to the shift of the spatial demand and the type of goods requested as a consequence of the relocation of production.

Ageing society

Description:

- Because of age composition, the average age of EU28 inhabitants is expected to increase considerably (Eurostat, 2014b) due to a significant increase in the prevalence of non-working age groups (i.e. above 65 years of age). The development of a decreasingly active workforce in the EU is based on low birth rates and higher life expectancy;
- With regards to internal migration between EU28 countries, the major trend is migration from areas with low economic growth – mainly from the 13 most recent Eastern European Member States (c.f. 'EU population development') –

towards the more prosperous areas of the EU (Eurozone 15). This internal migration often compensates for the negative evolution (demographic change) of the natural population in certain areas of Western Europe (e.g. western Germany, eastern Austria, northern Italy).

Legal basis:

- Not applicable.

Relevance for the logistic market:

- The ongoing and future ageing of European society induces a structural change of logistic supply chains, because of the different demand habits of elderly people with regards to products (type) and their purchase (time, frequency). The share of elderly people in the EU until 2030 and beyond will increase, as well as the intensity and frequency of goods and services delivery. This results from the fact that elderly people will progressively integrate e-commerce related tools into their everyday lives. Furthermore, the growing share and importance of the over 65 years age group and its changing requirements will also change the types of most demanded goods.

Urbanisation

Description:

- Urbanisation describes the sprawl of urban areas (physical urbanisation) and lifestyles (functional urbanisation) due to a growing ratio of inhabitants living in urban areas/cities compared to the population living in non-urban or rural areas. Often, the urban sprawl and the growth of urban areas are the result of significant physical movements of inhabitants from rural areas into urbanised areas;
- Europe has reached a comparatively "advanced" level of urbanisation, which means that the growth rate of urbanisation is moderate or stagnating. Furthermore, urban areas distribute quite evenly across Europe. The urban audit, considering more than 300 European cities, determined that 6 European cities comprise more than 3m inhabitants, while 20 cities comprise between 1 and 3m inhabitants.

Legal basis:

- Not applicable.

Relevance for the logistic market:

- While the spatial distribution of urban areas within Europe is widespread and stagnant, the expected functional urbanisation in Europe influences the spatial structure of supply chains due to different sourcing, production and distribution.

Proliferation of electronic business

Description:

- The "internet society" implies the increasing dependency of society on the internet in its widest form. In the past twenty years, the utilisation of web-based services has become an essential part of daily life and business practices. Mobile devices enable people to easily communicate and share experiences through social media and other web-based applications, as well as purchase goods and services anytime and anywhere. Internet-derived applications and functions have shown to be able to replace products, and especially services, in a short time;
- The individualisation of business and consumer preferences in the context of purchasing products has to be considered in combination with the rapid increase of electronic business. In 2012, nearly 75% of individuals aged 16-74 used the internet in the past 12 months and 60% of those internet users had

shopped online[81]. This marks a very significant increase since 2008, when only 32% of EU27 citizens had used the internet for online purchases (the respective percentage for 2013 is 47%)[82].

Legal basis:

- Acknowledging the importance of high speed broadband internet access, the Commission set out ambitious targets in the Communication from the Commission (COM(2012)784[83]) titled 'The Digital Agenda for Europe — Driving European growth digitally' ('the Digital Agenda'), to bring basic broadband to all Europeans by 2013. Furthermore the digital agenda aims to ensure that, by 2020, all Europeans have access to much higher internet speeds of above 30 mbps and 50% or more of Union households subscribe to internet connections above 100 mbps.

Relevance for the logistic market:

- The increasing proliferation of electronic business, especially regarding consumer preferences, has significant relevance for the logistic sector because it will impose enormous requirements in the fields of reliability, punctuality and expedition;
- For the logistics sector, e-commerce (impacting parcel deliveries and return logistics), the tracking of freight and vehicles, and its management, as well as cloud-services (which allow the sharing of data to make synchromodal supply chains work) are likely to be of increasing importance for the future operation of logistics chains;
- On the other hand, internet- and web-based services create challenges in the way the privacy of information and data is dealt with.

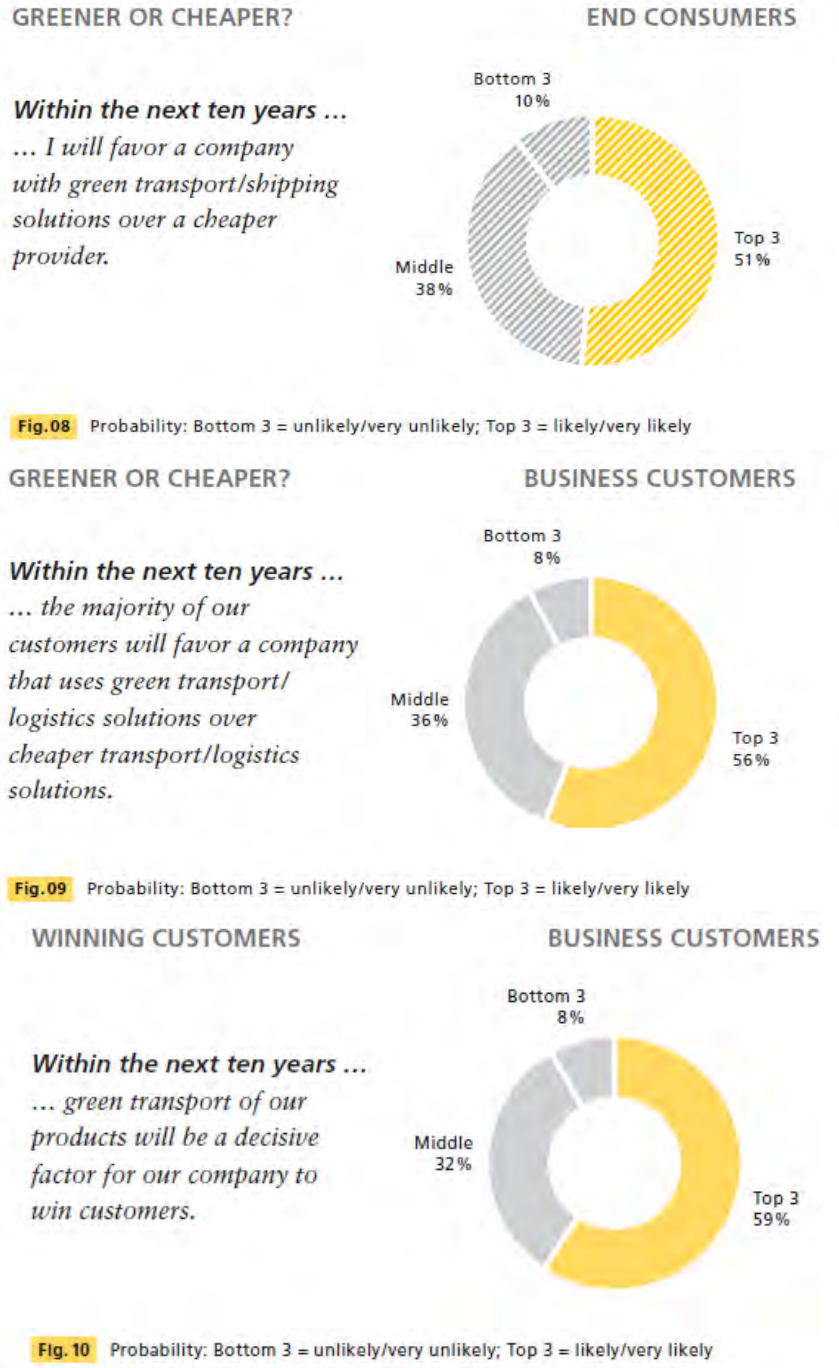
Environmental awareness

Description:

- The adoption of an environment-friendly culture in economic activity includes transport activities and requires that economic actors (producer, intermediaries and consumer) consider factors like environmental effects of economic activity and the sustainable usage of scarce resources. Furthermore, the positive and sustainable contribution of economic activity to the environment in the organisation and provision of logistics services will also become more relevant and important in the future;
- In this context, the general topic "green logistics", describes a supply chain management practice and strategy that reduces the environmental and energy footprint of freight distribution. In addition to the abovementioned aspect, green logistics focusing on reducing the ecological impacts of material handling, waste management, packaging and transport are expected to become increasingly important. The following figures confirm this expectation:

81 Eurostat, 2013d.
82 Eurostat, 2013e).
83 COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS The Digital Agenda for Europe - Driving European growth digitally.

Figure 3.9 Selected results of the "Green Trends Survey" carried out by Deutsche Post DHL in six key global markets (India, China, the US, Brazil, the UK and Germany)



Remarks: Survey with 1.800 business customers and 1.800 end consumers.
Source: Deutsche Post DHL (2010).

- Also Kohn/Brodin (2008) consider the environmental concern as a "mega trend", which is an important and inevitable aspect to be considered for all types of businesses and constitutes a fundamental change within the conditions of logistics development;
- Nevertheless, one has to be careful when assuming that environmental awareness is a given at this time. Some authors (e.g. Fries (2009): Market potential of sustainable freight transport chains) still point out that the willingness to pay for, for example, environmentally friendly transport is still comparably low. This might also be true for purchasing environmentally friendly products, at least for consumers with lower incomes.

Legal basis:

- Not applicable.

Relevance for the logistic market:

- For logistics systems to become environmentally responsible and sustainable, the traditional logistics view of minimising costs and lead times needs to be balanced by the target to minimise environmental impacts;
- The abovementioned survey results show that environmental awareness will become substantially important in the mid-term.

Changes in social and consumer behaviour characteristics

Description:

- The increasing degree of individualisation (e.g. appropriate parameter: share of one-person households), which notably increased over the past decades, is expected to continue at least until 2025. Individualisation, revealing an individual differentiation by dissociating from the common lifestyle and its general ideals, will broaden the types of living, consumption, working etc., which will have consequences for consumer behaviour and its satisfaction (smaller packaging, increasing frequency of purchase, e-commerce, conscious and sustainable demand, variety of product types, changes of spatial and temporal demand etc.).

Legal basis:

- Not applicable.

Relevance for the logistic market:

- The fact that lifestyles are undergoing a more rapid change than ever in post-industrial society, and individualisation is increasing, is expected to have a minor direct influence on the logistics sector, but a stronger indirect influence because of an distinct change in personal mobility, consumer behaviour, diversity of work, importance of recreational time, etc.;
- The influence of connections between social and consumer behaviour on the logistics sector might not be obvious at first glance; however, it is expected to have an impact on the amount of ordering processes and direct deliveries, transport supply system and subsequent transport loads;
- In general, it is a reasonable assumption that individual lifestyles and thus the individual degree of individualisation is expected to increase, and will gain importance accordingly.

3.2.4 Technological factors

Vehicle and transport technologies (cleaner vehicles)

Description:

- Clean and energy efficient vehicles are very important in achieving the EU objectives of decreasing energy consumption, CO_2 and other pollutant emissions;
- Major technological developments relate to the production of more energy-efficient vehicles capable of adhering to the increasingly strict emission standards set forth by the European Commission. For heavy-duty vehicles involved in road freight transport, the Euro V standard has been effective since October 2008, while the Euro VI will be gradually rolled-out to commercial vehicles starting from September 2014 (cf. Regulation EU 136/2014[84] as quoted below);

[84] COMMISSION REGULATION (EU) No 136/2014 of 11 February 2014 amending Directive 2007/46/EC of the European Parliament and of the Council, Commission Regulation (EC) No 692/2008 as regards

- In addition, the implementation of Selective Catalytic Reduction (SCR) technology in diesel engines used in road, rail and water transport – as well as the development of hybrid diesel-electric engines for freight transport – are important, recent technological developments aimed at diminishing air pollutants;
- Transport technology developments target several areas. Most relevant improvements concern the propulsion, design and operations. To reduce CO2 emissions and costs, alternative power strategies are sought for road vehicles such as electric, hybrid and hydrogen propulsion. Improvements in design (e.g. transmission, lubricants, bearings, etc.) will lead to further fuel savings, while certain countries are testing longer and/or heavier vehicles (LHV);
- In rail transport, innovations focus on optimised diesel and electric engines, in combination with weight reduction, standardisation of load capacities, improved aerodynamics, regenerative breaking systems and longer trains. To allow for this, the infrastructure needs to be improved to create an extended and efficient network that can accommodate increased train lengths, increased axle loads and (semi-) dedicated freight rail lines.

Legal basis:

- Regulation EU 136/2014[85] amending Directive 2007/46/EC, Regulation (EC) 692/2008[86] as regards emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and Regulation EU 582/2011[87] as regards emissions from heavy duty vehicles (Euro VI). As it bases on several directives and regulations, which establish a framework for motor vehicles, trailers and their systems/components/technical units concerning type-approval documents and outlines engine characteristics, engine power values as well as power related characteristics. It further defines common technical requirements for the type-approval of motor vehicles in respect to emissions, laying down rules for in-service conformity, durability of pollution control devices, on-board diagnostic (OBD) systems, measurement of fuel consumption, etc.;
- Regulation (EC) No 595/2009[88] (cf. Transport-related emissions and climate change (Type approval of EURO VI heavy duty vehicles)).

Relevance for the logistic market:

- The developments are of relevance for the logistic sector because of, on the one hand, an increase of costs and on the other hand, a reduction of emissions and energy dependency;

emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and Commission Regulation (EU) No 582/2011 as regards emissions from heavy duty vehicles (Euro VI) (Text with EEA relevance).

85 COMMISSION REGULATION (EU) No 136/2014 of 11 February 2014 amending Directive 2007/46/EC of the European Parliament and of the Council, Commission Regulation (EC) No 692/2008 as regards emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and Commission Regulation (EU) No 582/2011 as regards emissions from heavy duty vehicles (Euro VI) (Text with EEA relevance).

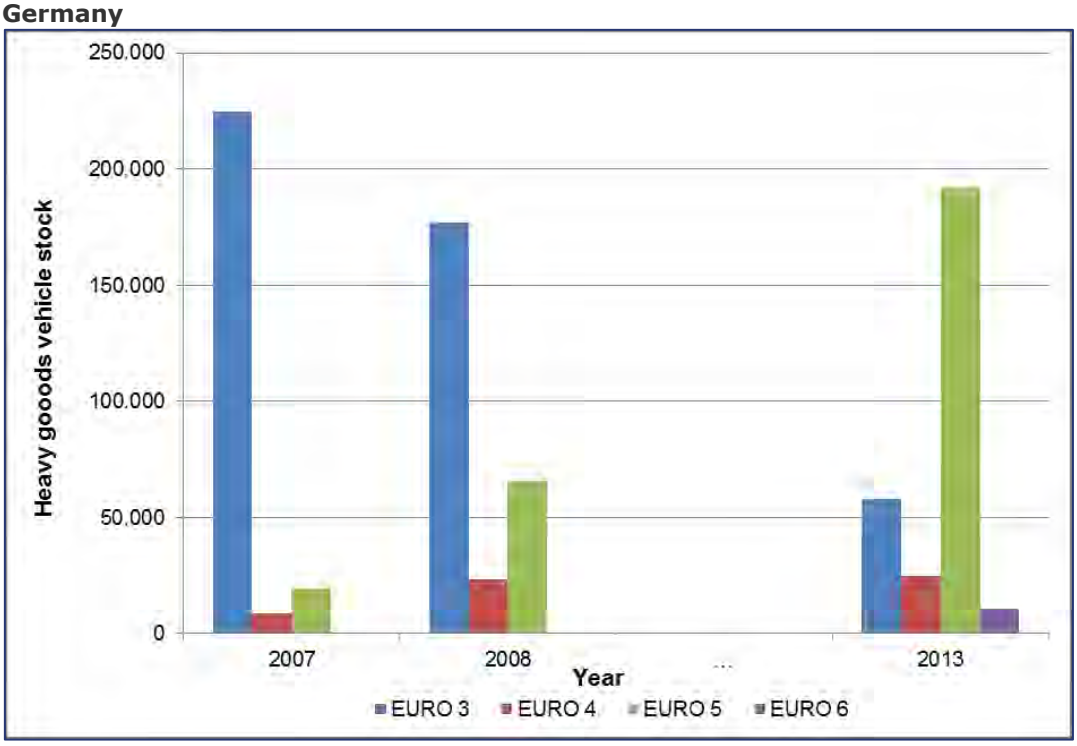
86 COMMISSION REGULATION (EC) No 692/2008 of 18 July 2008 implementing and amending Regulation (EC) No 715/2007 of the European Parliament and of the Council on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information (Text with EEA relevance).

87 COMMISSION REGULATION (EU) No 582/2011 of 25 May 2011 implementing and amending Regulation (EC) No 595/2009 of the European Parliament and of the Council with respect to emissions from heavy duty vehicles (Euro VI) and amending Annexes I and III to Directive 2007/46/EC of the European Parliament and of the Council (Text with EEA relevance).

88 REGULATION (EC) No 595/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 June 2009 on type-approval of motor vehicles and engines with respect to emissions from heavy duty vehicles (Euro VI) and on access to vehicle repair and maintenance information and amending Regulation (EC) No 715/2007 and Directive 2007/46/EC and repealing Directives 80/1269/EEC, 2005/55/EC and 2005/78/EC (Text with EEA relevance).

- Taking the heavy goods vehicle stock in Germany as an example, one can illustrate important changes between 2007 and 2013[89]. In this period the stock of EURO III heavy goods vehicles dropped from more than 220,000 to just above 5,000 vehicles in 2013. Contrarily to that, EURO V vehicles grew from approx. 19,000 to more than 190,000 vehicles in the same period. As of 1 January 2014, the stock of EURO VI vehicles amounted to only 10,000 vehicles, due to the reluctance of road hauliers to invest in EURO VI trucks given the uncertainties regarding the development of the German toll. Nevertheless, one can expect a similar development of the stock of EURO VI vehicles in the coming years.

Figure 3.10 Heavy goods vehicle stock 2007, 2008 and 2013 per EURO class in Germany



Source: KBA 2014, own calculations.

3D printing

Description:

- 3D printing or additive manufacturing describes the manufacturing of a three-dimensional solid object by means of a 3D printer, a digital file and specific metals, polymers, ceramics, synthetic resin and synthetics. This technology enables products to be manufactured on demand and on-the-spot;
- With regards to 3D printing, two different models of manufacturing developments are discussed; the buyer-beware model and the R&D model. The first is about the decentralised network of local hubs, enabling custom blueprints for the same products at a decentralised level as well as manufacturing product prototypes next to the consumer to gather quick feedback. The R&D model is about a manufacturing ecosystem, where research and development organisations provide their ideas to small businesses and local manufacturers[90].

[89] Kraftfahrtbundesamt 2014.
[90] Forbes 2014.

Legal basis:

- Not applicable.

Relevance for the logistic market:

- The technological improvement and pending usage of 3D printers in the manufacturing process is expected to decrease transport and vehicle performance by reducing the distances due to the division of labour;
- The discussion about if and to what extent 3D printing will influence the global economy ranges from expecting the "third industrial revolution" at the upper end to "no major influence" at the lower end. What is sure is that 3D printing is not expected to become a common sight in the next few years, but will certainly influence the logistics sector to some degree, although there are still some issue to be solved such as the high costs of materials and processes, as well as copyright.

Information and communication technologies (Intelligent Transport Systems (ITS))

Description:

- Information and communication technologies (ICT) related to transport and logistics are of crucial importance, and a basic prerequisite of ensuring further improvement of Intelligent Transport Systems (ITS). Information and communication technologies can easily be defined as a key element of our time, both for business and private life. ICT was one prerequisite of globalisation and is now fundamental for every aspect of today's life. In fact there are some main areas in which ICT plays a major role for logistics and manufacturing. It is obvious that ICT has a cross-sectional character, relevant for several logistic strategies, which becomes apparent even more when looking at the amount of influencing logistic strategies.

Legal basis:

- Directive 2010/40/EU[91] on the 'framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport', establishes a framework of deployment and use of ITS within the EU, in particular across Member State borders, and sets out the general conditions necessary for that purpose;
- COM (2008) 886[92] 'Action plan for the deployment of Intelligent Transport Systems in Europe' (non-binding) accelerates and coordinates the deployment of ITS in road transport, including interfaces with other transport models;
- COM (2007) 607[93] 'Freight Transport Logistics Action Plan' (non-binding) (c.f. chapter 4).

Relevance for the logistic market:

- Planning tools: Companies, shippers and logistics service providers have to make various decisions on different timescales in order to run their businesses. For the support of the decision process, several IT tools have been developed;
- ICT in transportation/logistics: Transportation, on the other hand, has evolved from transporting goods from A to B towards an information-based flow of valuables from A to B. Information is - aside from transportation - one of the

[91] DIRECTIVE 2010/40/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport.
[92] COMMUNICATION FROM THE COMMISSION Action Plan for the Deployment of Intelligent Transport Systems in Europe.
[93] COMMUNICATION FROM THE COMMISSION Freight Transport Logistics Action Plan.

most important elements in a competitive market for logistics service providers;

- Supporting technologies: The group of supporting technologies covers applications like Radio Frequency Identification (RFID), barcode, Global Navigation Satellite Systems (GNSS), magnetic inks, Optical Character Recognition (OCR), voice recognition, touch memory as well as smart cards;
- Within ITS, the important technologies concern various systems related to many areas of traffic and transport as regards management, safety, information provision and monitoring[94]. With the ever-growing complexity of logistic chains and numerous partners involved, a smooth, common information system (e.g. tracking and tracing tools) becomes a pre-condition for managing the whole transport and logistic chain. This becomes even more important, since information systems increase transport safety, and facilitate customs procedures and short-term capacity planning at the transhipment points (in the case of multimodal transport chains).

R&D and innovative solutions for logistics

Description:

- Contrary to the common misconception of logistics as a simple transport service, where only low innovation potential is assigned, the logistic industry is obliged to constantly improve its processes. In particular, innovations in cargo handling, storage systems and packaging, and innovative business models within the supply chain, are daily business for the logistic industry;
- The Commission has been and is supporting innovative solutions along the supply chain through specific programmes (e.g. Marco Polo, Connecting Europe Facility or Horizon 2020);
- Top innovators amongst the LSP are able to increase the EBIT margins by an average of 8.5%, while all shippers and logistic service providers are potentially able to reduce logistics costs by 7% to 14%[95]. Innovation management systems are expected to significantly improve the delivery reliability and delivery time. To gain such benefits, the top innovators within LSP and shippers concentrate their innovation activities on method- and process-related improvements as well as technological improvements. Adaptability and flexibility of logistics systems and networks have the highest potential within logistics innovation efforts. Innovative measures concerning cooperation across the supply chain are considered to be crucially important for the realisation of improvement potentials. Furthermore, virtual reality and automated controls (agent systems, RFID) have been identified as the most important growth areas for innovation.

Legal basis:

- Not applicable.

Relevance for the logistic market:

- Given the relatively low net margins in this business, constant investments in innovative logistic processes can be seen as leverage for creating competitive advantages for logistics service providers. Thus, companies with an effective and efficient innovation management system can significantly decrease their logistics costs[96];

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94 Traffic Management Systems, Intelligent Cargo Management Systems, Vehicle Safety Systems, Implementation of Traffic Management System (ERTMS), Single European Sky ATM Research (SESAR) programme and other ITS applications such as e. g the River Information System (RIS) and the Vessel Traffic Monitoring and Information System (VTMIS).

95 European Logistics Association 2007.

96 European Logistics Association 2007.

- Fraunhofer comes to the conclusion that: *"The new technologies can assist the 'Professionalization of logistics services'. In particular, 'Faster ticking clocks' require innovative applications that can mostly be realized only through new technologies to solve the resulting challenges. Moreover, as a result of the 'New service orientation', business models, which were previously unheard of, may appear, based on new technologies. Some of the 'New risks along the global supply chain' may even be mastered only with the help of new technologies"* (Fraunhofer 2013).

Supply chain resilience

Description:

- Supply chain resilience, in the context of safeguarding supply chain procedures, is about the minimisation of all possible external events which might hamper the supply chain somehow or other (e.g. terrorism, natural phenomena, failure of technology and physical infrastructure, human factor, etc.).

Legal basis:

- Not applicable.

Relevance for the logistic market:

- Supply chain resilience is directly linked to the improvement of logistics management, control and use of resources, and is expected to increase freight transport capacity, performance and reliability. It has become of crucial importance due to the increasing sensitivity of global supply chains.

3.2.5 Legal factors

Social regulation

Description:

- This external factor is about the restrictions of working time in the road freight transport sector within the EU. It directly affects the freight transport and logistic sector by restricting the supply chain process temporally, but also ensures the reliability of the supply chain by improving road safety as well as the driver's safety and health.

Legal basis:

- As of 23 March 2009, the rules of Regulation 561/2006/EC[97] on the harmonisation of certain social legislation relating to road freight and passenger transport have laid down minimum common rules on drivers (all persons performing road transport activities) and determined the daily driving period, total weekly driving time, and the daily and weekly resting periods.

Relevance for the logistic market:

- This regulation contains a number of definitions (i.e. ”working time” or “periods of availability”) which, in the context of the current discussion regarding the daily problems at the loading ramps, are of crucial importance as unforeseen waiting times at the loading ramps might be counted as working time which, in turn, reduces the driver’s flexibility.

[97] REGULATION (EC) No 561/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 March 2006 on the harmonisation of certain social legislation relating to road transport and amending Council Regulations (EEC) No 3821/85 and (EC) No 2135/98 and repealing Council Regulation (EEC) No 3820/85.

Safety and security regulations

Description:

- In the EU, heavy goods vehicles (HGV), buses and coaches have to be constructed and equipped in in such a way that they do not cause any harm, prejudice, interference or inconvenience;
- Therefore, the EU defines the technical framework conditions of the minimum allowed maximum common weights and dimensions for the EU Member States for HGV by Directive 96/53/EC[98] concerning border crossing transport. This directive ensures that no Member State can restrict the circulation of vehicles performing international transport operations within their territories that comply with these limits. However, each Member State is allowed to issue national deviating rules for national operations.

Legal basis:

- Directive 96/53/EC of 25 July 1996 laying down for certain road vehicles circulating within the Community the maximum authorised dimensions in national and international traffic and the maximum authorised weights in international traffic;
- On 15 April 2014 the European Parliament decided to amend Directive 96/53/EC regarding the transportation of 45' containers for intermodal and especially for road transport by trucks (where length would only need to be extended by 15cm to avoid holding special permissions). This aspect can be seen as an answer to the future tendency towards expanded sizes of containers in, namely, short sea shipping to 48 or even 53 feet;
- In addition, there are several other legislative acts with regards to safety and security, e.g.:
  - The Proposal for a Regulation on enhancing the supply chain security (SEC(2006)251[99]) aims to enhance the supply chain security in order to provide greater protection for all European freight transport against terrorist attacks;
  - Regulation (EC) No 68/2009[100] adapts Regulation (EEC) No 3821/85[101] on recording equipment in road transport, where the latter regulation fundamentally covers technical specifications for the construction, testing, installation and inspection of recording equipment in road transport;
  - Regulation 68/2009/EC[102] pays particular attention to the overall security of the system and its application to vehicles by determining technical specifications for installing recording equipment;
  - Directive 2003/59/EC[103] on the initial qualification and periodic training of drivers of certain road vehicles for the carriage of goods or passengers regulates the activity of driving vehicles which require a driving licence in the defined categories (C, C1 C+E, C1+E, D, D1, D+E,

98 COUNCIL DIRECTIVE 96/53/EC of 25 July 1996 laying down for certain road vehicles circulating within the Community the maximum authorized dimensions in national and international traffic and the maximum authorized weights in international traffic.

99 Proposal for a Regulation on enhancing the supply chain security.

100 COMMISSION REGULATION (EC) No 68/2009 of 23 January 2009 adapting for the ninth time to technical progress Council Regulation (EEC) No 3821/85 on recording equipment in road transport.

101 COUNCIL REGULATION (EEC) No 3821/85 of 20 December 1985 on recording equipment in road transport.

102 COMMISSION REGULATION (EC) No 68/2009 of 23 January 2009 adapting for the ninth time to technical progress Council Regulation (EEC) No 3821/85 on recording equipment in road transport.

103 DIRECTIVE 2003/59/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 July 2003 on the initial qualification and periodic training of drivers of certain road vehicles for the carriage of goods or passengers, amending Council Regulation (EEC) No 3820/85 and Council Directive 91/439/EEC and repealing Council Directive 76/914/EEC.

D1+E), to be subject to a compulsory initial qualification and compulsory periodic training;

- Regulation (EC) No 661/2009[104] concerns type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units. It establishes requirements for the type-approval of motor vehicles, their trailers and systems, components and separate technical units with regard to safety; the type-approval of motor vehicles in respect of tyre pressure monitoring systems, fuel efficiency and CO_2 emissions; and the type-approval of newly-manufactured tyres with regard to their safety, rolling resistance performance and rolling noise emissions;
- Directive 2009/40/EC[105] determines that every motor vehicle, trailer and semi-trailer registered in a Member State shall undergo periodic roadworthiness tests;
- Directive 2002/85/EC[106] amending Council Directive 92/6/EEC[107] on the installation and use of speed limitation devices for certain categories of motor vehicles in the Community, determines that Member States shall take the necessary measures to ensure that HGV may be used on the road only if equipped with a speed limitation device set in such a way that their speed cannot exceed 100 kilometres per hour;
- Directive 2008/68/EC[108] on the inland transport of dangerous goods by road, rail or inland waterway lays down specific safety requirements for the national and international transport of dangerous goods within their territory.

Relevance for the logistic market:

- The introduction of weights and dimensions of HGV transport in Europe affects the logistic and freight transport sector by ensuring the free movement of goods throughout Europe. It also limits gross vehicle weights and vehicle dimensions, and thus the respective types of loads, which influences the number of transport processes;
- In general, the adaptation of European safety and security legislation as quoted above affects the logistic and freight transport sector's overhead costs, as these regulations and directions will cause additional expenses with regards to freight transport equipment and drivers/operators. In addition to that, the legislation supports a fair competition for international transports within the European transport industry. At the same time it is disadvantageous for service providers of European LSP and their competitive positions for services outside the EU.

Administrative procedures

Description:

- The logistics industry needs to comply with regulatory requirements stemming from administrative considerations. The simplification and decentralisation of electronic exchanges of freight-related information, which is currently under

[104] REGULATION (EC) No 661/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 July 2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended therefor.

[105] DIRECTIVE 2009/40/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 6 May 2009 on roadworthiness tests for motor vehicles and their trailers (Recast)

[106] DIRECTIVE 2002/85/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 November 2002 amending Council Directive 92/6/EEC on the installation and use of speed limitation devices for certain categories of motor vehicles in the Community.

[107] COUNCIL DIRECTIVE 92 / 6 / EEC of 10 February 1992 on the installation and use of speed limitation devices for certain categories of motor vehicles in the Community.

[108] DIRECTIVE 2008/68/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 September 2008 on the inland transport of dangerous goods.

development (COM (2005)609)[109], can substantially reduce the cost of regulatory requirements, especially when using information and communication technologies.

Legal basis:

- The proposal for a decision on a paperless environment for customs and trade (COM(2005)609) is intended to create the necessary commitment to implement 'single window' and 'one-stop- shop' concepts. Thus, it fosters the establishment of a framework for the information provided by economic operators to be given only once ('single window') and for the goods to be controlled by authorities at the same time and in the same place ('one stop administrative shop');
- Therefore the Decision 70/2008/EC[110] on a paperless environment for customs and trade shall provide information about the structure and means for the operations of electronic customs system, which are secure, integrated, interoperable and accessible for the exchange of data contained in customs declarations, documents accompanying customs declarations and certificates, and the exchange of other relevant information. In addition and in this context, the White Paper on Transport proposed an action on multimodal transport of goods - 'e-Freight' - to support the development of an overall framework for information exchange between the different actors in the transport logistics chain, in combination with the necessary standards, administrative, governance and legal provisions.

Relevance for the logistic market:

- The complexity of the modern supply chain, the number of parties involved and the increasing volume of just-in-time deliveries require information on international trade transactions both for suppliers, carriers and buyers, as well as for customs and other border agencies. In the future, "Electronic exchange of information between customs administrations and between customs administrations and other authorities involved in the international movement of goods will make for more efficient and effective controls and, consequently, more efficient risk management and allocation of resources." (COM (2005)609).

3.2.6 Environmental factors

Fossil fuel scarcity and energy costs (freight transport energy usage)

Description:

- Oil will remain the most important resource for energy production, but will lose some significance to renewable energy sources. This external factor is about the increase of energy costs for production and logistics, mainly influenced by the scarcity of fossil fuel and the higher costs of alternative energies;
- The share of transport in energy consumption increased from 30% in 2001 to 33% in 2011 and while final energy consumption in the EU28 fell by 4% between 2001 and 2011, transport energy consumption increased by 6%[111]. In particular, road freight transport energy usage accounts for approximately 30% of total transport energy consumption[112] and this is also the freight transport mode with the highest share in energy consumption;

[109] Proposal for a DECISION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on a paperless environment for customs and trade.
[110] DECISION No 70/2008/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 January 2008 on a paperless environment for customs and trade.
[111] Eurostst 2013g.
[112] Enerdata 2010.

- The various studies about the future availability of crude oil reveal different results, but with the same general tendency: According to several studies, the maximum rate of oil extraction (peak oil) will be reached during the next 15-20 years, followed by a declining rate of extraction and a depletion of resources in about 50 years. While alternative propulsion is the main topic regarding passenger transport, alternative propulsion technologies for long distance freight transport have been moving slowly until now. A breakthrough in technology development (e.g. for batteries) might be the solution for passenger cars, but for heavy goods vehicles, alternative strategies are necessary up to 2030.

Legal basis:

- Not applicable.

Relevance for the logistic market:

- Accordingly, past and future key challenges for the logistics sector are the increasing oil and energy prices, the need for more energy efficient and thus cleaner vehicles, as well as insecurity about the future supply of fossil fuel and energy demand developments. Governments, especially in Europe, are reacting to the decline of oil resources and their resulting dependency on oil exporting countries, focusing on energy efficiency and alternative energy sources. Strict emission limits should force hauliers to invest in new trucks because taxes and road charges are linked to these limits. Taxation on fuel is high and expected to further increase;
- Nevertheless, it should also be kept in mind that alternative energy sources, like hydrogen or (natural) gas, are not automatically environmental friendly and often are not inherently competitive due to their prices. For instance, the production process of hydrogen (from gas) is not carbon neutral. While the production of hydrogen from real alternative energy sources (solar, wind, water, etc.) is environmental friendly, large scale applications of internal combustion are still far from possible;
- The importance of alternative energy sources in comparison to fossil energy sources (oil, gas, coal) for transport and production will increase. Taxation advantages for alternatively powered vehicles are expected to have a positive impact, resulting in a higher vehicle share in the future and thus technologies as hybrid, electronic and hydrogen propulsion will play an important role.

Raw material scarcity

Description:

- As scarcity describes the decreasing availability of natural products, this external factor is also influenced by other external developments. First of all, the growing demand for raw materials (mainly influenced by the Asian economic development), the rapid rise of the middle class and global population growth shortens the availability of raw materials on the global markets, raising prices and thus the costs of production. In addition, many natural resources are limited and consequently their extraction has become technically more and more difficult. This affects the exploitation and makes it more expensive. These materials account for more than 1/3 of all goods traded worldwide[113].

Legal basis:

- Not applicable.

[113] RBSC 2011.

Relevance for the logistic market:

- According to RBSC[114], the global demand for food and agricultural products will increase due to growing population and per capita food consumption. But the growth rate of world agriculture production will fall to 1.5% p.a. in comparison to 2.1-2.3% p.a. over the past four decades. In addition, the global food production is expected to fall by 2030 due to projected changes in the ecosystems due to climate change;
- Raw material scarcity constitutes a challenge of increasing importance for manufacturers and industries, e.g. in 2012 63% of companies expected to face scarcity for their own raw materials in the next 5 years, rising to 75% within the next 10 years and above[115];
- In developed countries the demand for agricultural products is expected to slightly increase (2010-2030: 6.1%). Furthermore the dependence on imported raw materials will increase up to 2030. Prices will increase significantly as well, not least for minor and specialty metals that are particularly used in the high-tech sector[116].

Transport-related emissions and climate change (Type approval of EURO VI heavy duty vehicles)

Description:

- Although total greenhouse gas (GHG) emissions (measured in CO_2 equivalents) produced in the EU27 have been reduced by 18% between 1990 and 2011, transport-related emissions have increased by 18% in absolute values and consequently its relative share grew from 13.9% in 1990 to 19.7% in 2011[117]. Transport is the second largest contributor to GHG emissions (after general energy use) and it is the source of GHG emissions growing at the fastest pace;
- While demographic projections and forecasts of economic activity make it likely that the demand for freight transport will increase in the future, this does not necessarily mean an equivalent increase in emissions due to the adoption of advanced transport technologies and cleaner transport modes. However, statistical data[118] shows that neither fuel, nor vehicle technologies or modal split have been able to decouple this relationship between freight transport demand and emissions, so far. One reason for this failure is that the transport sector has not been able to develop and shift the transport modal split towards a more sustainable and environmental allocation. In 2011, the modal shift remained almost unchanged compared to 1999.

Legal basis:

- The type approval of motor vehicles and engines with respect to emissions from heavy duty vehicles (EURO VI), as considered in Regulation (EC) 595/2009[119], depicts that manufacturers must equip their vehicles or engines with components that ensure compliance with the emission limits laid down in Annex I of this Regulation. National authorities shall no longer grant Community or national type-approval for vehicles that do not comply with this Regulation as from 31 December 2012 and are prohibited to register new vehicles that do not comply with this Regulation as from 31 December 2013;

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114 RBSC 2011.
115 KPMG 2012.
116 RBSC 2011.
117 Eurostat, 2013h.
118 Eurostat, 2011.
119 REGULATION (EC) No 595/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 June 2009 on type-approval of motor vehicles and engines with respect to emissions from heavy duty vehicles (Euro VI) and on access to vehicle repair and maintenance information and amending Regulation (EC) No 715/2007 and Directive 2007/46/EC and repealing Directives 80/1269/EEC, 2005/55/EC and 2005/78/EC.

- The European Commission proposed new rules (Proposal for a Directive of the European Parliament and of the Council amending Council Directive 96/53/EC)[120], to allow manufacturers to develop more aerodynamic lorries, which will reduce fuel consumption by 7-10%, cut emissions of GHG, and also enhance the safety of vulnerable road users. The proposal will allow cabins with a rounded shape and for the use of aerodynamic flaps at the back of the trailer. These measures will considerably improve the aerodynamics of vehicles;
- On 15 April 2014, the European Parliament decided to update the Regulation 96/53, but only regarding the aerodynamic features of the lorries and the extended length of trailers for the transport of 45 feet units.

Relevance for the logistics market:

- Considering the growing relative share and absolute volumes of transport and its related emissions for the total GHG effect, it is evident that logistic activities, mainly transport, are significantly influencing climate change. Climate change is assumed to negatively influence the amount and intensity of natural disasters. In turn, natural disasters are negatively affecting the operation of supply chains;
- The abovementioned transport policies affect the logistic sector and respective transport services negatively, as transport prices for the same services will increase, due to higher statutory requirements regarding vehicle/engine emission standards and thus investment costs;
- The reduction of fuel consumption by more aerodynamic, long-distance road haulage trucks will entail a very important economic and environmental contribution. These trucks allow for saving approximately € 5,000 per year in fuel costs for a typical long-distance lorry covering 100,000 km.

  In addition, the transport of 45' containers and higher gross vehicle weights (44 tonnes) is currently allowed in combined transport. In theory, the bigger the loading capacity of any transport mean, the less vehicle-km and emissions per tonne transported. Nevertheless, it can be assumed that a container with expanded length (e.g. 48′/53′ container) will only be marketable for short sea shipping on specific routes – if at all – since the intercontinental maritime transport with an ongoing growth of vessels (e.g. Triple-E size with a capacity of 18,000 TEU) is still technically geared to standard boxes (20′ and 40′ containers). However, in the intra-EU markets the discussion is more oriented towards the width of containers than the length, since the standard maritime containers (ISO containers) does not fit with EU standard pallet dimensions. This is crucial since EU logistics are based on pallets as a unified load unit. Therefore for intra-EU markets, the standard dimensions of containers will develop to the 45′ pallet-wide container.

Transport-related emissions and climate change (EU ETS Directive – Emission Trading Scheme)

Description:

- As a so-called "cap and trade" scheme, the EU Emissions Trading System (EU ETS) aims to combat climate change and is a key tool for reducing industrial greenhouse gas emission cost-efficiently. The EU has imposed a cap on the total level of emissions (CO_2, N_2O, PFC) of a sector (based on emission levels during a defined past period);

[120] COUNCIL DIRECTIVE 96/5 3/EC of 25 July 1996 laying down for certain road vehicles circulating within the Community the maximum authorized dimensions in national and international traffic and the maximum authorized weights in international traffic.

- Participation in the EU ETS is mandatory for companies operating in sectors such as energy generation, energy intense production and commercial airlines. Nevertheless in some sectors only plants above a certain size are included. Currently, the system covers and caps the carbon dioxide emissions of approximately 11,000 facilities in 31 European countries;
- With the beginning of 2012, the ETS was expanded to the aviation industry. Emissions from all domestic and international flights that arrive at or depart from an EU airport ought to be covered by the EU Emissions Trading System (28 EU Member States, 3 EEA-EFTA States (Iceland, Liechtenstein and Norway)), but the EU deferred the application to allow time for an agreement to tackle the aviation emissions globally. The overall objective of the inclusion of aviation in the EU ETS until 2020 is to tackle the climate impact of aviation by reducing CO_2 emissions by 21% compared to 2005. The Commission proposes to reduce the emissions by 43%;
- The European Commission initially proposed amending the EU emissions trading system so that aviation emissions would be covered for the part of flights that takes place in European regional airspace. In October 2013, the International Civil Aviation Organization (ICAO) assembly agreed to develop a global market-based mechanism to address international aviation emissions by 2016 and to apply it by 2020;
- The key features of the revised ETS system resulting from this proposal would be as follows:
  - All emissions from flights between airports in the European Economic Area (EEA, covering the 28 EU Member States plus Norway and Iceland) would continue to be covered;
  - From 2014 to 2020, flights to and from countries outside the EEA would benefit from a general exemption for those emissions that take place outside EEA airspace. Only emissions from the part of flights taking place within EEA airspace would be covered;
  - To accommodate the special circumstances of developing countries, flights to and from third countries which are not developed countries and which emit less than 1% of global aviation emissions would benefit from a full exemption.
- Because of resistance from some important trading partners (USA, Russia, China, India) the EU Commission decided in 2013 to postpone the Regulation by one year for all intercontinental flights. In April 2014 the Commission decided to again postpone the Regulation to 2016/2017.

Legal basis:

- Directive 2009/29/EC[121], amending Directive 2003/87/EC, aims to improve and extend the GHG emission allowance trading scheme of the Community, aiming to promote reductions of GHG emissions in a cost-effective and economically efficient manner;
- Within Directive 2008/101/EC[122] 'amending Directive 2003/87/EC as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community', the European Council targets the limitation of GHG emissions from aviation. In order to avoid distortions of competition and improve environmental effectiveness, emissions from all flights arriving at and departing from Community aerodromes to be included from 2012.

[121] DIRECTIVE 2009/29/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community (Text with EEA relevance).

[122] DIRECTIVE 2008/101/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 November 2008 amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community (Text with EEA relevance).

Relevance for the logistic market:

- The ETS is expected to have a growing influence on the European logistics sector, in particular for aviation services, due to a price increase of production and transportation-related emissions in the long run, although in the previous years, the price of an emission certificate has constantly declined.

Internalisation of external costs (of transport)

Description:

- In the past, freight transport flows and volume growth has been higher than GDP growth; nevertheless logistics and transport demand is positively correlated to production. Demand management attempts to better allocate supply resources in order to avoid negative impacts caused by congestion, pollution and noise. The internalisation of external costs is one step towards more efficiency in the transport sector as all costs will be borne by the users. A first step in this direction will be achieved by the revision of the Eurovignette Directive, allowing EU Member States to internalise air pollution and noise costs to the HGV road charges;
- The internalisation of external costs of transport is a political instrument to charge transport infrastructure users for the direct and indirect costs emerging from transport-related impacts. The EU is intending to allow EU Member States to charge external costs to truck traffic, according to very detailed prerequisites.

Legal basis:

- The Eurovignette directive aims to ensure cost transparency regarding road usage and external costs of road freight transport by setting out common rules by which Member States can charge heavy goods vehicles for the use of the road network by distance, time and location. Directive 1999/62/EC[123] and Directive 2006/38/EC[124] recommend the introduction of tolls and time-based user charges (vignettes) in all EU countries for HGV vehicles, requiring hauliers to pay for the usage of interurban high capacity roads and main roads;
- In July 2008, the Commission published a proposal (COM (2008)436 final)[125] to set transport prices which better reflect the actual use of infrastructure in terms of pollution, congestion and climate change. In 2011 the "Eurovignette" directive (Directive 2011/76/EU)[126] came into force, whereby Member States may charge road freight transportation for the harm arising from air and noise pollution, as well as from road congestion. Furthermore the rule extends to vehicles above 3.5 tonnes on all TEN-T roads and roads which carry a significant amount of international cargo.

Relevance for the logistic market:

- Practically speaking, the Eurovignette aims to charge road users "with the cost they produce". This will lead to higher prices for road transport in general, but also may raise productivity gains for the road sector, e.g. through a reduced number of empty trips and/or a higher load factors.

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123 DIRECTIVE 1999/62/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 June 1999 on the charging of heavy goods vehicles for the use of certain infrastructures.

124 DIRECTIVE 2006/38/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures.

125 DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures.

126 DIRECTIVE 2011/76/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 September 2011 amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures.

3.2.7 Identification of main external factors

The selection of the main external factors is a result of an internal interactive workshop by experts of the Lot 1 consortium, where all external factors have been allocated and assessed in respect of their impact for the logistic sector, as well as the probability of occurrence, and complemented by result of the questionnaire. Therefore the following eight external factors were selected to be further assessed according to their impacts for transport and logistics, as well as their economic, social and environmental effects:

- Ageing society;
- Transport infrastructure development;
- Proliferation of electronic business;
- Information and communication technologies (ICT);
- Supply chain resilience;
- Fossil fuel scarcity;
- Energy costs;
- Raw material scarcity.

3.3 Identification of logistic strategies and trends

Logistic trends do not emerge on their own terms, but are, in most cases, a reaction to constant changes to the external factors and requirements of the customers. These kinds of reactions can be called "logistic strategies".

Hence, a logistic strategy is a procedure, activity field or change of intensity of any relevance for transport and production logistics, which is a reaction to the change of one or more external factors. As the external environment is continuously changing, logistic activities (= business strategies) also have to continuously develop.

A logistic strategy states a reaction to an external change and thus will turn into a logistic trend if a logistic strategy is used permanently and widely.

Based on the result of the data research and subsequent to the identification of external factors, the study identifies the most important current, emerging and future strategies and trends in logistics and supply chain management. Within this stage of work it is crucial not only to identify the potential strategies, but to reveal and discuss the underlying assumptions and reasons behind them, in order to gather an in-depth and sufficient picture of correlations and impacts.

With the aim of elaborating contrasting, but − simultaneously comparable − scenarios, the consortium proposes a systematic approach that, as a first step, classifies the various types of logistic strategies into three major categories (see definitions in the box further down):

1. Technical and physical structure strategies;
2. Organisational and administrative strategies;
3. Information and technology strategies.

Several strategies and trends related to the supply chain physical structure, organisation and product/information flows, which will be used in the subsequent analysis, have been identified in foresight studies within the framework of earlier research projects and desk research (e.g. BE-Logic (2009), LogMan (2011) and BVL (2013).

Definitions

Technical and physical structure strategies

Strategies affecting the physical location (e.g. production, inventory-keeping, etc.) and geographical extent (e.g. supply base, sourcing, distribution, etc.) of supply chain processes, which determine the overall physical structure of the supply chain and the logistics system. (Spatial concentration/de-concentration of inventory, centralisation/de-centralisation of production, on-/off-/nearshoring of production, flexible supply base, E-commerce/-procurement, etc.).

Organisational and administrative strategies

Strategies affecting the way business processes in the supply chain are managed and performed, the extent and depth of relationships between supply chain partners, and the roles undertaken by the various supply chain partners in the execution of supply chain processes. (Collaboration between supply chain partners/supply chain integration, vertical integration, postponement (product form, logistical), outsourcing, supply chain agility/adaptability, etc.).

Product and information flow strategies

Strategies affecting the direction, extent and depth of product flows along the various supply chain processes and the associated flows of information across supply chain partners (Reverse logistics (production/logistics), ICT/Information sharing, multimodality, etc.).

Logistic trends affect freight transport demand and supply characteristics[127], but also demand and supply for logistics services. The performance of the logistics system is determined by the interaction between demand and supply. Demand trends refer to the evolution of demand characteristics for logistics services such as quantities transported, distances over which transportation/distribution takes place, size of shipments, inventory levels, demand for external (third-party) logistics services providers (3PL), demand for different types of 3PL services, demand for value-added services (e.g. aftermarket), etc. Supply trends refer to the evolution of supply characteristics of logistics services, including vehicle characteristics, service provision (e.g. number of 3PL service providers) and infrastructure characteristics (e.g. development of transport corridor and terminal infrastructure, and development of infrastructure for cargo handling, size/area and location of warehouse/storage facilities).

Following the identification of external factors and logistic strategies by means of the mentioned literature and sources, the following 14 logistic strategies/trends were considered to be relevant for and within the logistic sector at present and in future.

Description

On-/off-/nearshoring

Onshoring is the counterpart to offshoring and denotes the (re)location of operations back to the market. The reasons for that are various, such as increased flexibility, better market access, avoidance of high transport costs, etc. This term has to be clearly distinguished from the term insourcing, which is related to the reintegration of an activity into the company. Insourcing is also often referred to as vertical integration.

Offshoring denotes the (re)location of operations, especially production processes, abroad in a country where operational costs such as labour costs are lower. For the sake of reducing the negative side-effects of operational costs, such as increasing transportation costs, longer lead times, etc. are accepted. Offshoring has to be distinguished from the term outsourcing, which means that an external party supplies an activity. Outsourcing is therefore related to a change in the organisational structure of a company, whereby offshoring is related to the geographical dispersion of a company. Typical offshore regions are located in Asia.

[127] Zografos and Giannouli, 2001.

Nearshoring denotes the (re)location of operations to a country close to the European market where benefits from low operational costs can still be exploited. Typical nearshoring countries for EU companies are Eastern European Countries (Belarus, Ukraine), Turkey and North African countries.

Therefore, on-/off-/nearshoring describe the spatial relation between the location of operations and the market due to the difference between transport and operational costs.

Global sales channel

Global sales channel means that enterprises geographically expand into regions all over the world to broaden their distribution channel and increase the demand basis. Companies in various sectors are continuing to pursue global growth strategies that focus on the expansion of distribution into new regions, where the BRIC countries currently represent the major targets for their expansion. But alongside this there may also emerge new problems that enterprises have little experience in dealing with; some of these are driven by economic realities, currency movements, government regulations, or access to existing logistics networks.

Centralisation/decentralisation

Centralisation means to consolidate operations in a single location/reduce the number of locations (logistic nodes as warehouses, distribution centre, transhipment point, etc.) in order to exploit economies of scale and risk pooling effects.

Decentralisation is the counterpart to centralisation and means to operate a distributed network with several (regional) locations.

Centralisation can be applied to production as well as to storage sites. In the logistics sector, hub-and-spoke systems are a common implementation of a centralised network structure. The possibility to increase/intensify direct deliveries (B2C) is a crucial effect of centralising distribution systems, implying the change from several warehouses to one or a few warehouses. As a further consequence of this strategy, the total amount of transport work in terms of transport performance (tkm) will increase, as freight needs to be transported on longer distances compared to a more decentralised system. Nevertheless, this strategy also positively influences the logistic strategy/trend consolidation, multimodality and "emergency deliveries" (decreasing due to higher availability in centralised warehouses).

Flexible supply base

To rely on a flexible supply base means that a company widens the number of its supply sources. This strategy is employed to mitigate risks. Furthermore, in using multiple sources, a company can exploit the cost-efficiency of one supplier and the flexibility of another at the same time.

E-commerce/E-procurement (E-business)

E-commerce, as a part of E-business (with E-procurement), is the ability to perform major commerce transactions electronically. Especially in the business-to-consumer field, E-commerce refers to retail activities over the internet. Many companies in the 1990s recognised that the internet helps to increase supply chain performance. In fact, impacts on supply chain responsiveness and efficiency can be witnessed, whereby supply chain responsiveness means the ability to gain and protect revenues and efficiency primarily refers to supply chain costs. It is crucial to know that the value of E-commerce can be different according to the industry a company belongs to. The success of E-commerce mainly depends on how companies can exploit the new opportunities offered in order to increase responsiveness and reduce costs. E-commerce products or modules are usually kept centrally and are assembled and delivered directly to the customer only on order.

E-procurement means the procurement of goods and services mostly over the internet. The use of the internet includes all aspects of procurement, including identifying suppliers, selecting products or services, making purchase commitments, completing financial transactions, obtaining service and using exchanges. The term E-procurement does not refer to email-only adoption. There are several technologies enabling E-procurement; the most common known and most widely used are E-markets, E-catalogues and auctions.

Consolidation (including collaboration, transport bundling and route planning)
Logistics **collaboration** takes place between two manufacturing companies or between a manufacturing company and a logistics service provider. Horizontal collaboration takes place between two companies on the same level whereby vertical collaboration happens between companies that succeed each other in the supply chain. Two separate parties work together for the purpose of increasing efficiency in logistics processes, such as transportation and warehousing.

Transport bundling and consolidation of freight flows describe the situation where different shipments are grouped together into larger shipments in order to better utilise a transport vehicle's capacity (increase the load factor) and positively affect the cost of transport per weight unit and inventory levels (reduction). Nevertheless, consolidation might negatively affect the delivery frequency and lead times.

Transport route planning and control covers the finding of the optimal route between point of origin and destination, and the tracking of the freight based on real-time information.

Logistic postponement
There are three different types of postponement (time postponement, place postponement and form postponement. **Time postponement** is defined as delaying activities until orders are received. By contrast, **place postponement** means the delay of moving goods through a supply chain until orders are received. These two concepts can be subsumed under the term logistics postponement.

Logistics postponement is a widespread and often used principle in companies nowadays. Often it is used to delay the delivery of finished products to a region or a distribution centre until the demand is known with a higher degree of certainty. By doing so, companies are able to store units centrally and avoid high inventories at the respective distribution centres. This lowers inventory costs on the one hand and, on the other hand, reduces the risk of having a product in the wrong place at the wrong time. One practical implementation of logistics postponement is E-commerce. Products or modules are usually kept centrally and are assembled and delivered directly to the customer only on order. Thus, an immense increase in transport, predominantly truck transport, is the consequence. Generally speaking, it can be assumed that logistics postponement in a supply chain reduces the inventory level while often resulting in a greater amount of transport movements, because of the higher rate of single orders.

In accordance to the principles of assemble-to-order, **form postponement** describes the way of making a product suitable (customising) for a specific market or customer at the latest possible point in a supply chain, since every differentiation that makes a product more suitable for a specified segment of a market makes it less suitable for other segments.

Outsourcing
Outsourcing describes the (vertical) exclusion of logistic activities and services to external parties (2PL, 3PL, 4PL) that the company is not willing or unable to conduct in the future. Outsourcing is therefore related to a change in the organisational structure of a company. The counterpart of outsourcing is called insourcing, which means the vertical integration of logistic activities and services.

Supply chain integration
In integrated supply chains the boundaries inhibiting the flow of materials/products, financial resources and information are removed in order to optimise the overall performance of the supply chain. In order to effectively manage the complex flows among supply chain partners and to improve efficiency and customer responsiveness, integration among the various supply chain partners is required. Supply chain integration affects the organisation of the freight transport system. The more integrated the supply chain, the stronger the requirements for higher coordination and performance of the supply chain. The stronger the performance requirements, the lower the transport lead-time and the higher the quality of transport services (in terms of punctuality, safety of cargo, etc.).

Search for talent/staff retention
Staff retention and search for talent has become an important issue for the whole logistic sector, as the European population is ageing due to natural population development.

According to the study form BVL "the single most important strategic initiative, both today and in the next five years, will be talent management, which includes the need to fill critical gaps that exist in the logistics workforce in the next decade."

Agility

A major logistical trend, which aims at creating supply chains that are more responsive to specialised customer requirements, is called agility. Agility is defined as "the ability of a supply chain to react quickly to unexpected or rapid shifts in supply and demand". Agile supply chains are becoming prominent in various industries characterised by high volatility, low predictability and short life-cycles. Supply chains need to develop deep intelligence into market trends and characteristics and be efficient in undertaking changes in supply chain architecture to cope with the sudden changes in demand. Along with agility, the adaptability of supply chain architecture design to produce the right product for the right customer at the right time is also proposed as a characteristic of high-quality supply chains.

Multimodality/intermodality

Multimodal transport chains involve more than one mode of transport (rail, sea, inland waterway, air and road), while intermodal transport chains – specifically in freight transport – imply the transport of freight within an intermodal load unit. Consequently, freight itself does not inevitably need to be handled when changing modes.

Reverse logistics

Reverse logistics means logistics processes such as planning, implementing and controlling the return of the products and materials from their final destination for the purpose of (re-) capturing value or proper disposal. Remanufacturing and refurbishing activities may also be included in the definition of reverse logistics.

Reverse logistics are of importance within production as well as transport processes. The transport part of reverse logistics can be organised in different ways. In integrated returns network the retailer uses the distribution transport fleet to bring back products from the store to the distribution centre (DC) by using e.g. backhauling. Reverse logistics activities are done by the DC. In non-integrated returns network logistics activities are done in a separate warehouse to which products are returned to from the store by a third party organisation. Under the scheme return to supplier an agreement between retailer and supplier allows products to be returned to the supplier by sending them back directly. Reverse logistics responsibility lies with the supplier. Third-party return refers to the fact that all reverse logistics processes are outsourced to a third party contractor.

The production part of reverse logistics can be organised in different ways. Remanufacturing is considered to be the process of disassembly – building a product from product components reclaimed from returned products. The term reuse is reserved to indicate the use of products or some of its components for the same purpose for which they were originally designed or another purpose. Reuse includes different activities such as: refurbishing, or upgrading a whole product to its original specification or beyond. Recycling is the reprocessing in a production process of a product or its components with the aim of using parts or extracted material streams for their original purpose or for other purposes, excluding energy recovery (e.g. steel production).

Use of ICT in logistics

ICT is relevant in many social and economic sectors. Information is – aside from transportation – one of the most important elements in a competitive market for logistics service providers. With the current state of traffic en route it is important to schedule deliveries through the timely and accurate flow of information across the supply chain to facilitate the coordination of operations among supply chain partners.

The relevance of ICT and its expected prevalent future usage in the logistics sector is evident. Nowadays, these technologies are already part of almost each single segment of the supply chain. ICT has an impact on the capacity, efficiency and reliability of a transport mode. ICT influences the mode-shift and supports more environmental transport modes, such as rail and IWW as ICT can help to improve their competitiveness. These two modes mainly suffer from inflexibility which can be reduced with the help of ICT. Thus, new technologies can make intermodal transport solutions a more considerable option for

companies and better decision-support can be provided through real-time information about the status of the freight and the transport system.
Source: ProgTrans, mainly based on LogMan (2011), BE-Logic (2009), Handfield, Straube, Pfohl, Wieland (2013).

The following table provides an overview of the 14 logistic strategies identified above and their links with impacts on logistic indicators. Values in brackets [ ] show the results from the online survey and reflect the experts' estimation on the likely development of the importance of the individual logistic strategies/trends in the upcoming 15 years (up to 2030), ranging from a strong decrease (-2) to strong increase (2). Thus, the figures represent the average of estimations regarding the importance of strategies, followed by average estimation of development up to 2030.

Table 3.2 Logistic strategies/trends and their impacts, based on the questionnaire results

Description of strategy/trend	Impacts on logistic indicators
Technical and physical structure strategies and trends	
On-/off-/nearshoring	
Spatial relation between location of operation and the market [Importance Nearshoring: 0.66 Offshoring: 0.60 – Increase]	The strategy to spatially shift or relocate production processes will affect the ratio of international to domestic transport activities for products.
Global sales channel	
▪ Enterprises' distributive expansion into regions all over the world; ▪ Geographic expansion of distribution; ▪ [Importance 0.82 – Increase].	The strategy will ▪ increase the overall transport performance due to expansion of distribution; ▪ increase the average distance of transportation flows due to spatial expansion of distribution.
Centralisation/decentralisation	
Centralisation of operations in less locations/logistic nodes [Importance 0.59 – Increase]	A centralisation of operations will: ▪ decrease the number of logistic nodes and vice versa; ▪ increase direct deliveries (B2C).
Flexible supply base	
Expansion of supply sources [Importance 1.04 - Strong increase]	The increase of flexible supply base will: ▪ increase the number of supply companies (horizontal supply base); ▪ and the depth of the supply chain (vertical supply base).
E-commerce/E-procurement	
▪ Major commerce transactions performed electronically ▪ Procurement of goods and services over the internet ▪ [Importance 1.44 - Strong increase]	The trend of E-commerce will: ▪ increase the amount of single orders/consignments/deliveries which will: - decrease the average size of transport units and the load factor (t/veh.); - decrease the average vehicle dimensions (gross vehicle weight in t); - increase the number of vehicle movements/trips; ▪ increase the number of self-service post boxes/local shops.
Organisational and administrative strategies and trends	
Consolidation	
Transport collaboration and consolidation and transport bundling, route planning and control [Importance 1.30 - Strong increase]	Consolidation of transports will: ▪ lead to an increasing average load factor; ▪ decrease the number of trips.
Logistic postponement	

Description of strategy/trend	Impacts on logistic indicators
▪ Delay the activities of products and the moving of goods down the supply chain; ▪ Make a product suitable for a specific market or customer at the latest possible point in a supply chain; [Importance 0.78 – Increase]	The longer the finished products are stored centrally and delivered to the regional/distribution at the latest possible moment or the longer the product is not finished, the more modules will be stored centrally, the: ▪ central inventory stock turn rate will increase, while regional will decrease; ▪ the average area of warehouses/storage facilities centrally will increase, while regionally will decrease; ▪ decrease of number of trips thanks to avoiding unnecessary deliveries.
Outsourcing	
Shifting transport activities to external hauliers and specialised companies providing customised logistics solutions (2Pl, 3Pl, 4PL) [Importance 0.58 – Increase]	The strategy to further specialise on services others than transport/value-added services will: ▪ decrease the (monetary) share of transport services within the LSP activities; ▪ decrease the vehicle fleet within the economy/logistic sector.
Supply chain integration	
Integration of physical and information flows to create seamless business processes [Importance 1.31 - Strong increase]	The integration of physical and information flows will: ▪ decrease the average period of logistic processes; ▪ decrease the average period of activities across the supply chain.
Search for talent/staff retention	
Shortage of truck drivers, experienced warehouse staff and partly higher educated logistic staff (e.g. supply chain managers) [Importance 0.83 – Increase]	The shortage of talent/employees will lead to: ▪ an increase of investments in company-related training and education.
Agility	
The ability of a supply chain to react quickly to an unexpected or rapid shift in supply and demand [Importance 1.11 - Strong increase]	The strategy will ▪ increase the efficiency of the logistic process; ▪ decrease the average period of delays in the supply chain; ▪ increase the logistics-related costs.
Information and technology strategies and trends	
Multimodality/intermodality	
Involvement of more than one transport mode in a supply chain/transport chain [Importance 1.13 – Strong Increase]	The strategy will: ▪ support the shift of transport modes away from road, thereby increasing the usage of rail and waterborne transport.
Reverse logistics	
▪ Integrated returns network, non-integrated returns network, return to supplier; ▪ Remanufacturing, reuse, recycling ▪ [Importance 1.37 - Strong increase].	The strategy will: ▪ increase the share/rate of transport performance related to reverse logistics within the overall transport performance; ▪ lead to an increase of the recycling quota (input (t) of remanufactured, reused products) within the overall production process; ▪ an increasing amount of trips.
Use of ICT in logistics	
Timely and accurate flow of information across the supply chain supported by ICT [Importance 1.51 - Strong increase]	The strategy will: ▪ increase the efficiency of the logistic process by implementing ICT. This requires the increase of the rate of technology investments to the overall investments.

Remark: Results of questionnaire dated 06.02.2014; * weighted average -2: strong decrease of importance, -1: decrease of importance, 0: No change, 1: increase of importance, 2: strong increase of importance.

Source: ProgTrans AG; Ecorys.

In the next stage, the abovementioned logistic strategies and trends will be further described and analysed regarding their temporal evolution in combination with the main external factors.

3.4 Impact assessment of main external factors, strategies and trends

3.4.1 Assessment of the impact of the main external factors

The main purpose of this section is to determine the impacts of external factors on the freight transport and logistics sector and the explanation of the most important economic, social and environmental impacts. However, this impact assessment is an abridged version − in the sense of shortened and more general analysis of effects − and does not intend to have the same level of detail as requested in the EU Impact assessment guidelines[128].

The correlation between the main external factors, which are assumed to intensify in the future and the logistic strategies / trends are stated in the subsequent table, where a plus (+) illustrates a positive correlation and a minus (-) represents a negative correlation.[129] The amount of characters depict the intensity of correlation from moderate (+/-), strong correlations (++/- -) to very strong correlation (+++/- - -). This analysis has been performed for any external factor.

[128] EU Impact assessment guidelines SEC(2009)92.
[129] On-/Off-/Nearshoring are not indicated in this manner.

Table 3.3 Main external factors and their influence on logistic strategies / trends

		External factors							
		Ageing society	**Transport infrastructure development**	**E-business**	**ICT**	**Supply chain resilience**	**Fossil fuel scarcity**	**Raw material scarcity**	**Energy costs**
Logistic strategies / trends	On- / Off-Nearshoring		On / Near				On		Off
	Global sales channel		++	+++	+	+	- -		
	Centralisation	++	++	+	+	+			
	Flexible supply base				++	-	+	+++	++
	E-Commerce / E-Procurement	++		+++	+++				
	Consolidation				++		++		
	Postponement			+	+	+			
	Outsourcing								++
	Supply chain integration				+++	+++			
	Staff retention	- - -							
	Agility			++	++	++			
	Multimodality / Intermodality		+++				+++		
	Reverse logistics						+	+++	+++
	ICT Logistics			++	+++		+		

Remark: Note that all mentioned main external trends are expected to increase. The first line of logistic trends (On- / Off- / Near-shoring) reveals the external factors' most likely impact on logistic strategy regarding relocation of production.
Source: ProgTrans, AUEB.

The above matrix-table reveals that the main external factors and logistic trends are mostly positively correlated. Particularly proliferation of e-business, information and communication technologies, energy costs and the supply chain resilience are very positively influencing the logistics sector and its strategies and trends. In contrast the small influence of the (European) ageing society on the logistics sector is remarkable. The remaining external factors fossil fuels scarcity, transport infrastructure development and raw material scarcity are expected to have a positive and comparatively average influence. Fossil fuel scarcity, supply chain resilience and ageing society are the only external factors negatively correlated with one logistics strategy.

This table provides a first comprehension on how main external factors and logistic strategies interact and are correlated. It is important to show the correlation and its intensity as this interaction is essential for revealing the further effects of main external factors and relevant (correlated) logistic business strategies / trends on the economic, social and ecological environment by means of an abridged impact assessment.

3.4.2 Impact assessment of main external factors and logistic strategies

The following 8 tables represent so called fact-sheets in which all important impacts of external factors (Part A of the fact-sheet, selection based on allocation of external factors – Assessment of impact and uncertainty on logistic strategies and trends (B) are reported, assuming to be relevant in the long term (2030). This is followed by the impact assessment (C) of the logistic strategy / trend on the economy (C1), society (C2) and environment (C3). Each section of scope (C1 – C3) consists of areas of activities (e.g. competition, safety, transport activity etc.), which are assessed. There might be direct impacts (primary level), as well as indirect impacts. At the end of the fact-sheet (D), the main sources used for the assessment are quoted, followed by a short description of the main and most relevant remaining problems expected to be tackled by the EU transport policy. Additionally, the last section will, wherever possible, describe the most relevant logistic strategies and trends by means of adequate indicators and data, which have been provided in task 1. However, in some cases the analysis reveals substantial weaknesses in fundamental availability of logistic indicators and data significance, due to a lacking availability of data concerning its temporal (missing years) or spatial (reporting countries) coverage. Furthermore, it becomes obvious that, due to the fact that the data is mostly provided for the period 2005 – 2012, the financial and economic crisis in 2009 is of significant influence for the freight transport and logistic sector development.

The subsequent assessments provide information and findings, which are almost exclusively qualitative. This is due to the fact that the impacts of external factors on logistics strategies cannot be quantified, as the latter are not mono-causal and are dependent on external developments. In fact, logistic strategies react on various external factors, which are partly driven by microeconomic decisions. Accordingly, the subsequent economic, social and environmental effects – as a reaction on logistic strategies and trends - can be deduced qualitatively, but not quantitatively.

An example may illustrate this issue: The external factor "ageing society" in the EU is a fact (see the table below).[130]

[130] The old age dependency ratio is used as an indicator of the extent to which the older population (65 years or over) must be supported by the population of working age (conventionally 15- 64 years old).

Table 3.4 EU27 population, share of population aged 65 or above and old age dependency rate in 2010 and 2030

	2010	2030	
Population	499.389	519.942	+4.1%
Share of total population aged 65 or above	17.4%	23.6%	+6.2%
Old age dependency ratio	25.9	38.0	+46.7%

Source: Eurostat 2010.

Given this, one of the impacts will lead to a shortage of staff in the logistic sector. Experts from the road hauliers industry expect that only in Germany in the next 10 – 15 years 250.000 truck drivers will retire (= 40% of German truck drivers) (source: Wall Street Journal Deutschland, 2012), without an indication that they will be replaced by younger drivers.

Although the shortage of truck drivers might be one aspect of the ageing society, it is not plausible that this impact is mono-causally driven by the ageing society. In fact, there is a bundle of relevant reasons (wages, level of competition in Europe, job reputation, education, attractiveness of professional field, etc.). Furthermore, the ageing issue is not equally applicable for the whole EU and thus its effects differ, subject to the regional economic and social prerequisites. These fundamental issues imply the impossibility to quantify the isolated impact of the ageing society on the shortage of staff and assign it to the logistic sector.

To conclude, quantifying the complete cause-and-effect chain is not possible at this level of detail. Instead, reasonable and reliable figures regarding such specific questions at any spatial level might be derived by particular research projects.

As a result, the fact-sheet displays in which direction the effects are expected to evolve, which is illustrated by arrows within the last column ranging from a strong decrease (🡻) to a strong increase (🡹). The colouring behind the arrows illustrates the impact on the economy, society and environment according to the overall policy targets of the EU (red: negative, green: positive, blue: inconclusive). Logistic strategies are not assessed in that sense since they are considered to be the starting point of the impact assessment.

Table 3.5 Fact-sheet main external factor "Ageing society"

Ageing society		
A General information		
The average age of EU28 inhabitants is expected to increase significantly as is the prevalence of non-working age groups (i.e., above 65 years of age), leading to an expectation of decrease of the active workforce in the European Union, both in absolute and relative numbers.		
B Logistic strategy / trend		
E-Commerce / E-Procurement	The ageing of the European population is expected to lead to a strong increase of E-Commerce as elderly people will become further used to the diverse information and communication devices.	🡹
Staff retention	Staff retention will become an important issue for the logistics sector as the availability of qualified employees will strongly decrease due to an absolute decrease of active workforce.	🡹
Centralisation	The ageing of the European society and the expected strong increase of e-commerce will lead to centralisation of logistic activities (consolidation of operations in a single location / reduction of the number of locations). Centralisation affects / increases the transport performance (tkm).[131]	🡽

[131] Here, transport performance (tkm) is defined as the freight volume (t) multiplied by distance (km). Transport performance is the most adequate parameter to describe the freight transport activity.

Ageing society		
C Impact of influenced logistic strategies / trends on:		
C1 Economy		
2PL / 3PL	Growing staff retention and subsequent competition between companies will lead to higher wages / labour costs of LSP	↗
Competition	Due to the increasing importance of staff retention, the sectorial competition within the European economy for qualified staff will increase	↗
	Competition and prices between retailers are becoming more transparent (e-commerce) and thus prices will decline	↗
Revenues / costs in the logistics sector	Higher labour costs will decrease the revenues in the logistic sector / LSP	↘
2PL / 3PL	Decrease of revenues will lead to concentration of LSP companies / decrease the number of LSP	↘
Employment / Labour market	Concentration of LSP companies is expected to influence the number of employees, but the net effect of employment and the labour market is inconclusive	→
	The growing e-commerce market will decrease the local demand at specialist stores (revenues / employment)	↓
GDP	*No impacts expected from logistic strategies / trends*	
Extra-EU countries	International trade will increase and thus transport and logistics demand	↗
Other Impacts	*No impacts expected from logistic strategies / trends*	
C2 Society		
Public income	Higher wages will lead to an increase of public income; but net effect under consideration of employment (staff retention, concentration of LSPs, specialist stores) is inconclusive	→
Social inclusion / Equality / Opportunity	The growing demand for qualified personnel will increase intra- / extra European migration and the need of profession-related training facilities	↗
Safety / Crime / Security	Data security and supply chain protection is expected to be of significant sensitivity in the context of growing demand of e-commerce and e-procurement.	↗
Health	Negative effects due to increasing air pollutants and noise emissions where centralisation and thus increasing transport performance takes place	↗
Other Impacts	*No impacts expected from logistic strategies / trends*	
C3 Environment		
Transport performance / volumes	E-Commerce will lead to an increase of vehicle movements with a smaller size of shipments and thus increase overall freight vehicle performance (vkm).[132].	↑
	Centralisation is expected to increase the freight transport performance, but these might be reduced by "positive" impacts based on consolidation, modal shift and less emergency deliveries	↗
Air pollutants / Noise emissions	Increasing freight transport (centralisation) and vehicle (e-commerce) performance will have negative impacts caused by the absolute increase of air pollutants and noise emissions	↗
Land use / Visual quality of landscape	*No impact expected from logistic strategies / trends*	
Other Impacts	Centralisation is might decrease the amount of "emergency deliveries", often conducted by environmental unfavourable vehicles (e.g. airfreight), according to the extent of reduction	↘
D Additional information		
Data	E-Commerce: ▪ Vehicle movements: Air transport, registered carrier departures	

[132] Here, vehicle performance (vkm) is a parameter, which determines the sum of distances driven by all road vehicles in a specific period of time (per year).

Ageing society	
	worldwide from the EU28 2005 – 2012: +/- 0.0 % p.a.; ▪ Vehicle fleet of light commercial vehicles (<3.500 t) 2006 – 2013 in EU28: -32.2 %; 2005 – 2013 Germany +9.9 %; France -12.9 %; Italy -51.6 %; ▪ Average tonnes per road vehicle (lorries and road tractors) of selected EU Member States 2006 – 2011: -124 kg; -14 %. Centralisation: ▪ Number of warehouses / logistic facilities: not available; ▪ Number of LSP: not available on EU 28 level (Extract Germany 2005 – 2011: - 16 %); ▪ Number of national and international road freight vehicle movements in the EU 27 2005 – 2012: - 4.4 % p.a. Staff retention: ▪ Number of employees (LSP)[133] in the EU27 2008 – 2011: -1.2 % p.a.; ▪ Average wages (LSP)[134] in the EU27 2008 – 2011: 0.9 % p.a.
Sources	▪ Data task 1; ▪ Kohn / Brodin (2008); ▪ Eurostat 2014d.

Main remaining problems

The ageing of the society is expected to significantly enhance staff retention and search for talents, which is a fundamental future problem of almost all economic sectors. Furthermore this will lead to a growing competition for any kind of employees amongst sectors and companies, which, in turn, increase labour costs and decrease revenues. In addition, the expected increase of e-commerce will specifically have negative impacts on (local) specialist stores concerning revenues and the employment. Furthermore, increasing e-commerce and centralisation will have negative effects on the environment and society due to the increase of vehicle and transport performances, owing to a smaller size of shipments and centralised logistic facilities.

Table 3.6 Fact-sheet main external factor "Transport infrastructure development"

Transport infrastructure development		
A General information		
The TEN-T core network, comprising of nine major corridors within the comprehensive network, will connect ports, airports, railway lines, road axis, inland waterways and cross-border projects and will ensure full coverage of the EU and accessibility of all regions. The core network is to be completed by 2030 and should enable the Union action to concentrate on those components of the trans-European transport network with the highest European added value, in particular cross-border sections, missing links, multimodal connecting points and major bottlenecks.		
B Logistic strategy / trend		
On— and Nearshoring	The development of the Trans-European Transport Network (TEN-T), leading to an improved functioning of the cross-border traffic and a reduction of bottlenecks, is expected to support the European logistics sector and production, based on a higher reliability of supply chains.	↗
Centralisation	The concentration on a TEN-T core network will enhance the centralisation of logistics facilities (warehouses, distribution centres etc.), due to relocation of nodes.	↗
	Centralisation will increase the number of direct deliveries (B2C), but reduce the number of emergency deliveries (B2B) and might enable consolidation and multimodality	↗

[133] NACE Rev.2 H - Transportation and storage.
[134] NACE Rev.2 H - Transportation and storage.

Transport infrastructure development		
Global Sales Channel	The improvement of infrastructure enhances the possibility / opportunity to directly expand the sales channel	↗
Multimodality / Intermodality	An improved and more reliable European transportation network is the pre-condition for a slight modal shift of freight transport	↗
C Impact of logistic strategies / trends on:		
C1 Economy		
2PL / 3PL	The expansion of global sales channels will enhance the LSP network	↗
Competition	Near- and On-shoring will intensify and broaden the spatial competition amongst European LSP	↗
Revenues / costs in the logistics sector	Increasing competition among LSP will lead to decreasing revenues in the logistic sector	↘
Employment / Labour market	Further centralisation will lead to decreasing overall employment in the logistics sector due to economies of scope	↘
GDP	Expanding global sales channels will mainly increase the revenues of European producers and thus increase the GDP	↗
Extra-EU countries	Extra-EU (neighbouring countries) LSP will partly benefit (limited by cabotage) from the improvement of pan-European transport infrastructures, due to more competitive access to European markets	↗
Other Impacts	*No impact expected from logistic strategy / trend*	
C2 Society		
Public income	*No impact expected from logistic strategy / trend*	
Social inclusion / Equality / Opportunity	*No impact expected from logistic strategy / trend*	
Safety / Crime / Security	*No impact expected from logistic strategy / trend*	
Health	Inconclusive impacts on health of the society due to uncertain net effect between centralisation and multimodality on noise emissions and air pollutants	→
Other Impacts	*No impact expected from logistic strategy / trend*	
C3 Environment		
Transport performance / volumes	Improvement of transport infrastructure will decrease the infrastructural bottlenecks and missing links and improved cross-border traffic will enhance the reliability, speed and possibilities of freight transport performance on the entire network	↑
	Centralisation is expected to increase the freight transport movements and thus transport performances	↗
Air pollutants / Noise emissions	The slight shift of freight transport ('multimodality / intermodality') activities to environment-friendly modes (from road to rail & inland waterways) will lower the air pollutants and noise emissions	↘
	Although a more fluent (less congested road) traffic flow with less bottlenecks lowers the emission of air pollutants, the average traffic load might increase and have contrary effects	↗
Land use / Visual quality of landscape	The expansion of infrastructures have negative impacts on the visual quality of landscape and increases the rate of transport and logistics related land use	↘
Other Impacts	*No impact expected from logistic strategy / trend*	
D Additional information		
Data	**Centralisation:** ▪ Number of warehouses / logistic facilities and average size / area: not available; ▪ Number of LSP: not available on EU 28 level (Extract Germany 2005 – 2011: -	

Transport infrastructure development	
	16 %); ▪ Number of national and international road freight vehicle movements in the EU 27 2005 – 2012: - 4.4 % p.a.; ▪ EU28 transport performance for inland modes 1995 – 2012: +1.3% p.a. **Global Sales Channel** ▪ EU28 transport performance (tkm) 1995 - 2012Sea: +21.4 % Road: +31.3 %; ▪ Average length of international haul (km) Rail EU28 2005 – 2012: 0.4 % p.a. Road EU27 2005 – 2012: 0.0 % p.a. **Multimodality / Intermodality:** ▪ Modal share of inland freight transport performance of EU28 1995 – 2012: road +4.2 %, rail -3.1 %, iww 0.0 %, Pipeline -1.1 %; ▪ Combined rail/road transport (unaccompanied / companied in Europe 2005 – 2011: TEU + 28.9 %; Gross-tonnes + 32.8 %; ▪ Combined rail/road transport (unaccompanied / companied in Europe 2005 – 2011: Domestic + 28.4 %; International + 29.5 %.
Sources	▪ Data task 1; ▪ UIC (2012); ▪ Kohn / Brodin (2008); ▪ Eurostat 2014d.

Source: ProgTrans.

Main remaining problems

Although the expansion of global sales channels will broaden the LSP network, the intensity of European On- and Near-shoring will also foster the spatial competition amongst European LSP. In economic terms, the revenues of LSP are expected to decrease. Furthermore, centralisation is expected to decline the employment in the logistics sector. Overall, the economic net effect for the European logistics sector is inconclusive.

Furthermore centralisation, driven by transport infrastructure expansion and improvement, increases transport performance and negative environmental impacts. However, the total environmental effects are inconclusive depending on the type of infrastructural expansion (road / rail / iww (incl. nodes)) with its consequences for the development of modal split. Infrastructure expansions lower the visual quality of landscape, which constitutes a further problem.

Table 3.7 Fact-sheet main trend "Proliferaton of electronic business"

Proliferaton of electronic business		
A General information		
The trend towards the individualisation of business and consumer preferences in the context of purchasing products and services has to be considered in combination with the rapid increase of electronic business. In 2012, nearly 75% of individuals aged 16-74 in the EU used the internet and 60% of those internet users had shopped online. This marks a very significant increase since 2008, when only 32% of EU-27 citizens had used the internet for online purchases (the respective percentage for 2013 is 47%). The proliferation of electronic business, especially regarding the consumer preferences, has significant relevance for the logistic sector because it will impose enormous requirements in the fields of reliability, punctuality and expedition.		
B Logistic strategy / trend		
Global sales channel	The increased presence of electronic business in everyday life of individuals and economy will significantly increase the global demand and supply due to a further improvements of data-exchange and data-processing between the demand and supply side.	↑
Centralisation	The tendency to purchase consumer products by means of electronic devices fosters the centralisation of warehouses and	↗

Proliferaton of electronic business		
	storage facilities, in parallel to the centralisation of e-commerce operation and organisation. Postponement further enhances the centralisation tendencies.	
E-Commerce / E-Procurement	The proliferation of electronic business is a key pre-requisite of e-commerce and e-procurement. Thus, it obviously supports the future influence of e-commerce in the context of providing and purchasing products and services.	↑
Logistic postponement	E-business and consequently e-commerce enhance the possibility to keep products or modules centrally and assemble and deliver them directly to the customer on order.	↗
Agility	The agility of logistic and supply chain procedures is expected to be enhanced due to an increase of e-business. Agility is defined as the ability of a supply chain to react quickly to unexpected or rapid shifts in supply and demand. With the expected increase of e-business, supply chains in various industries, characterised by high volatility, low predictability and short life-cycles, will need to react with more agility.	↗
C Impact of logistic strategy / trend on:		
C1 Economy		
2PL / 3PL	The significant increase of global sales channels is expected to extend the global logistic activities and accordingly the activities of 2PL / 3PL.	↗
Competition	The global competition of logistic service providers will increase due to an enlargement of spatial market distribution of suppliers (diversification of suppliers). This will certainly pressurize the European logistic sector.	↗
Revenues / costs in the logistics sector	The competition among suppliers will lead to declining revenues due to enhanced global price competition.	↘
Employment / Labour market	Indirect impacts on employment and the labour market are inconclusive because of inconclusive net effects between price competition and global expansion (enlargement of supply and demand market)	→
GDP	Due to expected decline of revenues, production in Europe and GDP will decrease.	↘
Extra-EU countries	Extra-EU countries and markets will benefit from global sales	↗
Other Impacts	*No impact expected from logistic strategy / trend*	
C2 Society		
Public income	*No impacts expected from logistic strategy / trend*	
Social inclusion / Equality / Opportunity	*No impacts expected from logistic strategy / trend*	
Safety / Crime / Security	E-Commerce processes, including fundamental personal and financial information, will be target of external manipulation and interference.	
Health	The societal level of health is negatively impacted by increasing air pollutants and noise emissions	↘
Other Impacts	Obviously there are individual advantages regarding e-commerce and its positive effects on reliability, punctuality and expedition of purchasing products and services	↑
C3 Environment		
Transport performance / volumes	Altogether centralisation, postponement and e-commerce are expected to increase the freight transport movements (vkm) and transport performances (vkm) significantly.	↑
Air pollutants / Noise emissions	Increasing freight transport and vehicle performances will distinctly raise air pollutants and noise emissions.	↑
Land use / Visual quality of landscape	*No impacts expected from logistic strategy / trend.*	
Other Impacts	*No impacts expected from logistic strategy / trend.*	

Proliferaton of electronic business	
D Additional information	
Data	**Global Sales Channel** ▪ EU28 Transport performance (tkm) 1995 - 2012 Sea: +21.4 % Road: +31.3 % ▪ Average length of international haul (km) Rail EU28 2005 – 2012: 0.4 % p.a. Road EU27 2005 – 2012: 0.0 % p.a. **Centralisation:** ▪ Number of warehouses / logistic facilities and average size / area: not available; ▪ Number of LSP: not available on EU 28 level (Germany 2005 – 2011: - 16 %); ▪ Number of national and international road freight vehicle movements in the EU 27 2005 – 2012: - 4.4 % p.a.; ▪ EU28 transport performance for inland modes 1995 – 2012: +1.3 % p.a. E-Commerce: ▪ Vehicle movements: Air transport, registered carrier departures worldwide from the EU28 2005 – 2012: +/- 0.0 % p.a.; ▪ Vehicle fleet of light commercial vehicles (<3.500 t) 2006 – 2013 in EU28: -32.2 %; 2005 – 2013 Germany +9.9 %; France -12.9 %; Italy -51.6 %Average tonnes per road vehicle (lorries and road tractors) of selected EU Member States 2006 – 2011: -124 kg; -14 %. **Logistics postponement** *(No adequate indicator).* **Agility** ▪ Inventory stock turnover EU28 2005 – 2012: + 9.8 %.
Sources	▪ Data task 1; ▪ http://www.e-commercefacts.com/background/2013/08/pumas-unified-e-com-strat/index.xml ▪ Kohn / Brodin (2008); ▪ Eurostat 2014d.

Source: ProgTrans.

Main remaining problems

The expected problems resulting from the proliferation of electronic business and the consequent reactions of logistic strategies mainly concern two issues. Firstly, from the economic point of view, the expected global price competition of European logistic service providers and the subsequent decrease of revenues and domestic products sale appear to be considerable problem for European policy. However, the expected logistic strategies do entail some crucial – but pretty much - individual benefits for consumers and manufacturers. The second problem, which becomes evident in the future with regard to the proliferation of E-business, is the significant increase of transport performances due to centralisation, as well as vehicle performance because of increasing E-commerce and the subsequent considerable negative impacts for the environment (air pollutants and noise emissions).

Table 3.8 Fact-sheet main trend "Information and communication technologies (ICT)"

Information and communication technologies (ICT)
A General information
Information and Communication Technologies (ICT) related to transport and logistics are of crucial importance stating a basic prerequisite to further improve Intelligent Transport Systems (ITS). ICT was one prerequisite of globalization and is now fundamental for every aspect of today's life. It is obvious that ICT has a cross-sectional character, relevant for several logistic strategies, which becomes apparent even more when looking at the magnitude of influencing

Information and communication technologies (ICT)		
logistic strategies.		
B Logistic strategy / trend		
Global sales channel	Global sales channel will benefit and increase by the further implementation of ICT in logistics as well as sales processes. ICT support the simplification, acceleration, reliability and spatial proliferation of intermediate and final products sales.	↗
Centralisation	ICT allows optimising complex logistic processes between B2C and B2B, thus economies of scale can be raised due to a centralisation of logistic facilities supporting B2C and B2B information and freight exchange.	↗
Flexible supply base	In contrast to centralisation, the flexible supply base will increase because of the enhancement of B2B communication and information deployment.	↑
E-Commerce / E-Procurement	The implementation and improvement of ICT is expected to have positive impacts on e-commerce and e-procurement as the latter are fundamentally dependent on technologies.	↗
Consolidation	Better communication among LSP will improve the possibilities to consolidate and bundle freight movements, and optimise routings and control.	↑
Logistic postponement	Improvements in ICT foster the postponement because of an increasing certainty, reliability and predictability of (delayed) business / customer supplies.	↗
Supply chain integration	Supply chain integration is highly dependent and significantly positive correlated to ICT. The enhancement of communication and information provision leads to an improvement of supply chains performance and increasing integration.	↑
Agility	Agility, strongly dependent on information technologies, is expected to grow following ICT development.	↗
ICT logistics	ICT in logistics will significantly increase because of ICT development.	↑
C Impact of logistic trend on:		
C1 Economy		
2PL / 3PL	2PL and 3PL will certainly benefit and improve efficiency from increasing SC integration, agility, global sales channel, flexible supply base and consolidation.	↑
Competition	ICT are available for all market participants within and outside the EU, thus the improvements and implementation of ICT will not have considerable impacts on competition.	→
Revenues / costs in the logistics sector	Revenues within the logistics sector will significantly increase due to improved supply chain integration, agility, global sales channel, flexible supply base and consolidation.	↑
Employment / Labour market	Although 2PL / 3PL will benefit and revenues in logistics will increase, the impacts on the labour market and for employment are inconclusive (global sales channel vs. centralisation / consolidation).	→
GDP	Increase of GDP due to more efficient supply chains and logistic processes.	↗
Extra-EU countries	*No impacts expected from logistic strategies / trends.*	
Other Impacts	*No impacts expected from logistic strategies / trends.*	
C2 Society		
Public income	Expected increase because of growing revenues, income and GDP.	↗
Social inclusion / Equality / Opportunity	*No impacts expected from logistic strategies / trends.*	
Safety / Crime / Security	Supply chains and logistic processes will be significantly endangered by the increasing importance of ICT in supply chains as well as its increasing sensitivity towards external manipulation and interference.	↓

Information and communication technologies (ICT)		
Health	The societal level of health is negatively impacted by increasing air pollutants and noise emissions.	↘
Other Impacts	*No impacts expected from logistic strategies / trends.*	
C3 Environment		
Transport performance / volumes	Centralisation, postponement and global sales channel are expected to increase the overall freight transport performance significantly.	↑
Air pollutants / Noise emissions	Air pollutants and noise emissions will significantly increase due to growing freight transport performance.	↑
Land use / Visual quality of landscape	*No impacts expected from logistic strategies / trends.*	
Other Impacts	*No impacts expected from logistic strategies / trends.*	
D Additional information		
Data	**Global sales channel:** ▪ EU28 Transport performance (tkm) 1995 - 2012 Sea: +21.4 % Road: +31.3 % ▪ Average length of international haul (km) Rail EU28 2005 – 2012: 0.4 % p.a. Road EU27 2005 – 2012: 0.0 % p.a. **Centralisation:** ▪ Number of warehouses / logistic facilities and average size / area: not available; ▪ Number of LSP: not available on EU 28 level (Germany 2005 – 2011: - 16 %); ▪ Number of national and international road freight vehicle movements in the EU 27 2005 – 2012: - 4.4 % p.a.; ▪ EU28 transport performance for inland modes 1995 – 2012: +1.3 p.a. **Flexible supply base:** ▪ Number of LSP: not available on EU 28 level (Extract Germany 2005 – 2011: - 16 %); ▪ Vehicle-km per transport mode for EU27 not comparable due to data gaps (Extract Germany road vehicle km 2005 – 2011: - 1.4 %). **E-Commerce / E-Procurement:** ▪ Vehicle movements: Air transport, registered carrier departures worldwide from the EU28 2005 – 2012: +/- 0.0 % p.a.; ▪ Vehicle fleet of light commercial vehicles (<3.500 t) 2006 – 2013 in EU28: -32.2 %; 2005 – 2013 Germany +9.9 %; France -12.9 %; Italy -51.6 %; ▪ Average tonnes per road vehicle (lorries and road tractors) of selected EU Member States 2006 – 2011: -124 kg; -14 %. **Consolidation:** ▪ Load factor (t/veh.) road vehicles for EU 2005 – 2011 decreased by appr. 20 %. **Logistic Postponement** *(No adequate indicator).* **Supply chain integration** *(No adequate indicator).* **Agility** ▪ Inventory stock turnover EU28 2005 – 2012: + 9.8 %. **ICT logistics:** ▪ Share of inputs for ICT in Transportation and Storage: no data	

Information and communication technologies (ICT)	
	available on EU 28 level.
Sources	▪ Data task 1; ▪ Kohn / Brodin (2008); ▪ Eurostat 2014d.

Source: ProgTrans.

Main remaining problems

The current and prospective importance of centralisation, resulting in the enhanced utilization of ICT in logistics, is expected to increase transport performances. It will lead to environmental hazards and a declining level of societal health due to a higher level of air pollutants and noise emissions. A further field of interest, but with progressive importance, is the sensitivity of supply chains and logistics processes with regards to external computerised manipulation. The logistic processes will be significantly endangered because of the growing importance of ICT in almost every Electronic Data Processing-supported system component. The consequence is increasing sensitivity of entire supply chains to external manipulation and interference is the consequence.

Table 3.9 Fact-sheet main trend "Supply chain resilience"

Supply chain resilience		
A General information		
Supply chain resilience is about the systems' ability (by measures) to cope with all possible external events which disrupt the supply chain, e.g. terrorism, natural phenomena, failure of technology and physical infrastructure, human factor. Resilience will be of growing importance for the overall EU logistics sector and the operation of supply chains. Supply chain resilience is directly linked to the improvement of logistics management, control and use of resources in any concern and is expected to increase freight transport capacity, performance and reliability.		
B Logistic strategy / trend		
Global sales channel	The increase of supply chain resilience will increase the global sales channel because of growing certainty of the whole supply chain system and a minimisation of financial risks.	↗
Centralisation	Centralisation of the logistics sector will increase, because of the improvements in resilience and the reliability of supply chains, which in turn needs less logistic nodes and facilities.	↗
Flexible supply base	An increase of supply chain resilience will decline the supply base, due to the growing certainty of the whole supply chain system.	↘
Logistic postponement	Improvements in supply chain resilience foster the postponement because of an increasing certainty, reliability and predictability of (delayed) business / customer supplies.	↗
Supply chain integration	Supply chain integration is highly dependent and significantly positive correlated to the resilience of supply chains. The enhancement of process resilience leads to an improvement of supply chains performance and increasing integration.	↑
Agility	The agility of logistic and supply chain procedures is expected to be enhanced due to an improvement of supply chain resilience. Agility is defined as the ability of a supply chain to react quickly to unexpected or rapid shifts in supply and demand. Supply chain resilience positively impacts supply chains of various industries, characterised by high volatility, low predictability and short life-cycles.	↗

Supply chain resilience		
C Impact of logistic trend on:		
C1 Economy		
2PL / 3PL	The increase of global sales channels is expected to extend the global logistic activities and accordingly the activities of 2PL / 3PL.	↗
	Increasing supply chain integration leads to cost reduction in 2PL and 3PL services.	↑
Competition	The global competition of EU logistic service providers is not expected to accelerate, because the increase of EU logistics supply chain integration and agility will strengthen the sector also globally.	↗
Revenues / costs in the logistics sector	The increase of global sales channel will increase the revenues of the logistics sector.	↗
Employment / Labour market	Centralisation will have negative effects on the overall employment in the logistics sector due to increasing economies of scope.	↘
	Increasing competition, revenues and LSP activities have positive effects for the employment and labour markets.	↑
GDP	Increasing 2PL / 3PL revenues are expected to support the GDP growth.	↗
Extra-EU countries	Increasing global sales channel is expected to increase the welfare of Extra-EU countries.	↗
Other Impacts	*No impacts expected from logistic strategies / trends.*	
C2 Society		
Public income	Increasing GDP will positively influence the public income.	↗
Social inclusion / Equality / Opportunity	Inconclusive employment induces inconclusive social inclusion and equality.	→
Safety / Crime / Security	*No impacts expected from logistic strategies / trends.*	
Health	The societal level of health is negatively impacted by increasing air pollutants and noise emissions.	↘
Other Impacts	*No impacts expected from logistic strategies / trends.*	
C3 Environment		
Transport performance / volumes	Centralisation, postponement and global sales channel are expected to increase the freight transport movements and transport performances significantly.	↗
Air pollutants / Noise emissions	Increasing freight transport / vehicle performances will distinctly raise air pollutants and noise emissions.	↗
Land use / Visual quality of landscape	*No impact expected from logistic strategies / trends.*	
Other Impacts	*No impact expected from logistic strategies / trends.*	
D Additional information		
Data	**Global sales channel**	

Supply chain resilience	
	▪ EU28 Transport performance (tkm) 1995 - 2012 Sea: +21.4 % Road: +31.3 %; ▪ Average length of international haul (km) Rail EU28 2005 – 2012: 0.4 % p.a. Road EU27 2005 – 2012: 0.0 % p.a. **Centralisation** ▪ Number of warehouses / logistic facilities and average size / area: not available; ▪ Number of LSP: not available on EU 28 level (Germany 2005 – 2011: - 16 %); ▪ Number of national and international road freight vehicle movements in the EU 27 2005 – 2012: - 4.4 % p.a.; ▪ EU28 transport performance for inland modes 1995 – 2012: +1.3 % p.a. **Flexible supply base** ▪ Number of LSP: not available on EU 28 level (Extract Germany 2005 – 2011: - 16 %); ▪ Vehicle-km per transport mode for EU27 not comparable due to data gaps (Extract Germany road vehicle km 2005 – 2011: - 1.4 %). **Logistic postponement** *(No adequate indicator)* **Supply chain integration** *(No adequate indicator)* **Agility** ▪ Inventory stock turnover EU28 2005 – 2012: + 9.8 %.
Sources	▪ Data task 1; ▪ Eurostat 2014d.

Source: ProgTrans.

Main remaining problems

In general, the external factor concerning supply chain resilience generates comparatively more positive impacts by logistic strategies than problems. Negative impacts will mainly emerge and create (future) problems due to increasing centralisation and its effects for employment, environmental hazards and declining level of societal health.

Table 3.10 Fact-sheet main trend "Fossil fuel scarcity"

Fossil fuel scarcity		
A General information		
Whereas final energy consumption in EU-27 fell by 4% between 2001 and 2011, transport energy consumption increased by 6%. In specific, road freight transport energy usage accounts for approximately 30% of total transport energy consumption and is the freight transport mode with the highest share in energy consumption. There are various studies about the future availability of crude oil, revealing different results but with the same general tendency. The maximum rate of oil extraction (peak oil) will be reached during the next 15 - 20 years, followed by a declining rate of extraction and a depletion of resources in about 50 years (gas approximately 60 years), which will increase prices of fossil fuels.		
B Logistic strategy / trend		
Onshoring	Scarcity of fossil fuels will incite to relocate production to decrease transport (costs), hence minimising distances between production facilities and demand markets	↗
Global sales Channel	According to minimising fossil fuels and transport costs, global sales channels will be substituted by locating production facilities in demand markets	↘
Flexible supply base	The growing dependency of developed countries on imported fossil fuels and the increase of transport costs in relation to the overall production costs leads to decline of the producers' supply base	↘

Fossil fuel scarcity		
Consolidation	Fossil fuel scarcity incites consolidated logistics and transport	↑
Multimodality / Intermodality	Fossil fuel scarcity incites multimodal freight transport	↑
ICT in logistics	Fuel scarcity increases the development and utilization of information and communication technologies in logistics	↗
C Impact of logistic strategy / trend on:		
C1 Economy		
2PL / 3PL	2PL directly suffer from higher transport costs	↘
	The substitution of global sales channels will diminish the spatial LSP network	↘
	European 3PL benefit from increasing local production	↗
Competition	Ratio between production and transport costs will decrease. This enhances competition between European companies as well as between 3PL	↗
Revenues / costs in the logistics sector	Revenues in the logistic sector expected to decrease significantly as transport costs will rise	↓
Employment / Labour market	Impacts on employment in 2PL and 3PL because of relocation of production are indifferent.	→
	Consolidation will decrease the overall employment in the logistics sector.	↓
GDP	The overall slowdown of globalisation will slowdown economic activities	↘
Extra-EU countries	*No impact expected from logistic strategy / trend*	
Other Impacts	Slowdown of globalisation / global division of work.	↘
C2 Society		
Public income	Impacts of employment and public income inconclusive	→
Social inclusion / Equality / Opportunity	*No impacts expected from logistic strategy / trend*	
Safety / Crime / Security	*No impacts expected from logistic strategies / trends*	
Health	*No impacts expected from logistic strategies / trends*	
Other Impacts	*No impacts expected from logistic strategies / trends*	
C3 Environment		
Transport performance / volumes	The tendency to relocate production (onshoring) to the European market will reduce global transport volumes and performance	↘
	The tendency to relocate production (onshoring) to the European market will increase transport volumes and performance in Europe	↗
	The slowdown of globalisation and reduction of global sales channels decreases the transport volumes and performance	↘
Air pollutants / Noise emissions	The reduction of transport volumes and performances decreases the emission of air pollutants in total	↘
	Structural changes of global logistic transport patterns (onshoring, globalisation slowdown) relocates noise emissions	↗
Land use / Visual quality of landscape	Structural changes of global logistic transport patterns will	
Other Impacts	More traffic load on European infrastructure	↗
D Additional information		
Data	**ICT logistics** ▪ Share of inputs for ICT in Transportation and Storage: no data available on EU 28 level. **Consolidation** ▪ Load factor (t/veh.) road vehicles for EU 2005 – 2011 decreased by	

Fossil fuel scarcity	
	appr. 20 %. **Flexible supply base** ▪ Number of LSP: not available on EU 28 level (Extract Germany 2005 – 2011: - 16 %); ▪ Vehicle-km per transport mode for EU27 not comparable due to data gaps (Extract Germany road vehicle km 2005 – 2011: - 1.4 %). **Global Sales Channel** ▪ EU28 Transport performance (tkm) 1995 - 2012 Sea: +21.4 % Road: +31.3 %; ▪ Average length of international haul (km) Rail EU28 2005 – 2012: 0.4 % p.a. Road EU27 2005 – 2012: 0.0 % p.a. **Multimodality / Intermodality** ▪ Modal share of inland freight transport performance of EU28 1995 – 2012: road +4.2 %, rail -3.1 %, iww 0.0 %, pipeline -1.1 %; ▪ Combined rail/road transport (unaccompanied/companied in Europe 2005 – 2011: TEU + 28.9 %; Gross-tonnes + 32.8 %; ▪ Combined rail/road transport (unaccompanied/companied in Europe 2005 – 2011: Domestic + 28.4 %; International + 29.5 %.
Sources	▪ Data task 1; ▪ Eurostat 2014d; ▪ UIC (2012); ▪ Roland Berger 2011.

Source: ProgTrans.

Main remaining problems

The main problems stemming from the external factor of declining fossil fuels will significantly affect the costs for transport and thus will lead to enhanced on-shoring activities of the industry to reduce the transport costs. In parallel, global sales channels are expected to be reduced or substituted by external production which will diminish the spatial LSP network and activities. Overall, the effect for employment in the logistics sector is inconclusive, because of these reverse effects arising from increasing costs of transport and relocation of production. However, consolidation tendencies within logistic processes will have significant negative impacts for the employment in the logistics sector.

Increasing prices of fossil fuels (and thus energy prices) will lead to an (global) economic slowdown. Thus, the general prosperity (GDP, public income, revenues) in Europe is expected to decline, which will consequently impact the activities of LSP. Structural changes of global logistic transport patterns, due to onshoring as well as the globalisation slowdown shifts transport activities and hence air pollutants and noise emissions to Europe.

Table 3.11 Fact-sheet main trend "Raw material scarcity"

Raw material scarcity		
A General information		
As scarcity describes the decreasing availability of raw materials, this external trend is also influenced by other external developments like the growing global demand for raw materials, the rapid rise of middle class and global population growth. In addition, many natural resources are limited and consequently the extraction has become technically more and more difficult. Raw material scarcity constitutes a challenge of increasing importance for manufacturers and industries.		
B Logistic strategy / trend		
Flexible supply base	The growing dependency of developed countries on imported raw materials and the contradiction of the supply will lead to an	↑

Raw material scarcity		
	enlargement of the producers' supply base	
Reverse logistics	The relevance / meaning of reverse logistics systems and the related logistic services will significantly increase.	↑
C Impact of logistic strategy / trend on:		
C1 Economy		
2PL / 3PL	Reverse logistics are expected to become more important, which broadens the 3PL market and services	↑
Competition	The prices for some "critical" raw materials[135] are expected to increase significantly, which will raise the production costs especially for (import dependent) producers	↑
Revenues / costs in the logistics sector	Due to increasing production costs (of exports), revenues will decrease	↘
Employment / Labour market	Decreasing revenues will burden the labour market	↘
GDP	Wealth will be transferred from import dependent (developed) countries to raw material supplying countries	↘
Extra-EU countries	Extra-EU countries, assuming not being dependent on imported scarce raw materials, will benefit from higher prices on the global markets	↗
Other Impacts	*No impact expected from logistic trend*	
C2 Society		
Public income	Expected to decline because of decreasing employment	↘
Social inclusion / Equality / Opportunity	*No impact expected from logistic strategy / trend*	
Safety / Crime / Security	*No impact expected from logistic strategy / trend*	
Health	Negative impacts on health of the society due to increasing traffic	↗
Other Impacts	*No impact expected from logistic strategy / trend*	
C3 Environment		
Transport performance / volumes	The enlargement of suppliers will lead to increased vehicle and transport performance and lower load factors	↗
	Reverse logistics are expected to increase the necessary transport performances, unless the reverse logistics system is able to avoid shipments and transport costs	→
Air pollutants / Noise emissions	Growing transport performance (flexible supply base, reverse logistics) will increase the emissions of transport related air pollutants and noise	↗
Land use / Visual quality of landscape	*No impact expected from logistic strategy / trend*	
Other Impacts	*No impact expected from logistic strategy / trend*	
D Additional information		
Data	**Flexible supply base** ▪ Number of LSP: not available on EU 28 level (Extract Germany 2005 – 2011: - 16 %); ▪ Vehicle-km per transport mode for EU27 not comparable due to data gaps (Extract Germany road vehicle km 2005 – 2011: - 1.4 %). **Reverse logistics** ▪ Average secondary raw materials share of total freight (tonnes, not weighted) of EU28 (excl. MT, UK) in 2012: 5.97 %; 2008 – 2012: + 1.32 %.	

[135] The EU characterized 14 critical raw materials: antimony, beryllium, cobalt, fluorspar, gallium, germanium, graphite, indium, magnesium, niobium, metals of the platinum group, rare earth metals, tantalum and tungsten.

Raw material scarcity	
Sources	▪ Data task 1; ▪ Roland Berger 2011.

Source: ProgTrans.

Main remaining problems

Raw material scarcity is expected to become significantly apparent in the future. The subsequent reaction in the logistic sector engenders several economic problems for the future. Firstly, the transport performance and costs are expected to increase. These will have negative effects, both for the environment and society, mainly because of an enlargement of suppliers. The prices for some "critical" raw materials are expected to increase significantly, thus the production costs for import dependent manufacturers will substantially grow (assuming no substitution of materials). Furthermore and due to this, competition, revenues, national income as well as the European employment rate is expected to develop negatively.

Table 3.12 Fact-sheet main trend "Energy costs"

Energy costs		
A General information		
Fossils will remain the most important resource for energy production, but will lose some significance to renewable energy sources. This external factor is about the increase of energy costs for production and logistics, mainly influenced by scarcity of fossils (fuels) and due to expected increasing costs of alternative energies.		
B Logistic strategy / trend		
Offshoring	Increasing energy costs will incite to locate production to countries, where energies are not subject to enhanced taxation. The more the transport costs carry no or less weight within the total production process / costs, the more offshore production becomes attractive.	
Flexible supply base	Increasing energy costs will lead to a spatial enlargement of the productive supply base to quickly react on volatile energy and hence production costs / prices and hence to mitigate financial risks.	↗
Outsourcing	Increasing energy costs will incite to outsource specific (energy intense) logistic (service) processes into countries with lower energy costs.	↗
Reverse logistics	With regards to the production part of reverse logistics, energy costs are of high importance. Conservation of energy is one major incitement for the implementation of reverse logistics into the production process. More precisely the implementation of reverse chains into the supply chain saves energy and costs; By implication reverse logistics will become of distinct importance.	↑
C Impact of logistic trend on:		
C1 Economy		
2PL / 3PL	In general, increasing energy costs are expected to have negative impacts on the economy and thus also 2PL and 3PL.	↘
Competition	Due to offshoring, outsourcing the growth of supply bases, competition among European logistics service providers is not expected to increase. However the global competition among LSP will increase.	↗
Revenues / costs in the logistics sector	In general, increasing energy costs are expected to have negative impacts on the economy and revenues due to higher costs of production.	↘
Employment / Labour market	In general, increasing energy costs are expected to have negative impacts on the economy and revenues and thus on employment.	↘
GDP	In general, increasing energy costs are expected to have negative impacts to national production.	↘
Extra-EU countries	LSP outside the EU will benefit from the growing flexible supply base, outsourcing and offshore production.	↗

Energy costs		
Other Impacts	*No impacts expected from logistic strategies / trends*	
C2 Society		
Public income	Public income is expected to decrease.	↘
Social inclusion / Equality / Opportunity	The negative impacts on economy, labour market and public income (incl. private energy prices) also implies negative effects on the social structure – low educated social groups are expected to suffer most from and the social inclusion declines.	↘
Safety / Crime / Security	*No impacts expected from logistic strategies / trends*	
Health	The reduction on air pollutants will have positive impacts for the societal level of health.	↘
Other Impacts	*No impacts expected from logistic strategies / trends*	
C3 Environment		
Transport performance / volumes	Reverse logistics and its effects on transport and vehicle performances is inconclusive.	→
Air pollutants / Noise emissions	Increasing reverse logistics save resources and reduce the total air pollutants and noise emissions of primary production.	↘
	Increasing transport performances of reverse logistics implicate increasing transport emissions.	↗
Land use / Visual quality of landscape	*No impacts expected from logistic strategies / trends*	
Other Impacts	*No impacts expected from logistic strategies / trends*	
D Additional information		
Data	**Flexible supply base** ▪ Number of LSP: not available on EU 28 level (Extract Germany 2005 – 2011: - 16 %); ▪ Vehicle-km per transport mode for EU27 not comparable due to data gaps (Extract Germany road vehicle km 2005 – 2011: - 1.4 %). **Outsourcing** *(No adequate indicator definable)* **Reverse logistics** ▪ Average secondary raw materials share of total freight (tonnes, not weighted) of EU28 (excl. MT, UK) in 2012: 5.97 %; 2008 – 2012: + 1.32 %.	
Sources	▪ Data task 1.	

Source: ProgTrans.

Main remaining problems

The external factor regarding growing energy costs and consequently logistic strategies negatively impacts the areas of interest in numerous negative ways. The main identified and remaining economic problems concern national income, employment and revenues. In addition, social inclusion of lower income social groups / households is endangered due to a weakening economic sector and a comparatively higher financial strain.

3.4.3 Main conclusions of impact assessment

To conclude, the impact assessment of the main external factors reveals the following logistic strategies and trends as the most important, according to their frequency of occurrence in the impact assessment and their economic, social and environmental impacts:

- Significant increase of **centralisation** and corresponding effects on transport performances;
- **E-commerce** as driving force of increasing vehicle performance;

- Expansion of **global sales channels**;
- **Flexible supply base**, which is expected to evolve in different directions, dependent on the respective external factor;
- Increasing **Consolidation** with significant negative impacts for the employment in the logistics sector.

In addition, subsequent impacts are the most negative outcomes evolving from the previous impact analysis of logistic strategies and trends. Simultaneously, these outcomes depict the main future problems arising for the economy, the society or the environment. The determination of the most relevant impacts is based on their frequency of occurrence in the impact assessment. This approach, complemented by an evaluation of effects (ranging from strong decrease to strong increase), also allows ranking future problems by importance and according to their relevance within the European logistics sector and the future transport (logistics) policy as follows:

- Decreasing revenues for the overall economy, for LSP and specialist / local stores;
- Negative environmental effects by increasing air pollutants and noise emissions and consequent effects on the societal level of health;
- Negative impacts for employment in the logistics sector;
- Growing competition: Amongst sectors and companies for employees (shortage of staff), price competition amongst European LSP;
- Significant endangerment by the increasing importance of ICT in supply chains as well as its increasing sensitivity towards external manipulation and interference;
- Increasing costs of labour and transport.

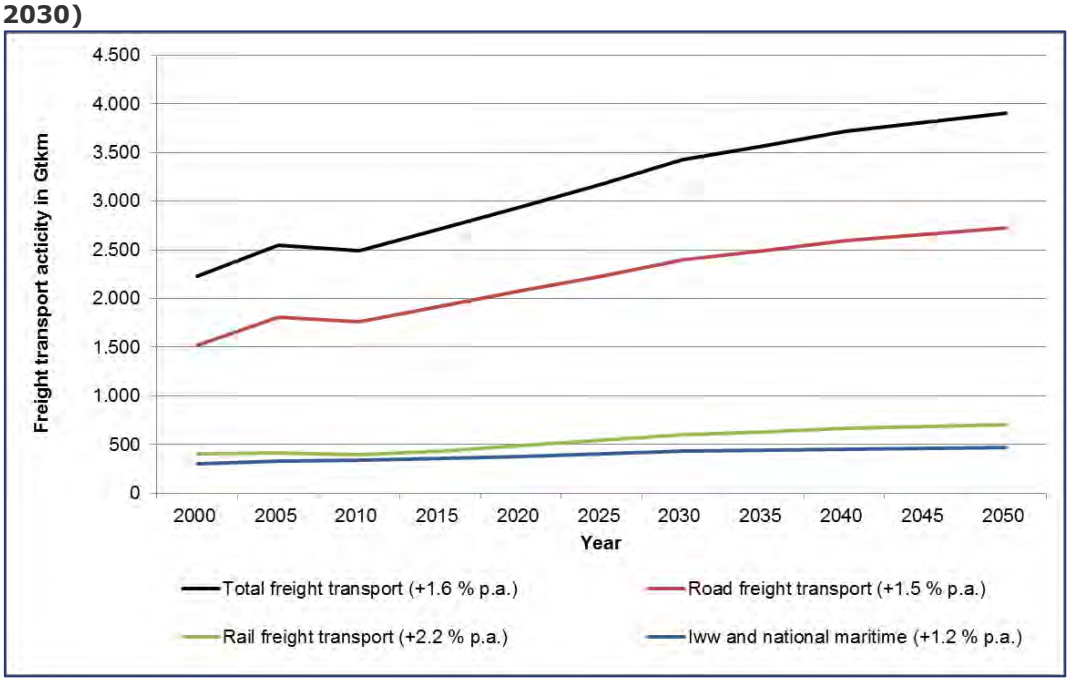
3.5 Scenarios for EU logistic development

At the early project stage, the consortium developed a 3-step approach to build scenarios upon the derived external factors. Based on this, each scenario - as a variation of the peculiarities of fundamental preconditions – was analysed concerning its changes on the development of the logistic sector, in particular reflects the most probable changes of logistic strategies and trends. This was followed by a rough impact estimation of the future transport development, more specifically the influence on freight transport performance.

3.5.1 EU Reference Scenario 2013

Therefore the EU Reference Scenario 2013 (European Commission 2013a) provides the baseline (=reference) scenario for the 2050 horizon of freight transport performance per mode as shown in Figure 3.11. However this project considers transport and logistic relevant developments up to the year 2030. In this respect, the EU baseline scenario reveals that in total, the development of freight transport performance for all EU28 Member States between 2010 and 2030 will significantly increase with +1.6 % p.a. up to approximately 3.500 Gtkm; between 2030 and 2050 by 0.7 % p.a. up to 3.900 Gtkm. This development is mainly influenced by the positive growth of road freight transport performance with 1.5 % p.a., in absolute terms by 634 Gtkm. However, rail freight transport is expected to increase even stronger with 2.2 % p.a., In contrast, inland waterway and maritime (national) transport performance between 2010 and 2030 is expected to increase by 1.2% p.a., but both at comparatively lower absolute levels.

Figure 3.11 Freight transport activity of the EU28 Member States per mode (in Gtkm) between 2000 – 2050 according to the EU Reference Scenario 2013 (AAGR 2010 – 2030)



Source: European Commission 2013a.

There are some qualitative descriptions concerning transport and logistic sector related assumptions, which underlie the EU Reference scenario 2013. Until 2030 the most important are:

- Fuel prices will increase;
- In general, freight transport activity is closely following the GDP development, especially road transport;
- The completion of the core network corridor until 2030 (and of the comprehensive network by 2050) will provide more adequate transport infrastructure which supports the concentration of trans-national traffic and long distance flows. These are expected to support the logistic functions and improve the intermodal integration of road, rail and inland waterways;
- Until 2030, innovative information management systems will reduce time loss by road congestions;
- Concerning rail and inland waterways activities, the completion of the TEN-T core and comprehensive network will have substantial positive effects, improving competitiveness of the modes. Especially inland waterway freight transport is expected to benefit from the improved network, as it will support logistics functions and intermodal integration.

The description of the EU Reference scenario 2013 (European Commission 2013a) does not reveal the specific quantitative assumptions which underlie the expected development of the logistics sector and the corresponding freight transport performance. In this respect it is not feasible to determine the impacts of any modifications within the reference (baseline) scenario to form the subsequent four scenarios and quantitatively assess them in terms of transport performance. Disregarding this, in the following an attempt is given to quantify the AAGR of the overall EU transport performance (measured in Gtkm) compared to the EU baseline scenario as a "best guess" based on our expertise.

In general, between 2030 and 2050 freight transport will increase at lower rates due to the GDP slowdown and the shift from economic activities towards services and limits to distant sourcing and off-shoring.

3.5.2 Scenario development

Step 1: Identifying external factors (cf. chapter 3.2)

In the first step the relevant external factors were identified. This was done by the determination of the relevant PESTLE factors in chapter 3. These have been additionally validated by means of the results from the questionnaire to stakeholders.

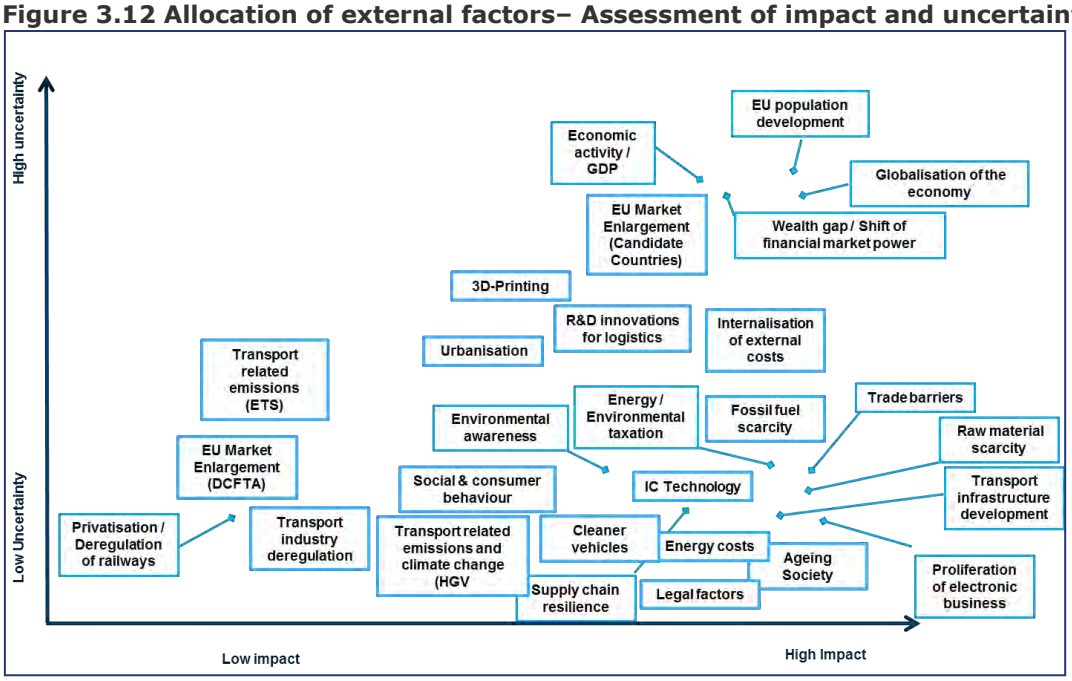
Step 2: Assessing the impact level and uncertainty of external factors

In the second step the impact and uncertainty of each external factor was assessed by experts of the consortium. Bearing in mind the questionnaires' results, a two axis diagram was developed, where the horizontal axis indicates the level (low to high) of impact of the external factor on the logistic sector. The vertical axis indicates the external factors' future development (un)certainty. The more unlikely the occurrence of the external factor, the higher the factor has been placed in the diagram.

The allocation of external factors was conducted by experts of the Lot 1 consortium by means of an internal interactive workshop. Wherever possible, the allocation and assessment of external factors according to their relevance for the logistics sector as well as their level of certainty, was amended by questionnaire findings.

The factors in the right top corner of the diagram became the leading factors in the second step, because these are assessed to have the largest impact on the logistics sector while their occurrence is uncertain and hence their occurrence or non-occurrence will be the main cause of different developments of the market (different scenarios). By picking these factors the 'extremes' can be formulated. The following figure shows the output of step 2.

Figure 3.12 Allocation of external factors– Assessment of impact and uncertainty



Remark: For purposes of readability, legal factors are summarized.
Source: Ecorys / ProgTrans / AUEB / Fraunhofer / TCI.

In the upper right corner of the above figure the driving forces are indicated. In the elaborated allocation of external factors, these are:

- Economic activity;
- Development of the EU population;
- Globalisation of the economy;
- Development of the wealth gap;
- Size of the European market / EU Market Enlargement (Candidate Countries).

Based on this, it is possible to cluster factors and to formulate two packages of leading factors:

I. the economic development of Europe (stagnant to dynamic & prosperous); and
II. the spatial peculiarity of production and consumption (regional to global).

Step 3: Formulating scenarios

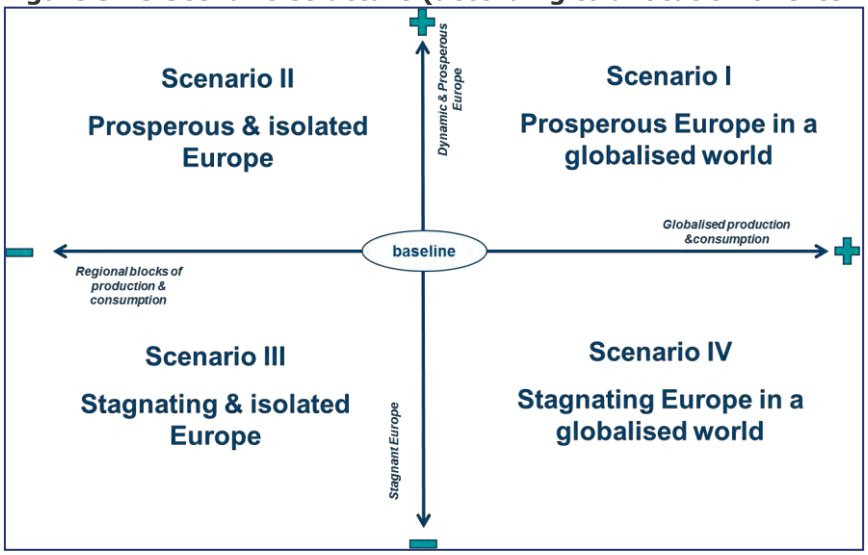
The two clusters of factors form the basis of the scenario development. One cluster is placed on the horizontal axis and the other on the vertical axis. The clusters are used in extremes. As shown in Figure 3.13below the two driving forces are: The spatial change in production and consumption process, ranging from local / regional to global production and consumption (e.g. in China; India, Brazil). The second force refers to the economic prospects of Europe - ranging from a stagnant to a very dynamic and prosperous economic development.

It enables us to define four scenarios (cf Figure 3.13):

Scenario I: Prosperous Europe in a globalised world (right-hand upper corner);
Scenario II Prosperous & isolated Europe (left-hand upper corner);
Scenario III Stagnating and isolated Europe (left-hand lower corner);
Scenario IV Stagnating Europe in a globalised world (right-hand lower corner).

Each scenario is developed in its own way. Based on the underlying assumptions, described for the specific scenario, the logistic strategies and trends are subsequently assessed according to their probable change in respect to the scenario, if influenced at all.

Figure 3.13 Scenario structure (according to allocation of external factors and trends)



Source: Ecorys / ProgTrans.

Each scenario is shortly described in a systematic and coherent way, s starting with the development of the two driving forces (spatial demand / supply and economic activity), explaining how these forces will behave in respect of the basic development of external PESTLE factors.

The second step is to describe the most probable changes of logistic strategies and trends, if occurring, as well as their implications on the European transport activity. Will they become more important or less meaningful given the development of the two driving forces? The scenarios will qualitatively estimate the deviation from the expected developments, in particular the transport performance given in the base line scenario, i.e. the EU Reference Scenario 2013.

3.5.3 Scenario assessment

In the following section the four scenarios are described more in detail. It seems important to point out that it is not the aim to judge whether one of these scenarios is more or less likely than the others or whether these scenarios are realistic or not. The goal of this exercise is to qualitatively estimate their impact on logistic strategies, knowing that the global developments described in the scenarios will not occur in their pure form. Since the economy is a "learning" and constantly developing system, each development described in these scenarios could be a starting point of counter measures of the economic players, which could lead to different results. But for the sake of clarity of the argumentation (mono-causality) the analysis stays with these contrasting scenarios, enabling us to describe the impacts of each scenario.

SCENARIO I: Prosperous Europe in a globalised world (Global Strength)

The "Global Strength" scenario assumes that the EU will be able to further expand its role as one of the leading economic powers in the global economic structure. Trade barriers will significantly decrease and enable further growth of the community's external trade and the economic strength of the EU as a whole. This scenario will be supported by an accelerated progress of technologies and its wide application in practice:

- Decreasing trade barriers, e.g. TTIP coming into force and the establishment of further DCFTA / FTAs / Association Agreements;
- Increasing external trade (current account surplus of the EU) with e.g. Asia and the U.S;
- Strengthening the importance of the European economy in globalisation;
- Surpassing economic growth in Europe;
- Fast EU enlargement by candidate countries;
- Above average acceleration of technological development;
- Overcoming of fossil fuel and raw material scarcity due to substitution;
- Stagnating / decreasing energy costs.

SCENARIO II: Prosperous and isolated Europe (Regional Strength)

The "Regional Strength" scenario expects the EU to concentrate on its "own strength" and benefit from an increasing intra-regional demand and supply as a reaction of the establishment of further trade barriers and other protectionist tendencies of extra-EU countries or regional blocks. However, the enlargement of the EU by candidate and potential candidate countries, leading to a considerable expansion of the Intra-EU market, is assumed to strengthen the Intra-EU economies and thus being able to overcome the global dependency. The regional strength will be supported by the conceivable substitution of fossil fuels and raw materials as well as a decrease of energy dependency and costs:

- Fast EU enlargement by candidate and potential candidate countries;
- Surpassing economic growth in Europe due to increasing Intra-EU production and trade (regionalisation of demand and supply);
- Increasing global trade barriers / protectionism (e.g. TTIP on hold);
- Strong mitigation of globalisation of the economy;
- Above average acceleration of technological development;
- Overcoming of fossil fuel scarcity due to substitution and/or stagnating / decreasing energy costs;
- Overcoming of raw material scarcity due to substitution and reverse systems (e.g. recycling).

SCENARIO III: Stagnating and isolated Europe (Global Protectionism)

This scenario, "Global Protectionism", concerns the implementation of extensive protectionism measures by countries outside the EU (Asia, U.S.). In contrast to the Regional Strength Scenario this scenario assumes that the EU will not be able to preserve its economic strength, not at least because of an aggravation of the ageing

society problem and consequently a decrease of population as well as a declining immigration and subsequent labour force deficits:

- Increasing protectionism by Asia and the US and trade barriers;
- Decreasing external trade with e.g. Asia and the U.S;
- Below average development of technological improvements (ICT) in the EU;
- Ageing society due to decreasing population and less immigration, labour shortage;
- Labour deficit and skilled worker shortage;
- No further EU enlargement, because of economic downturn in the EU.

SCENARIO IV: Stagnating Europe in a globalised world (European Paralysis)

The "European Paralysis" scenario assumes the economic downturn of the European economies due to an enhancement of economic activity in Asia, the U.S. and South / Central America. The economic enhancement is grounded on the catch up effect of medium-high tech industries in terms of productivity and technological improvements within regions outside the EU. In addition, European industries will not be able to assert their leading position by further process and technology advancements. Furthermore, the relocation will be fostered by significant differences in labour costs. As a consequence, the role of the EU in global economics and trade is expected to decline. The expected ageing of society (population decrease) and less immigration (due to shortage of labour) are expected to exacerbate this development:

- Enhancement of medium / high tech manufacturing industries and production processes in regions / countries outside the EU due to technological and productivity improvements;
- Shift of economic power to Asia, U.S. and South / Central America;
- The EU external trade and division of work will decline;
- Stagnating economic growth in Europe;
- Ageing society due to decreasing population and less immigration;
- Decreasing intra-EU demand and supply;
- Status quo of trade barriers;
- No further EU enlargement.

The following table reveals the estimated impacts on logistic strategies for the different scenarios, whereas the arrows depict the direction of impact (⇑ strong increase; ↗ moderate increase; → stagnation, ↘ moderate decrease ⇓ strong decrease).

Table 3.13 Impacts of scenarios on logistic strategies / trends

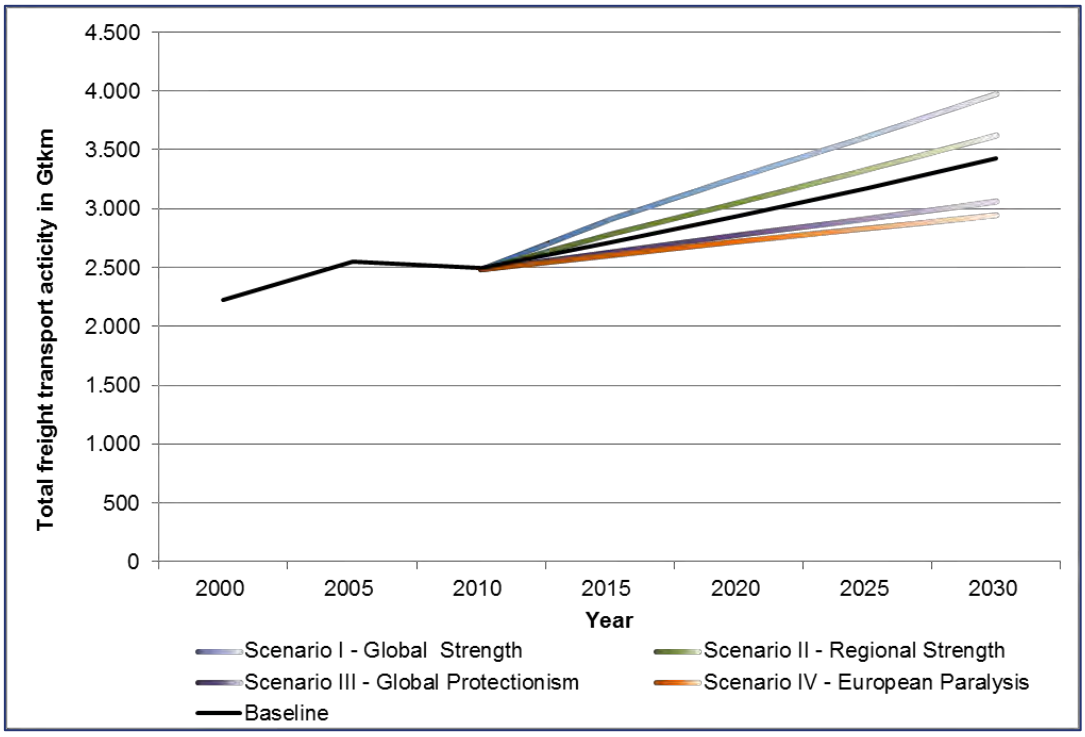
		Global strength	Regional strength	Global Protectionism	European Paralysis
Logistic strategies	Onshoring	→	⇑	⇑	→
	Offshoring	⇑	→	→	↗
	Nearshoring	→	⇑	↗	→
	Global sales channel	⇑	↗	⇓	⇓
	Centralisation	→	↗	↗	→
	Flexible supply base	⇑	↗	↘	→
	E-Commerce	⇑	↗	→	→
	Consolidation	↗	↗	→	→
	Postponement	↗	→	→	→
	Outsourcing	⇑	↗	↘	→
	Supply chain integration	↗	→	→	→
	Staff retention	⇑	↗	↗	⇑
	Agility	↗	↗	→	→

	Multi- / Intermodality	↑	↗	→	→
	Reverse logistics	↗	↑	↗	→
	ICT logistics	↑	↗	↘	→

Source: ProgTrans.

In addition figure 3.14 shows the estimated impacts of the above quoted changes of logistic strategies on transport performances between 2010 and 2030 for the EU28 Member States for the different scenarios.

Figure 3.14 Estimation for changes within freight transport activity (transport performance in Gtkm) of EU28 Member States between 2010 and 2030 for the baseline and scenarios I – IV



Source: ProgTrans.

3.5.4 Scenario conclusion

The four scenarios described above differ from the baseline scenario regarding the expected development of total freight performance (Gtkm) as shown in the figure above. It becomes evident that the scenarios I and II will lead to a total freight activity above the estimated development in the baseline scenario, whereas the scenarios III and IV will lead to a growth below the estimated development of transport performances in the baseline scenario. The impact for each scenario regarding the development of the total freight activity is given in the below.

Table 3.14 Impacts of scenarios on logistic strategies on the EU28 wide transport performance (AAGR of Gtkm) between 2010 and 2030

Period 2010 - 2030	EU Reference Scenario	Global strength	Regional strength	Global Protectionism	European Paralysis
Estimated changes of transport performance	1.6 %	2.4 %	1.9 %	1.0 %.	0.8 %

Source: ProgTrans.

As can be seen from the table above, the scenarios lead to deviations from the baseline scenario, regarding the average annual growth rates (AAGR) of the overall EU

transport performance. The main assumptions behind these deviations will be described below.

Scenario I "Global Strength"

Within this scenario, the EU is expected to assert and expand its position within the global economic framework, not at least due to an above average acceleration of its technological innovations. As a result, logistic strategies will continue towards off-shoring, global sales channel, flexible supply base and an enforced deployment of outsourcing - supported by the enhancement of ICT in logistics, agility and supply chain integration – which will lead to a considerable increase of global exchange of goods. Hence, the European logistics and freight transport activity will significantly increase by approximately 60 % between 2010 and 2030 (+ 2.4% p.a. instead of 1.6% p.a. in the EU reference scenario).

Scenario II "Regional Strength"

This scenario can be seen in contrast to the Global Strength scenario: An enlarged intra-EU supply and demand base, also fostered by a wide scale EU enlargement will lead to a prosperous Europe, enabling the EU economy to even overcompensate the decreasing global exchange of goods as a result of global increasing trade barriers. The regionalisation of demand and supply will lead to shorter transport distances for higher volumes of goods due enhancing onshoring and nearshoring activities, thus an increase of the AAGR of 1.9%.

Scenario III "Global Protectionism"

A significant growth of global protectionist measures, in particular outside the EU, will hinder the global exchange of goods and services. In contrast to the "Regional Strength" scenario, the EU is not able to overcome its global economic dependency. Therefore the tendencies towards on-shoring and near shoring with shorter transport distances, the decrease of the global sales channel, the flexible supply bases and outsourcing will lead to a decreasing overall transport performance with an AAGR even below the EU reference scenario (+ 1.0% p.a.).

Scenario IV "European Paralysis"

This scenario – in its effects similar to the latter scenario - can be characterised by an economic paralysis in the EU, where the EU economy will not be able to overcome the economic decline. A shift of production and consumption of medium / high value goods and services to the US and particularly Asia as well as to minor extent to South and Central America, leads to a stagnating economic activity. This situation is aggravated by the non-enlargement of the EU and the ageing society in the EU 28 in line with the economic downturn and the reduced demand of labour force. Hence, this scenario results in an even lower growth rate of the overall transport performance, than in the Global Protectionism scenario amounting to 0.8% p.a.

4. Mid to long-term logistics policy

4.1 Introduction

In this chapter FTLAP 2007 is reviewed on its relevance today and an analysis of impacts on several policy options is conducted. The other tasks within this study set the framework and toolbox for this assessment. Chapter 2 provided a coherent and extensive dataset, which in turn enabled the assessment of the importance of logistics in the EU. Further, chapter 3 described external effects, trends and strategies, proposing four future scenarios. This chapter builds on these efforts, ultimately brought together into a light impact analysis of possible future policy options.

The chapter is structured as follows. First (section 4.2), the problem definition is described, identifying the current problems, problem drivers and relating those problems to the objectives of FTLAP 2007. The next section (4.3) defines policy objectives based on the identified problems. Possible policy options in line with those objectives are proposed in section 4.4. The policy options were compared on their economic, social and environmental impacts (4.5). This chapter is concluded (section 4.7) with recommendations for future monitoring and evaluation mechanisms of the proposed policy options.

4.2 Problem definition

At the time of the FTLAP 2007 a number of factors[136] put pressure on the transport-related costs of logistics services in Europe, and also threatened the sustainability of the logistics market and freight transport industries. The world and the industry itself have changed. Analysing the current and future problems of the logistics sector in Europe enables development of adequate policy options. This section analyses the current problems of the EU logistics market as well as the problems of the future. These problems were defined using the market analysis (Chapter 2), trends (Chapter 3) and the stakeholder consultation responses, as explained below.

Market analysis and performance of the logistics sector

The analysis of the logistics market in the EU, logistics costs, added value and performance of the sector in Chapter 2 provides information about the current status of the EU logistics sector. In short, the market analysis identified the following evidence regarding current problems in the sector.

Logistics costs increased between 2006 and 2012 for road transport (+19%, according to paragraph 2.4.3), rail transport (+13%, according to paragraph 2.4.4), inland waterway transport (+18%, according to paragraph 2.4.5) sea transport (+19%, according to paragraph 2.4.6), air transport (+23%, according to paragraph 2.4.7) and only marginally increased for warehouses (paragraph 2.4.8). These figures show rising logistics costs, especially for the transport part of logistics.

The increase in logistics costs is merely caused by a rise in personnel costs (paragraph 2.4.1, cf. figure 2.20) and rising fuel and electricity costs (paragraph 2.4.1, cf. figure 2.21 and 2.22).

[136] Rising fuel costs, the introduction of the digital tachograph (which is facilitating enforcement of social legislation in road haulage), driver shortages and a certain degree of market consolidation were being cited as cost drivers that may drive up logistics costs. Other factors caused upward pressure on prices, including the effects of transport on the environment and human health and the costs incurred due to congestion.

In paragraph 2.6.1, a large variance in infrastructure quality between member states was observed. This observation confirms the potential for improving infrastructural quality and interoperability between member states. This would enhance the functioning of the EU internal market.

In addition, average EU infrastructural quality lags behind the quality provided by countries such as Japan, USA, and China. However, EU infrastructure quality is still perceived as higher than that observed in Brazil, India and Russia. (cf. paragraph 2.6.1)

In paragraph 2.6.3, different figures are shown between member states for empty runs as a percentage of total journeys, suggesting a potential to improve the usage of resources especially for Greece, Bulgaria, Latvia, Hungary, Poland, Spain, Croatia and Cyprus. In addition, the productivity per employee varies greatly, so efficiency gains can be realised.

Other information on indicators collected from the market and performance analysis will be shown per problem described in this chapter.

Stakeholder consultation

The stakeholder consultation phase consisted of a questionnaire and workshop. The questionnaire was sent to over 400 stakeholders of the logistics sector in Europe. The results are presented in Annex VII.

The following problems are perceived by the stakeholders as currently (highly) relevant problems. Roughly two-thirds of the stakeholders responding to the questionnaire believe these problems are the main threats to the competitive position of the European logistics sector.

Figure 4.1 Relevance of problems for the competitiveness of the EU logistics sector

Source: Questionnaire /Stakeholder Consultation, Ecorys 2014. (note: the number in the bars represent percentages).

The following problems are indicated as most relevant for the EU logistics sector, today (percentage of respondents indicated high and very high relevance for the problems):

- Lack of intermodal transport infrastructure (72%);
- Lack of well interconnected European transport infrastructure (68%);
- Increasing energy costs (68%);
- Increased congestion (63%);
- Regulatory/administrative procedures (63%).

In addition, stakeholders mentioned the following as 'other problems':

- Cost of last mile logistics;
- Lack of prioritisation and knowledge related to logistics efficiency solutions;
- Lack of organisational/skill innovation.

Trends and scenarios

The impacts for the future of the logistics sector were defined in chapter 3 through a combined analysis of external factors influencing the logistics industry and trends in current logistics strategies. The trend analysis provided evidence for the current problems of inefficient transport operations, empty trips and increasing shortage of staff.

The average tonnes per road vehicle (lorries and road tractors) of selected EU Member States decreased by 124 kg (-14 %) between 2006 and 2011. Furthermore, the load factor (t/veh.) for road vehicles in the EU from 2005–2011 decreased by approximately 20% (paragraph 3.4.2).

Also, the number of employees for logistics service providers in the EU27 decreased by 1.2% for 2008–2011. (NACE Rev.2 H - Transportation and storage, paragraph 3.4.2)

Through the combined impact analysis on trends and logistics strategies in paragraph 3.4.2, a number of problems are expected to arise or persist, listed in paragraph 3.4.3. These problems are mainly related to the increasing shortage of staff and skilled labour for the future logistics sector and rising externalities (noise, air, visual landscape).

11 problems, 3 main problems categories

Eleven problems of the EU logistics sector were identified, based on the findings of the market overview, analysis of trends, and stakeholder consultation. These problems are listed below:

- Inefficient operations within modes of transport;
- Slow evolution of innovations and take up of new technologies;
- Lack of interconnected transport infrastructure and congestion;
- Regulatory and administrative procedures;
- Increasing energy costs;
- Use of environmentally unsustainable technologies;
- Market pressure to use of environmentally sustainable solutions;
- Negative externalities;
- Mismatch in skills;
- Increasing imbalance between demand and supply of drivers due to regulatory regime;
- Sector attractiveness under pressure.

The following table indicates the part of the study from which these problems were derived. The market analysis, stakeholder consultation and identified trends reveal the current problems perceived and observed in the sector. The impact assessment on trends and strategies indicates the future problems, especially for the labour market.

Table 4.1. Evidence base for the 11 problems

According to evidence from Problems	Market Analysis (CH2)	Stakeholder consultation (Annex VII)	Trends and strategies (CH3)	Trends and strategies impact assessment (CH3)
Inefficient operations within modes of transport	✓	✓	✓	
Slow evolution of innovations and take up of new technologies	✓			
Lack of interconnected transport infrastructure and congestion	✓	✓		
Regulatory and administrative procedures		✓		
Increasing energy costs	✓	✓		
Use of environmentally unsustainable technologies		✓		
Market pressure to use of environmentally sustainable solutions	✓		✓	
Negative externalities				✓
Mismatch in skills		✓	✓	
Increasing imbalance between demand and supply of drivers due to regulatory regime				✓
Sector attractiveness under pressure				✓

The problems were clustered in three main problem categories: rising logistics costs, negative environmental impact and increasing shortage of staff.

Figure 4.2. Rising logistics costs, negative environmental impact and increasing shortage of staff as the main problem categories for the logistics sector

The clustering of several inefficiencies and market failures results in higher logistics costs. The negative environmental burden is expected to increase even further, and an increasing shortage of educated staff can be expected in the future.

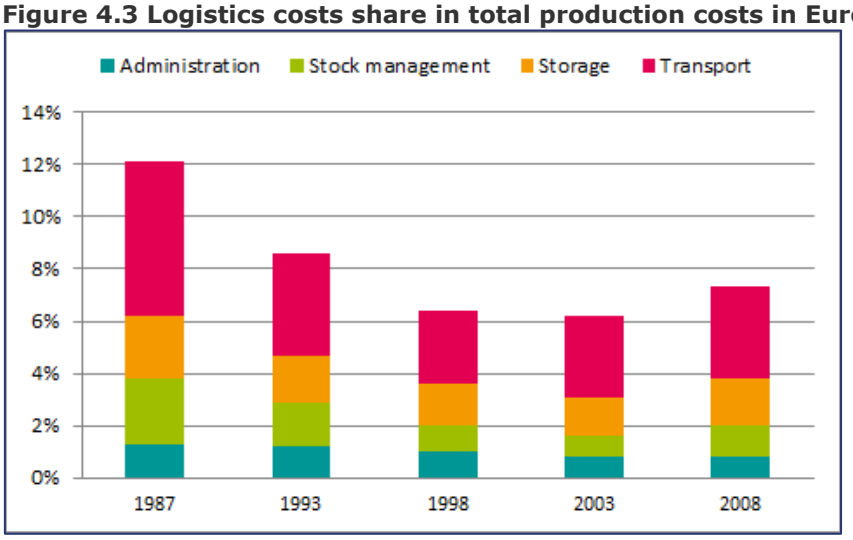
During the stakeholder workshop these 11 problems and problem categories were also presented. The stakeholders acknowledged the problems and categories and recognised the necessity to tackle them, either by the market forces, or by policy action.

Each of the main problem categories will be described in more detail in the remainder of this chapter.

4.2.1 Rising logistics cost due to inefficiencies and market failures

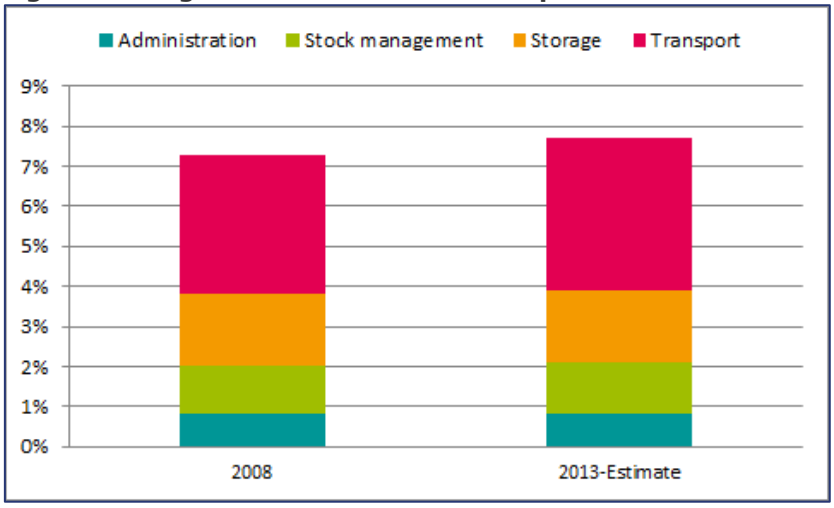
Increasing logistics costs are observed from 2006 to 2012 for road transport (19%, 2.4.3), rail (13%, 2.4.4), IWW (18%, 2.4.5) Sea (19%, 2.4.6), Air (23%, 2.4.7) and marginal increase for warehouses (2.4.8). Since 2003 the share of logistics costs in total production costs in Europe rose again after a significant decline since 1987. In 2013, logistics costs also increased compared to 2008, as shown in the figures below.

Figure 4.3 Logistics costs share in total production costs in Europe, 1987-2008



Source: European Logistics Association, A.T. Kearney.

Figure 4.4 Logistics costs share in total production costs in Europe, 2008-2013



Source: European Logistics Association, A.T. Kearney.

In essence, rising logistics costs does not necessarily indicate a problem for Europe. As more manufacturing might be outsourced to Eastern-European countries or Asia because of lower production costs; logistics costs can rise but total production costs could decrease.

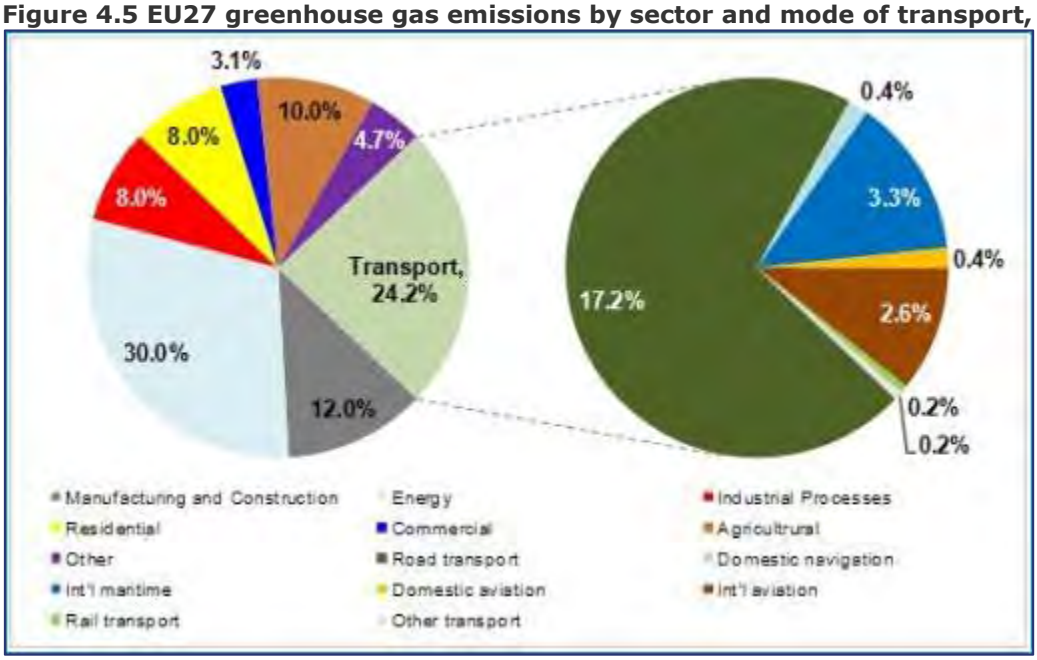
However, as long as the costs of logistics are caused by inefficient operations or market failures, these can potentially be reduced. Examples of market inefficiencies identified in this study are: more empty mileage, lower load factors, and longer transport times due to more congestion (at motorways, terminals, etc.). Market failures generated by the differences in regulatory and administrative procedures between the Member States are also identified. These root causes of the problems are analysed in detail in a later section.

The upward pressure on logistics costs and prices was already identified in 2007 when the Commission initiated the FTLAP. In accompanying documents of FTLAP[137], rising fuel costs, the introduction of the digital tachograph, driver shortages and a certain degree of market consolidation were cited as cost drivers that may have driven up logistics costs at that time.

4.2.2 Negative environmental impact

Transport is a major polluter of greenhouse gas emissions in the EU28. In 2007, 24% of the EU GHG emission came from the transport sector. The following picture shows the main contributors to the increase of greenhouse gas emissions by the transport sector: civil aviation; road transport; and maritime transport. Rail transport is shown to be more positive, as it contributes less to the CO_2 emissions from the transport sector.

Figure 4.5 EU27 greenhouse gas emissions by sector and mode of transport, 2007



Source: EC DG Climate Action (2010): http://ec.europa.eu/clima/policies/transport/index_en.htm.

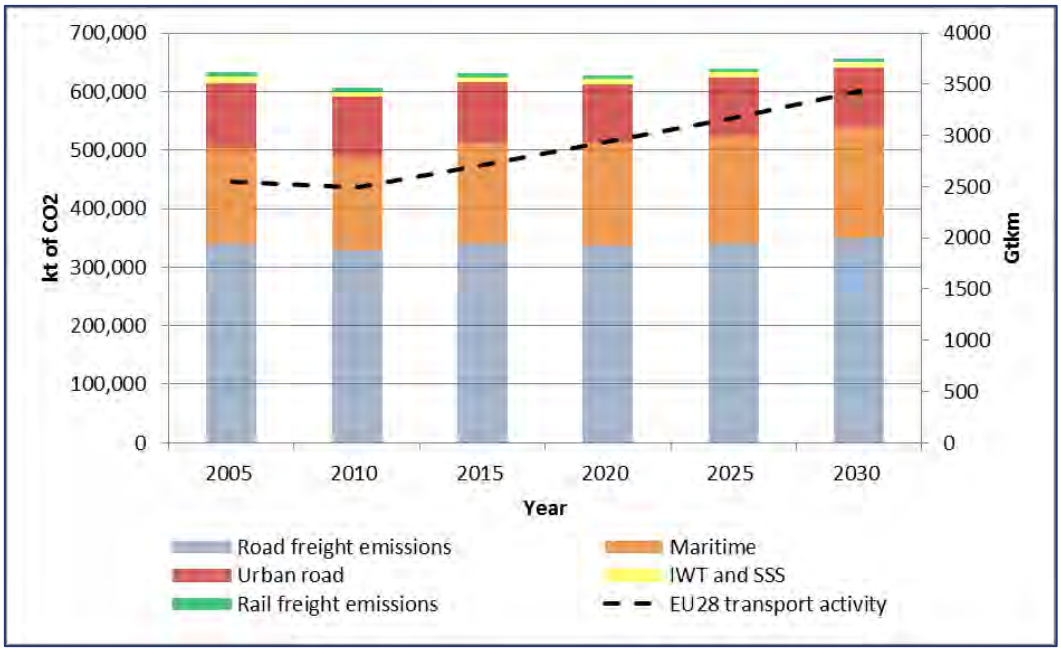
The problem of GHG emissions was recognised in 2007 by the EU leaders at the time, when they set the 20-20-20 targets as key objectives for 2020:

[137] EC (2007) Accompanying document to the COMMUNICATION FROM THE COMMISSION Freight Transport Logistics Action Plan IMPACT ASSESSMENT, COM(2007) 607 final.

- A 20% reduction in EU greenhouse gas emissions from 1990 levels;
- Raising the share of EU energy consumption produced from renewable resources to 20%;
- A 20% improvement in the EU's energy efficiency.

The figure below shows the (expected) development of CO_2 emissions from the transport sector, based on the PRIMES EU reference scenario. Because of a decrease in transport performance, 2010 showed less CO_2 emissions compared to 2005. However, as transport activity is expected to take up again in the coming years, GHG emissions will also increase. As a result, targets will not be met.

Figure 4.6. CO_2 emissions per transport activity in EU28 and transport performance in Gross-tonne km



Source: Ecorys, based on PRIMES - EU Reference scenario 2013 (civil aviation was not included in the PRIMES projections).

Besides the 20-20-20 target set by EU leaders in 2007, the FTLAP of 2007 already identified "the environmental impact and specifically its contribution to GHG emissions"[138] as major problem of logistics in 2007. The problem is not new, but persistent.

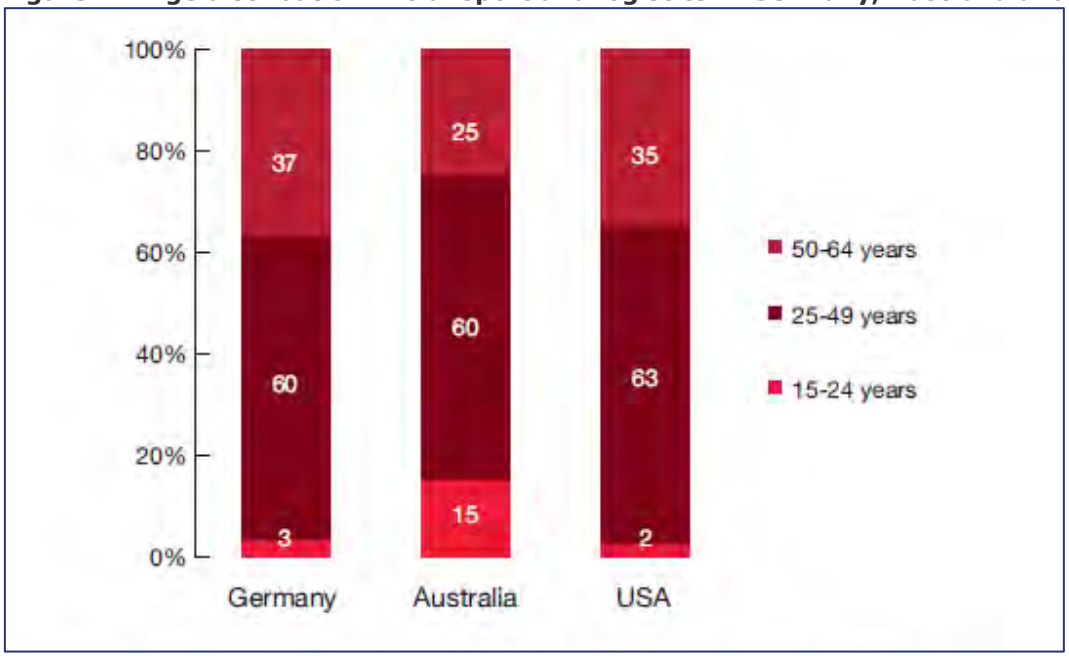
4.2.3 Increasing shortage of staff

Shortage of staff has become an important issue for the whole logistic sector, due to multiple factors, including socio-economic, demographic, work attractiveness, qualification and skills requirements. The shortage of staff problem is twofold. First, a shortage of skilled drivers has been extensively investigated. In 2008 the driver shortage was estimated to be just below 75,000 throughout the EU[139]. This trend slowed down with the economic downturn. Nevertheless, when the economy recovered, evidence pointed towards a likely driver shortage, due to the fact that drivers are often near-to-retirement workers, and the number of individuals taking

[138] EC (2007) Accompanying document to the COMMUNICATION FROM THE COMMISSION Freight Transport Logistics Action Plan IMPACT ASSESSMENT, COM(2007) 607 final.
[139] Shortage of qualified personnel in freight transport, 2009, DG for Internal Policies, European Parliament.

and passing their LGV test is declining year on year[140]. Data on age for the UK reveals that 16% of LGV drivers are 60 or above – this is over 48,000 drivers. In Germany, 37% of personnel in transport and logistics is 50 or above, which is more or less comparable to the US, but older compared to Australia.

Figure 4.7 Age distribution in transport and logistics in Germany, Australia and the US



Source: Transportation & Logistics 2030 Volume 5: Winning the talent race, PWC/IFK, 2012.

Secondly, there is also lack of qualified logistics managers. Automation will further increase and logistics is becoming more complex and global. As technology changes the working environment, greater skills are demanded on entry-level and formerly low-skilled roles. That means analytical and e-skills will be even more important. The ability of the logistics sector to meet service expectations of their customers is threatened without available drivers and qualified logistics managers.

Within FTLAP 2007, attention was paid especially to the shortage of truck drivers. At that time, it was estimated for France that 47,000 additional drivers would be necessary in 2015 compared to 2007. In Germany, 50,000 additional drivers would be needed[141]. In that sense, the problem is not new, but expected to become even more important in the coming years because of an ageing society and more complex operations.

4.2.4 Affected parties

In this section the affected parties are defined for each of the problem areas.

Rising costs of logistics

The first party affected by this problem is the logistics sector itself, which sees itself confronted with these higher costs. Depending on the market position and market forces, the sector may be possible to use higher prices in order to cope with the rise in costs. All other sectors that use the services of the logistics sector are thus also

[140] A Looming Driver Shortage? – the evidence behind the concerns, The Sector Skills Council for Freight Logistics and Wholesaling Sectors, April 2012.

[141] EC (2007) Accompanying document to the COMMUNICATION FROM THE COMMISSION Freight Transport Logistics Action Plan IMPACT ASSESSMENT, COM(2007) 607 final.

affected by this problem. Ultimately, this could lead to increasing prices of final products. Customers are therefore also affected by this problem; as are public authorities, in the sense that claims are often made that they contribute to the problem, via taxes on fuels, for example, or that the public authorities are looked upon for (short term) solutions.

Negative environmental impact

Negative environmental impact primarily affects EU citizens. Most of the environmental pollution takes place near the area of the (logistics) activity. Citizens that live close to the transport infrastructure are affected by noise and emissions. The actual impact depends on the volume of traffic, the types of vehicles used, and also the specific local circumstances. Measures can be, and are often, taken to keep these negative impacts within (legal) limits. The installation of noise barriers is an example of such a measure. The problem of the negative environmental impact also has an international component, in the case of the greenhouse gasses. The logistics sector itself is not directly affected by this problem, except for image reasons. The public sector, however, is highly affected, since it is expected from public authorities to minimise the negative environmental impacts, or to make sure that decisions are based also on environmental impacts.

Increasing shortage of staff

An increasing shortage of staff primarily affects the logistics sector itself. Not enough personnel can be found in the market. The level of qualification is insufficient, which leads to an inefficient working environment which in turn causes higher costs for the relevant businesses. This situation negatively impacts on the competitive position of the company. The general public is not affected by this problem. Public authorities are affected as they provide the rules concerning the level of qualification for specific jobs (e.g. drivers' licenses for lorry drivers) and requirements for the handling of dangerous cargo. They also set specific goals on the availability of staff, in order to attract businesses.

The table below summarises the above. The table shows a qualitative judgement for the three problem areas (rising costs, negative environmental impact and lack of personnel) and for each of the three identified stakeholder groups (logistics sector, general public and public authorities). The judgement is given on a scale ranging from 0 (not affected) to +++ (highly affected).

Table 4.2 Result of affected parties

	Logistics sector	General public	Public authorities
Rising costs of logistics	+++	+	0/+
Environmental impact	0/+	++	+
Lack of personnel	+++	0	0/+

Given this analysis it is clear that the logistic sector itself is most affected by the problems defined. This is why a more thorough investigation is carried out for this stakeholder.

Affected party: Logistics sector

Logistics comprises many services. Services include: planning, organisation, management, execution and monitoring of material; and goods and information flows of a company from purchasing, production, warehousing, added value services, distribution and reverse logistics. Because the activities of the logistics industry span include a range of activities which show a very high degree of interdependence with other economic sectors, high multiplier effects exist.

Different types of companies have responded to the questionnaire sent out within the stakeholder consultation process accompanying this study. An overview of the type and size of these companies is shown in the table below.

Table 4.3. Number of companies ordered by type and size who responded to this study's questionnaire.

		Size of company				
		SME	National company	Multinational	Other	Total
Type of company	Transport Operator	6	5	15	3	29
	Freight Forwarder	5	4	13	0	22
	Logistic Service Provider	6	4	15	0	25
	Shipper	2	2	7	1	12
	IT Partner	1	2	4	0	7
	Terminal Operator	3	3	10	0	16
	Total	23	20	64	4	111

Source: Ecorys (2014) Fact-finding studies in support of the development of an EU strategy for freight transport logistics Lot 1: Analysis of the EU logistics sector.

The questionnaire asked stakeholders to identify the most relevant problems of the logistics sector. Based on the answers given per type of stakeholder (e.g. shipper, transport operator, forwarder, etc.) and company size (SME, multinational, national sized company[142]), it is possible to infer which type of stakeholders could be affected most by the different problems.

In Figure 4.8, the stakeholders' assessment is shown based on the relevance of two of the main problem categories; environmental impact and shortage of staff. No comparable data could be derived from the stakeholders' assessment for the problem area of the rising costs.

Regarding the negative environmental impact and emissions, multinational companies in particular (73%) said the impact of this problem is high or very high. These larger companies are more aware of the problem and are possibly more affected by the negative environmental impact of logistics. As for the type of logistics companies - Figure 2 – mainly transport operators assess the problem of emissions as high or very high. Freight forwarders and logistics service providers are less affected by this problem.

Regarding the shortage of staff in logistics, the picture is different. National sized companies assess this problem as very relevant (75% of them), followed by SMEs. In addition, transport operators and logistic service providers mainly perceive the lack of staff as a problem, while shippers and terminal operators see this problem as less important, as shown in the fourth figure.

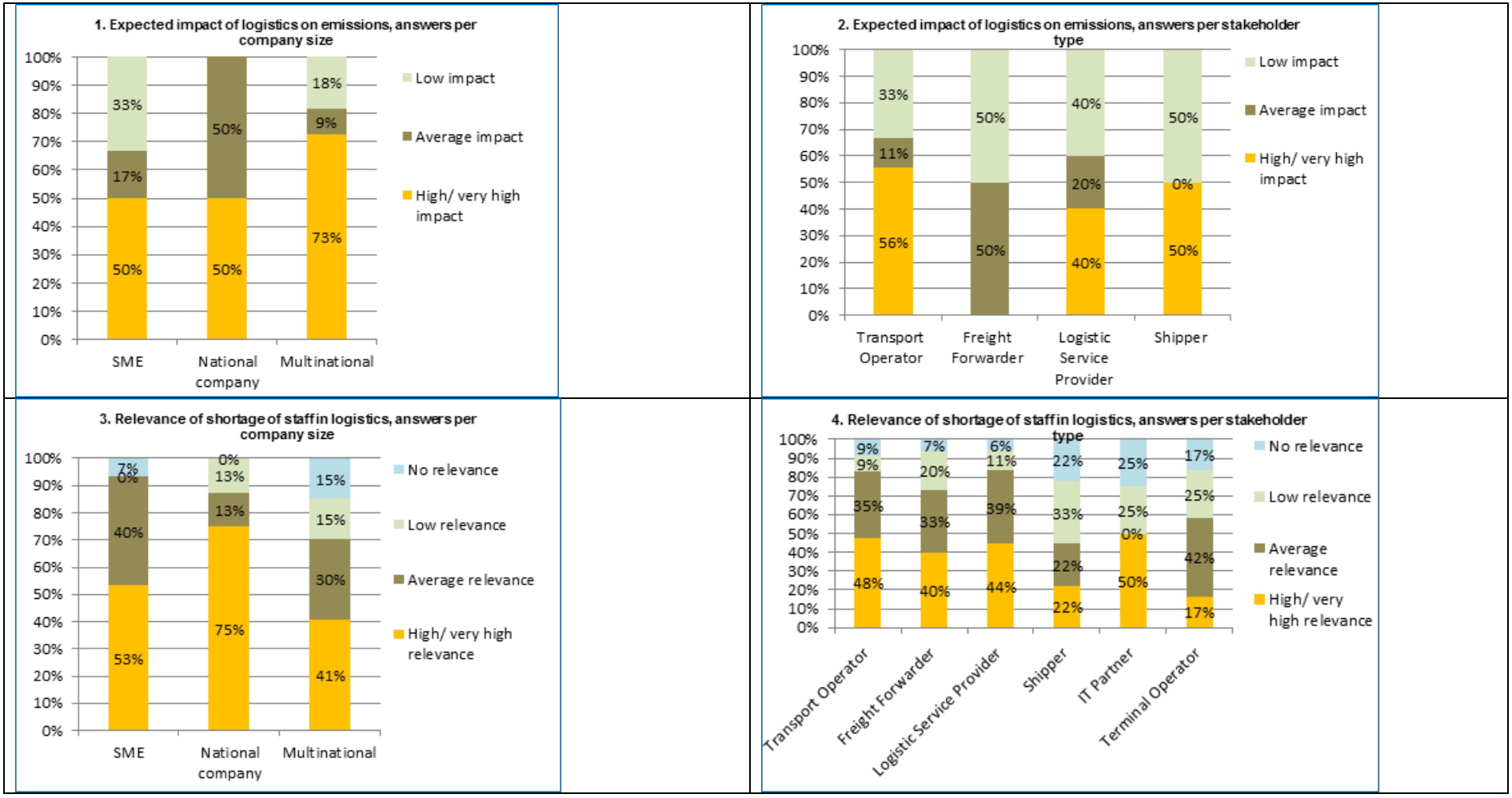
No similar data can be shown on rising costs. However, it is clear that for all actors in the logistics sector, costs are a major issue. It is the core business of any logistics service provider to deliver services of a quality desired by their customers for a price as low as possible. The transport companies will be affected most by the rising transport costs, since it is especially those cost components that will rise. For shippers this will be relatively low, since the percentage of costs that are transport related is

[142] Companies operating only within the borders of the country where it is based.

less for them. Margins within the logistics sector are low, leading to a high sensitivity to even small changes in costs.

Big companies and multinationals face the same level of cost increases as the SMEs, but are more capable of looking for solutions. These solutions could help increase efficiency. The financial position of the company is also important. Companies with a sound financial position are capable of accepting higher costs for a longer period of time.

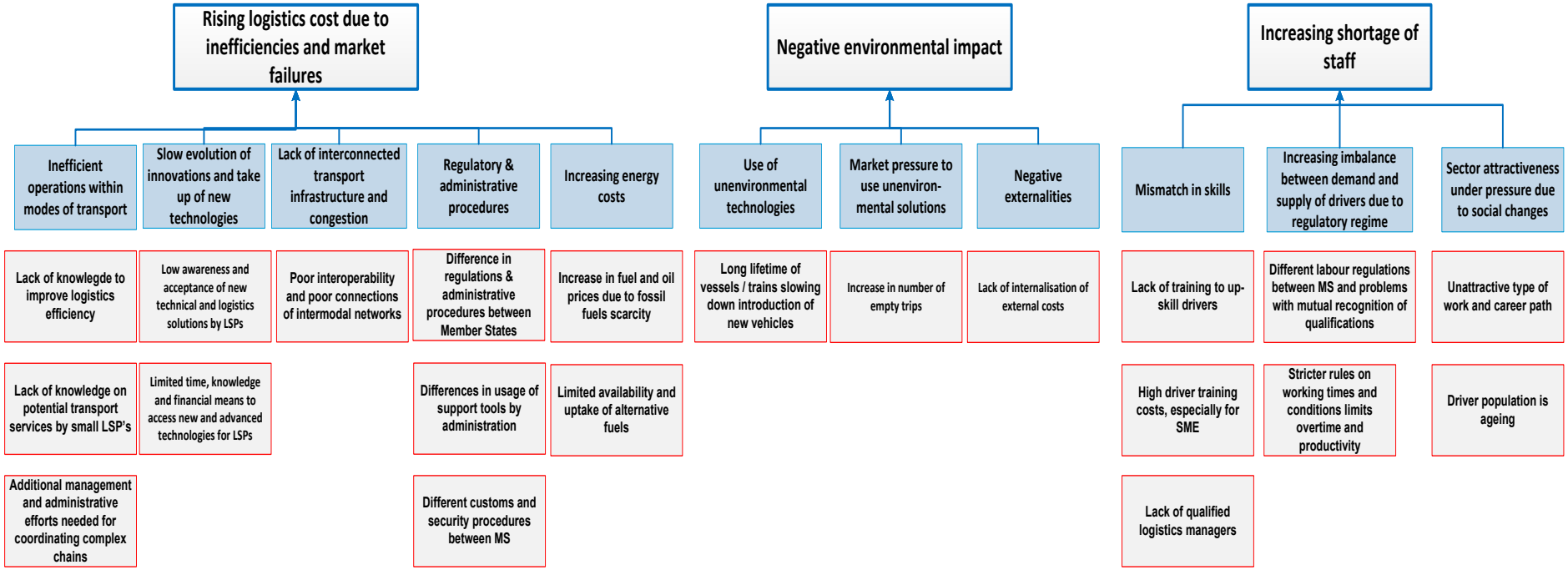
Figure 4.8 Stakeholder assessment of the impact and relevance of emissions and shortage of staff in logistics



4.2.5 Problem tree and root causes of the problems

The problem tree presents the main problem groups, the problems themselves and the root causes to these problems. By addressing the underlying causes with specific actions, the problems could potentially be reduced in size.

Firstly the problem tree is presented in a schematic overview. The remaining part of this section describes the root causes to the problems in more detail, and links the problems with policy objectives. These objectives are further elaborated in the following section on objectives.


Rising logistics cost due to inefficiencies and market failures
Negative environmental impact
Increasing shortage of staff
Inefficient operations within modes of transport
Slow evolution of innovations and take up of new technologies
Lack of interconnected transport infrastructure and congestion
Regulatory & administrative procedures
Increasing energy costs
Use of unenvironmental technologies
Market pressure to use unenviron-mental solutions
Negative externalities
Mismatch in skills
Increasing imbalance between demand and supply of drivers due to regulatory regime
Sector attractiveness under pressure due to social changes
Lack of knowlegde to improve logistics efficiency
Low awareness and acceptance of new technical and logistics solutions by LSPs
Poor interoperability and poor connections of intermodal networks
Difference in regulations & administrative procedures between Member States
Increase in fuel and oil prices due to fossil fuels scarcity
Long lifetime of vessels / trains slowing down introduction of new vehicles
Increase in number of empty trips
Lack of internalisation of external costs
Lack of training to up-skill drivers
Different labour regulations between MS and problems with mutual recognition of qualifications
Unattractive type of work and career path
Lack of knowledge on potential transport services by small LSP's
Limited time, knowledge and financial means to access new and advanced technologies for LSPs
Differences in usage of support tools by administration
Limited availability and uptake of alternative fuels
High driver training costs, especially for SME
Stricter rules on working times and conditions limits overtime and productivity
Driver population is ageing
Additional management and administrative efforts needed for coordinating complex chains
Different customs and security procedures between MS
Lack of qualified logistics managers

Problem Category 1: Rising logistics costs due to inefficiencies and market failures

Problem 1: Inefficient operations within modes of transport

Several root causes have been identified, which are shortly introduced hereafter.

Lack of knowledge of how to improve efficiency

In general, the logistics sector lacks knowledge of how to improve logistics efficiency[143]. The sector attitude is too much "business as usual", and innovations are rather scarce. This might be caused by the fact that the sector is still rather fragmented (especially in inland shipping and road transport) and comprises of many small companies. Fleet managers seem unaware of systems that can be used to optimise fleet utilisation and they seem not to be aware of the benefits such systems could bring to their company.

The new action plan could pursue this root cause by raising awareness amongst fleet managers, and could help to increase the knowledge regarding the benefits such systems have through dissemination of good practices.

Lack of knowledge of potential transport services by small LSPs

Many smaller companies are not aware of the possibilities to combine different modes of transport. Large companies have in-house staff which can search for intermodal alternatives. Small companies have limited resources and assets; their focus is on the maximum involvement of their equipment (say vehicle) instead of looking for potentially attractive alternatives. They remain with the mode they have always used, often road transport, because they are not always aware of the advantages these alternative modes may bring them. There are also companies that are aware of those possibilities, but they do not know how to arrange the intermodal transport efficiently. Therefore they remain with their current mode. The action plan can pursue this problem (i.e. by promoting and sharing good practices). Search engines such as www.intermodallinks.com already display within seconds numerous intermodal transport options for container transport from A to B across Europe using barge, rail, feeder services or a combination of these modes.

Additional management and administrative efforts needed for coordinating complex (multimodal) transport chains

The more links occur in transporting products from A to B, the more planning and e-skills are required to ensure a smooth transportation process. This requires additional capacity to monitor the transport chain and ensure that all links are cooperating. Additional management and administration efforts are needed to arrange the multimodal transport.

Specific objective: Improve the utilisation of resources.

Problem 2: Slow evolution of innovations and take up of new technologies

Low awareness and acceptance of new technical and logistics solutions by LSPs

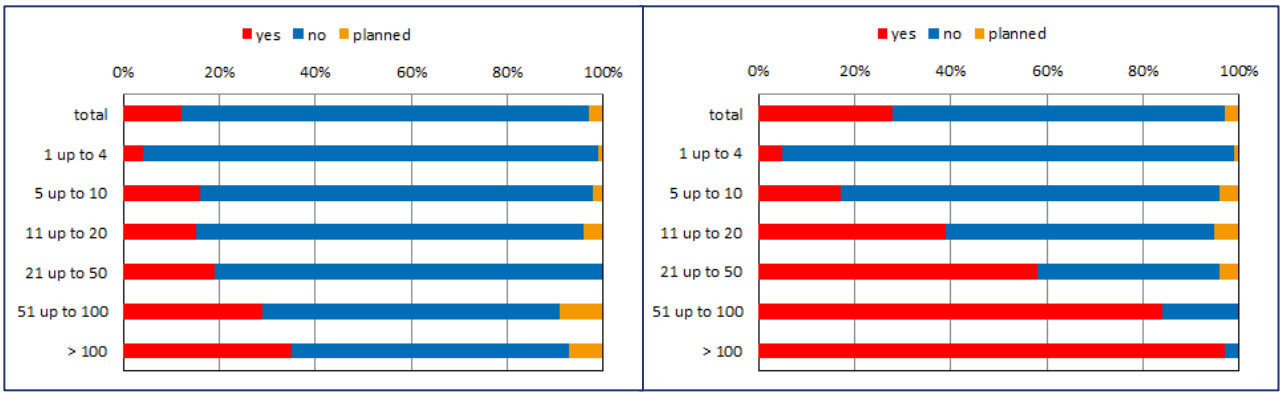
The low acceptance is partly influenced by the fact that there is a low awareness of technological and logistical solutions. The transport and logistics sector is still dominated by small and medium sized enterprises (especially in road and inland shipping). Most of these companies are not aware of the possibilities and therefore are

[143] Improving performance, benchmarking transport and logistics and dissemination of good practices were taken up in studies like BE LOGIC and BESTUFS. Both studies provided very good results, although more or less research driven and with focus on the transport modes rather than on intermodal transport or terminals.

likely to choose solutions that they are already acquainted with. To speed up the uptake of new technologies, the action plan can start initiatives to raise the awareness amongst LSPs, particularly SMEs. By raising awareness, the acceptance of the new technologies will improve as well.

The figures below provide two examples of low uptake of technologies in the Netherlands; the use of RFID and vehicle on-board computers. Radio Frequency Identification (RFID) including tracking and tracing (especially dangerous goods and animal transports), fleet management, intelligent truck parking and remote freight information, is used by only 10% of all transport companies in the Netherlands. Even the majority of large transport companies with over 100 vehicle units do not use RFID technology to optimise their operations.

Figure 4.9 Use of RFID (left) and vehicle on-board computers (right) by Dutch road freight transport companies by size (number of transport units) - figures 2012



Source: Transport Logistics Netherlands, Transport in figures 2012.

The use of on-board computers in freight vehicles also remained low in 2012 with less than 30% of all freight transport companies using this technology. There is a sharp distinction however between large and small companies. The largest companies (with more than 50 transport units) have on-board computers in their vehicles. Small companies with 20 vehicles or less rarely invest in on-board computers, as less than 20% of these small companies use this technology.

Limited time, knowledge and financial means to access new and advanced technologies for LSPs

The situation is expected to improve once the economy starts recovering. Transport companies will have more funds available to start investing in those new technologies. Meanwhile a new logistic action plan could address this root cause by supporting some publicly available advanced technologies and by stimulating cooperation between national innovation platforms/knowledge centres and SME in the logistics sector. This will bring knowledge within SME to a higher level. By removing barriers (i.e. financially) for companies which are currently locked in to existing technologies, the uptake of new advanced technologies can be further stimulated.

Specific objective: Stimulate innovation and faster adaptation of new technologies, especially within SMEs.

Problem 3: Lack of interconnected transport infrastructure and congestion

Poor interoperability and poor connections of intermodal networks

Lacking well-connected intermodal infrastructure, makes intermodal transport less favourable compared to road. Lack of interconnected infrastructure and poor interoperability of the infrastructure, mainly in railway transport but also poor

connections of intermodal networks with urban areas (last mile), will contribute to a dominant position of transport by road. More transport by road may result in more congestion, and subsequently higher transport costs. Generally, better interconnected European transport infrastructure and intermodal infrastructure will lead to more efficiency in the transport system and therefore lower transport costs, which will positively influence Europe's competitiveness.

Evidence for the lack of interconnected transport infrastructure is provided earlier in the report where a large variance in infrastructure quality between Member States is shown (paragraph 2.6.1). Therefore, there is a potential to improve infrastructural quality and interoperability between Member States. This would enhance the functioning of the internal market. Also, average EU infrastructural quality lags behind the quality provided by countries such as Japan, USA and China, but is still better than in Brazil, India and Russia.

Specific objective: Improve interoperability and supply chain coordination.

Problem 4: Regulatory and administrative procedures

Regulatory and administrative procedures can influence logistics costs. If procedures become more complex, administration costs will increase and therefore the costs of logistics increase. The root causes of this are outlined below:

Difference in regulations and administrative procedures between Member States

Non-harmonisation of regulation for freight transport remains a problem across Europe. The Commission Staff Working Document accompanying the White Paper – Roadmap to a Single European Transport Area[144] specifically discusses the harmonised enforcement of rules for professional road transport. Varying control and sanction systems in different Member States can create administrative burdens for hauliers and higher costs. In order to achieve the harmonisation, the Commission is advocating a standardised approach to the training of enforcement officers across Member States. This will help to facilitate a standardised application of legislation. The Commission is also advocating the exchange and distribution of information more systematically across enforcement agencies (i.e. through the ERRU and national registers, Member States should better target checks at the premises).

Differences in usage of support tools by administration

Another root cause is a difference in the use of administrative support tools. There are different tools available to support companies in their administrative procedures. However not all companies use these tools in the same way and inefficient use can occur. There are concerns on data sharing and the impact on security and commercial relationships. Better standardisation of administrative support tools at a European level is needed, addressing fragmentation and increasing compatibility between actors (i.e. e-Freight, e-Maritime type of tools, see also next intermezzo). However, monopolisation of technology service providers must be avoided.

Different customs and security procedures between Member States

Different customs and security procedures between Member States can also create administrative burdens for the logistics sector. The simplification and harmonisation of customs procedures, removing contradictory or inconsistent requirements for customs and security, can only and should be facilitated at EU level. It will mean faster and better-targeted checks. Specifically, the EU should work closely with the industry to

[144] Commission Staff Working Document Accompanying The White Paper - Roadmap To A Single European Transport Area – Towards A Competitive And Resource Efficient Transport System Brussels, 28.3.2011 SEC(2011) 391 Final.

secure appropriate implementing measures of a new Union Customs Code[145] without delay.

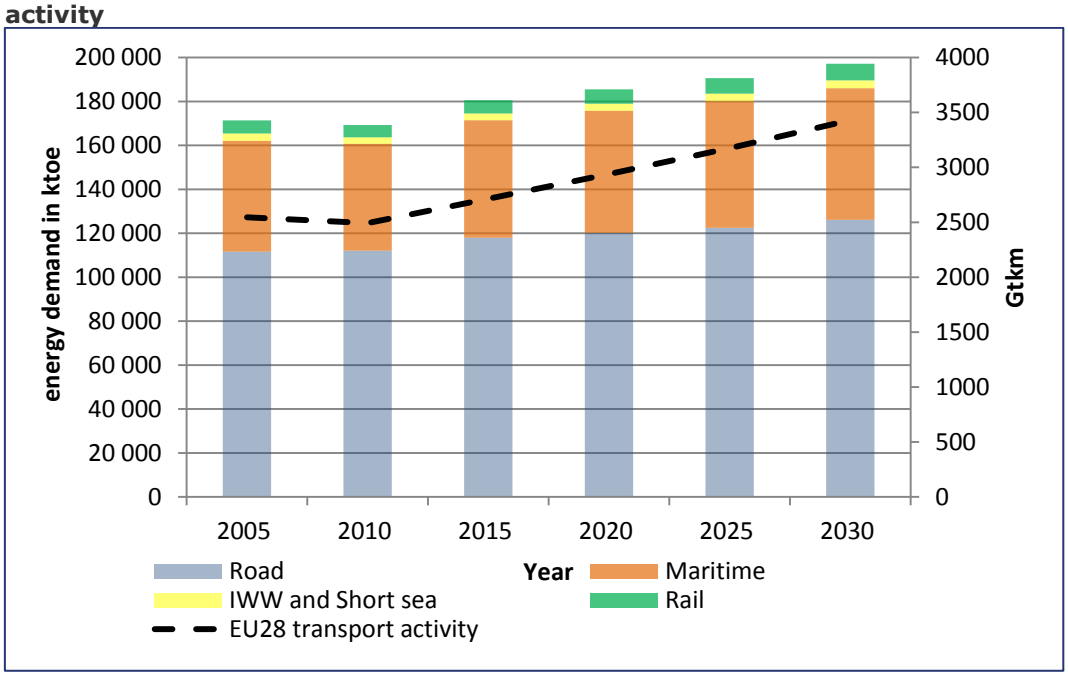
Specific objective: Reduce red tape.

Problem 5: Increasing energy costs

The sector is facing high energy costs, which tend to further increase. As a result, logistics costs will also continue to increase. Two main root causes to higher energy costs are outlined below.

Increase in fuel and oil prices due to fossil fuel scarcity. Fossil fuels are becoming scarcer within the coming decades and fuel prices tend to rise further, as shown in Chapter 2.4. The increase of logistics costs is partly based on the rise in personnel costs (2.4.1, cf. figure 2.20), rising fuel, and electricity costs (2.4.1, c.f. figure 2.21 and 2.22). At the same time, the transport sector in the EU is expected to demand even more energy in the coming years, as shown in the figure below.

Figure 4.10 Energy consumption in freight transport for EU28 and freight transport activity



Source: Ecorys, based on PRIMES - EU Reference scenario 2013 (civil aviation was not included in the PRIMES projections).

The combination of increasing energy demand for transport, fossil fuel scarcity and rising fuel prices puts an additional pressure on the energy costs in the EU freight transport sector. Therefore, switching to alternative fuels becomes even more important for the sector. Governments are encouraging the use of alternative fuels and more efficient technologies (i.e. via taxes). With targeted actions, fuel consumption by the transport sector, and road transport in particular, could be positively influenced.

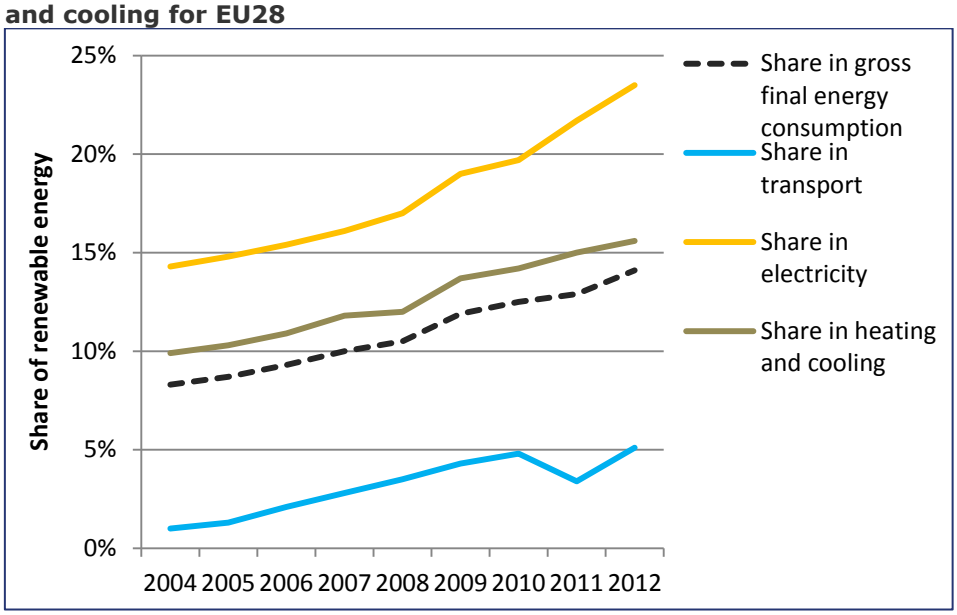
Limited availability and uptake of alternative fuels in transport

The transport sector in the EU achieves a limited uptake of the alternative fuels necessary to reduce the dependency on fossil fuels. As the figure below shows, the

[145] The Union Customs Code was adopted on 9 October 2013 as Regulation (EU) No 952/2013 of the European Parliament and of the Council. It will be applicable when the relevant Implementing Acts and Delegated Acts will be adopted and this no later than 2016.

transport sector has increased the usage of renewable energies in the past years, but the sector is still far below the average. Other sectors show a faster uptake of renewable energies.

Figure 4.11. Share of renewable energy use; total, transport, electricity and heating and cooling for EU28



Source: Ecorys, based on Eurostat (nrg_ind_335a).

As in the case of modal shift, knowledge and innovations of cleaner fuels within the sector are rather scarce. Some incentives in the new action plan might be introduced in order to speed up the uptake of alternative fuels. If more transport companies use alternative fuels, it will also be interesting for the industry to produce alternative fuels on a larger scale. This will have a price depressing effect, alternative fuels will then become available at more reasonable prices (compared to current prices for fossil fuels).

Effort has already been made in this area, as evident by the Clean Power for Transport package. This package includes a long term strategy for alternative fuels[146], a proposal for a Directive on the deployment of alternative fuels infrastructure[147] and a Staff Working Document on actions to develop an EU framework on LNG for shipping.

Specific objective: Speed up the use of alternative fuels

Problem Category 2: Negative environmental impact

Problem 6: Use of environmentally unsustainable technologies

The long lifetime of vessels and trains slows down the introduction of new technologies in these modes

As the life cycle of vessels and trains is much longer compared to trucks, introduction of new, cleaner technologies is evolving at a much slower pace. Introduction of cleaner technologies in inland shipping should encourage the sector to become more sustainable. However, the inland navigation sector currently faces severe problems due to the economic crisis. As a substantial part of the sector is struggling to survive the economic turmoil, possibilities to invest in cleaner technologies are currently

[146] (COM (2013) 17).
[147] (COM (2013) 18).

scarce. This means that improving the environmental sustainability of the sector remains problematic without further efforts.
A new action plan could stimulate the uptake of new technologies through tax measures (comparable to stimulating the uptake of alternative fuels).

Problem 7: Market pressure to use environmentally unsustainale solutions

Increase in number of empty trips
One of the reasons for the increase in the number of empty trips is the uptake of e-commerce. With the strong growth in recent years, the proportion of reverse logistics plays an increasingly important role. To bind customers, more and more online shops offer the option to return goods for free. Research[148] from the US shows that consumers will spend more money, between 58% and 357%, if they can make use of a free return policy. Customers are increasingly using this option. The transport that is involved in reverse logistics has an increasing impact on the environment[149]. A new action plan could develop a campaign to make final consumers aware of the impact of returning internet purchases (this could include CO_2 footprint calculations of the customers' decision to return goods). The Commission could also support campaigns for better horizontal loads coordination between shippers and hauliers with the aim to improve load factors.

Analysis from paragraph 2.6.3 shows a variance in empty runs as a percentage of total journeys for Member States, suggesting that Greece, Bulgaria, Latvia, Hungary, Poland, Spain, Croatia and Cyprus in particular could improve their usage of resources. The load factor (t/veh.) for road vehicles for the EU from 2005 to 2011 decreased by approximately 20%.

In addition, the productivity per employee varies a lot, so efficiency gains can be realised.

Problem 8: Negative externalities

Lack of internalisation of external costs
The last root cause is the lack of internalisation of external costs. This means that external costs are not paid for and the transport prices used do not reflect the actual transport prices. This topic can be addressed by regulation.

The European Commission has provided a handbook on external costs of transport (2014) which provides best practices on external costs calculations. These factors can be taken into consideration by infrastructure projects and for the pricing of infrastructure.

Within the Communication[150] strategy for the internalisation of external costs, the Commission has set specific possible measures per transport mode to internalise external costs. The measures could consist of toll pricing, taxation and emission trading via ETS.

Specific objective: Speed up the use of cleaner solutions (fuel, technology and business models) and improve environmental behaviour.

[148] The study was published in the Journal of Marketing, September 2012, published by the American Marketing Association.
[149] Expertgroup Ecology of Shopping2020; The expertgroup is part of the Shopping2020 Research Program in which 460 experts in 19 sector organisations participate. Shopping2020 aims to create a future vision about how consumers make purchases in 2020.
[150] COM(2008) 435 final.

Problem Category 3: Increasing shortage of staff

Problem 9: Mismatch in skills

Several root causes have been identified, which are outlined below.

Lack of training to upskill drivers

There appears to be varying levels of driver shortages that relate to how skilled the driver is. At the highly skilled end of the road haulage market, there appears to be an issue with being able to recruit people with the correct skills. No longer is it suitable for an employee to be a "driver"; they are an integrated part of a supply chain, delivering a transport service. The general need for training is acute, but half of firms are not taking any action on the issue[151]. This lack of training provision is ultimately a self-fulfilling prophecy of a shrinking pool of employable skilled drivers.

High driver training costs, especially for SMEs

This root cause is closely related to the previous one. Companies may be reluctant to train their drivers because training is usually a cost for the company to bear. Moreover, companies fear that especially young drivers who are more likely to be mobile will complete the training and then leave. The cost of driver training (both in educating young people to become a driver and in upskill of the existing pool of drivers) therefore appears to be a significant barrier, intensifying shortages of drivers and the mismatch in skills[152].

Financial support should be considered for upskilling drivers in those Member States where cost of the training to qualify as a driver are high and public funding is lacking.

Lack of qualified (logistics) managers

Transport and logistics companies need qualified staff with wider transport knowledge (for example on multi-modal transport) in order to increase the sectors' performance. The stakeholder consultation revealed that one of their main problems is the shortage of qualified logistics personnel. Due to the economic downturn the shortage is slightly reduced, but once the economy starts to flourish again the problem will come back in full force. At European level campaigns to promote the attractiveness of the sector could be considered.

Specific objective: Improve the attractiveness and education of logistics professions.

Problem 10: Increasing imbalance between demand and supply of drivers due to regulatory regime

Two root causes have been identified, which are outlined below.

Different regulation on qualifications between Member States

Difference in qualification regulation between Member States (i.e. minimum standards for drivers) and problems with mutual recognition of qualifications, causes a situation where qualified staff are often not mobile between Member States. Immobility can lead to shortages of drivers in one country and a surplus in another country. With better mutual recognition of driver qualifications, mobility of drivers across the EU can be improved and imbalances between demand and supply of drivers reduced. Harmonisation or smoother mutual recognition of qualifications and certification could be taken up at EU level.

[151] Bulletin on Transport Policies and Strategies in Europe – Issue 22 Employment and Training, 2008, CNT.
[152] Bulletin on Transport Policies and Strategies in Europe – Issue 22 Employment and Training, 2008, CNT.

Stricter rules on working times and conditions

Working rules and conditions have been implemented efficiently over time. For instance, the introduction of a tachograph led to improved controls during road checks on driving times of truck drivers. This, however, impacts the number of workers needed to perform longer distance trips which is increasing the costs. The industry still considers the Working Time Directive to be a contributory factor towards driver shortages[153]. This is because restricting the number of hours a driver could work can limit overtime and productivity. This has led to the need to employ more drivers. Setting and enforcing stricter rules on working times and conditions is meant to create a more equal competitive field and to improve road safety. Releasing stricter rules would put these goals at risk.

Specific objective: Improve the attractiveness and education of logistics professions.

Problem 11: Sector attractiveness under pressure

Two root causes have been identified, which are outlined below.

Unattractive type of work and career path

The freight transport sector is not an attractive proposition for many people. It is associated with long periods away from home (especially in road freight and inland shipping) with long hours, poor conditions and low remuneration. There is also a lack of clear career progression, and without funding from a transport operator a young person would have to put themselves through the relevant training at their own cost. This can be quite expensive (i.e. costs for driver training, examinations, CPC training).

Transport workforce is ageing

The transport workforce is ageing at a faster pace than the average working population[154]. Almost 30% of people employed in the transport sector are over 50, and will be retiring in the coming 10 to 15 years. In recent years, the transport sector has been less successful than many other sectors in recruiting younger workers, partly due to the sector's negative image for employment[155]. This inability to attract new staff into the logistics industry is becoming a big problem, particularly as new, younger drivers are required to replace older drivers that are approaching retirement. Campaigns to attract young staff and female staff to replacing older drivers can help to reduce the shortage of staff.

Specific objective: Improve the attractiveness and education of logistics professions.

4.2.6 How will the causes of logistics problems evolve in the future?

This section provides a concise analysis of how the root causes which were discussed in the previous section are likely to evolve in future based on the findings provided in chapter 3. Although a large number of logistics problem drivers are considered in the previous section, it was not possible to provide a more in-depth analysis for every cause on its future development based on conclusions drawn in chapter 3. Therefore, only those causes are considered; chapter 3 has provided clear evidence on their expected future development.

[153] Recommendations on How to Manage Driver Shortages, 2010, European Chemical Transport Association.

[154] European Agency for Safety and Health at Work (2011): Occupational safety and health in the transport sector – an overview, Luxembourg.

[155] European Economic and Social Committee (2011): Opinion of the European Economic and Social Committee on How EU policies have impacted on the job opportunities, the training needs and the working conditions of transport workers, TEN/445 – CESE 1006/2011, Brussels.

The important causes of the primary issue of rising logistics costs are regulatory and administrative procedures, which have become more complex over time. Key elements here are the different customs and security procedures between Member States which lead to inefficiencies. Chapter 3 concludes that the enhanced utilisation of ICT in logistics would lead to an improvement in transport performance. However, because of the growing importance of ICT applications, supply chains are becoming more vulnerable in terms of risks caused by external manipulation.

Both scarcity of fossil fuels and raw materials will have a negative impact on transport costs, due to increasing prices for energy and some 'critical' raw materials. Chapter 3 concluded that this problem will become more apparent in the future without proper measures targeted at quicker uptake of alternatives.

An important cause of the second main problem (negative environmental impact caused by the transport sector) is the market pressure to use environmentally friendly transport solutions. The uptake of e-commerce in the past years plays an increasingly important role in the number of reverse logistics. Chapter 3 concludes that this trend of increasing e-commerce activities will continue to evolve and thus will have considerable negative impacts for the environment unless further measures are undertaken.

An important driver to the third main problem of increasing shortage of staff is the ageing driver population. Chapter 3 concluded that this problem driver will remain an important issue to affect most sectors and leading to a growing competition between sectors in attracting new staff. Therefore, improving the attractiveness of logistics professions is a key element in responding to shortages of logistics staff which is expected to further increase without proper measures.

Finally, the four scenarios in Chapter 3 differ in terms of the extent to which certain problems will become apparent. A brief description of the main differences and the consequences for particular problem drivers is given below.

The scenarios Global Strength and Regional Strength can be characterised by a relatively strong acceleration of technological development and a relatively strong uptake of alternatives fuels and reverse systems (recycling). This will ease the problems of increasing energy costs and the scarcity of raw materials. These problems will become more apparent in the Global Protectionism and European Paralysis scenarios, as technological development and uptake of alternatives will evolve much slower. Moreover, due to decreasing migration and population, shortage of staff and the deficit of skilled workers will become major problems in these two scenarios as well.

4.3 Definition of the objectives

Objectives for policy options were defined based on the identified problems and root causes described in the previous section. The definition of objectives served as input for the establishment of policy options and specific actions, aiming at achieving the objectives. In the previous section, the objectives have already been touched upon, per problem. General objectives are directly related to the main problems, whereas specific objectives relate to the underlying problems and root causes. The following rationale has been applied to define the general and specific objectives.

The general objectives are:

1. Mitigate the factors which lead to inefficiencies in the freight transport and logistics sector in the EU;

2. Mitigate the factors which jeopardise the sustainability of the practices within the freight transport and logistics sector in the EU;
3. Mitigate the factors which lead to a shortage of (qualified) staff in the freight transport and logistics sector in the EU.

The general objectives are pursued by a number of specific objectives which are directly aimed at solving the underlying problems and their root causes.

In this way, the ultimate set of objectives where future EU logistics strategy could focus on is as follows:

1. *Improve utilisation of resources by raising awareness*

   Efficiency in transport and warehousing operations can still be improved. The resources available (infrastructure, transport modalities, warehouses) can be better utilised. Transport and supply chains have become more complex and so has the management of these chains. Additional management ('know-how'), and awareness of innovations is needed to improve the efficiency within these chains. This holds especially within SMEs, which lack the resources and knowledge of transport alternatives and innovative transport management systems.

2. *Stimulate innovation and faster adaptation of new technologies, especially within SMEs*

   Within the transport and logistic sector, a relative slow uptake of innovations exists. Low awareness, knowledge, limited financial means and time particularly restricts the ability of SMEs to take up new technologies. This uptake should be additionally stimulated, for instance by supporting publicly available advanced technologies and by facilitating cooperation between national innovation platforms/knowledge centres and SMEs within the logistics sector.

3. *Improve interoperability and supply chain coordination*

   Intermodal networks and corridors across Europe are still experiencing difficulties, particularly concerning so called last-mile rail infrastructure in urban areas. This makes intermodal transport solutions less favourable compared to road. Quick and easy access to information about last-mile infrastructure for rail freight will contribute to the planning of rail-based transport solutions, especially across borders.

4. *Reduce red tape*

   Differences in regulations, procedures and standards across Member States result in extra administrative burden for both the public and private sector. Standardisation of rules and on-board equipment will have a positive influence on enforcement (officers need less time for road checks for instance) and compliance (companies need less time to ensure they apply rules correctly).

5. *Improve environmental behaviour, speed up use of alternative solutions (fuel, technology and business models)*

   The uptake of alternative cleaner fuels by the transport and logistics sector should be stimulated. This will make the sector less dependent on fossil fuels, whose prices have a tendency to rise further in the future because of scarcity. Faster entry of cleaner fuels will put less pressure on energy costs, which also positively influences logistics costs. Moreover, the impact of the sector on the environment will decrease. Environmental behaviour also needs to be improved (i.e. the use of non-environmental transport solutions or technologies by the transport sector due to high costs or unawareness of alternative; or free return of ordered goods by clients, customers). External costs which are not yet internalised play an important role here (see also next specific objective).

6. *Reduce negative externalities*

Besides raising awareness on their behaviour and the impact on the environment, stakeholders in the transport and logistics sector can also be influenced by pricing externalities. Efforts are taken across Europe but there is still unrealised potential for internalising external costs. The issue of a Handbook on external costs of transport, comprising best practices on external cost calculations and specific measures for each transport mode to internalise external costs, need to be considered in that respect.

7. *Improve the attractiveness and education of logistics professions*

The attractiveness of work in the transport and logistics sector needs to be improved in order to respond to the expected shortage of personnel in the sector. Attractiveness should be improved by lowering the main barriers to enter into the sector: lower training costs especially for young people (i.e. to become a driver), improved career perspectives (not only for young people but also for older people who are physically not able to perform heavy tasks anymore). By improving the attractiveness in that way, more young staff will be willing to invest in a career in the sector; and older staff can be retained.

Once staff are qualified for the job, it is important that their qualifications are mutually recognised between the Member States, as this would improve the mobility of staff across the EU. Shortages in one Member State can be compensated by supply of staff from another.

The coherence between the main problems, root causes, and general and specific objectives is summarised in the table below. This set of objectives have been discussed and validated during a stakeholder workshop in Brussels on 4th of July 2014.

Table 4.4. Objectives resulting from problems and their root causes

Problem category	Problems	Root causes of the problems	General objective	Specific objectives
Rising logistics cost due to inefficiencies and market failures	Inefficient operations within modes of transport	Lack of knowledge to improve the logistics efficiency	**Mitigate the factors which lead to inefficiencies in the freight transport and logistics sector in Europe**	**Improve utilisation of resources**
		Lack of knowledge on potential transport services by small LSPs		
		Additional management and administrative efforts needed for coordinating complex chains		
	Innovations and take up of new technologies evolve too slowly	Low awareness and acceptance of new technical and logistics solutions by LSPs		**Stimulate innovation and faster adaptation of new technologies, especially within SMEs**
		Limited time, knowledge and financial means to access new and advanced technologies for LSPs		
	Lack of interconnected transport infrastructure	Poor interoperability and poor connections of intermodal networks		**Improve interoperability and supply chain coordination**
	Regulatory and administra	Difference in regulations & administrative procedures between MS		**Reduce red tape**

Problem category	Problems	Root causes of the problems	General objective	Specific objectives
	tive procedures	Differences in usage of support tools by administration		
		Different customs and security procedures between MS		
	Increasing energy costs	Increase in fuel and oil prices due to fossil fuel scarcity		**Improve environmental behaviour, speed up use of alternative solutions (fuel, technology and business models)**
		Limited availability and uptake of alternative fuels		
Negative environmental impact	Use of environmentally unsustainable technologies	Long lifetime of vessels and trains slows down introduction of new vehicles	**Mitigate the factors which jeopardise the sustainability of the practices within the freight transport and logistics sector in Europe**	
	Market pressure to use of environmentally unsustainable solutions	Increase in number of empty trips		
	Negative externalities	Lack of internalisation of external costs		**Reducing negative externalities**
Increasing shortage of staff	Mismatch in skills	Lack of training to upskill drivers	**Mitigate the factors which lead to shortage of (qualified) staff in the freight transport and logistics sector in Europe**	**Improve the attractiveness and education of logistics professions**
		High driver training costs, especially for SMEs		
	Increasing imbalance between demand and supply of drivers due to regulatory regime	Different labour legislations and regulation between MS (i.e. minimum standards for drivers)		
		Stricter rules on working times and conditions limits overtime and productivity		
	Sector attractiveness under pressure	Unattractive type of work and career path		
		Driver population is ageing		

4.4 Policy options

4.4.1 Introduction

The goal of having policy options is to show that strategic choices can be made which aimed to enhance the logistics sector in the EU. In this section three policy options are developed.

The individual policy options have their own general strategy. This strategy has led to the definition of a set of actions. They will be (mostly qualitatively) assessed in a later section.

The general idea behind the first policy option is: the continuation of relevant FTLAP 2007 actions, based on a review of the performance of FTLAP 2007. A list of actions

that could be considered for the way forward was drawn up from all previous actions. The idea behind the second policy option is to provide for a "minimum intervention" in the logistics market. It creates the basic framework in which the businesses will have to operate. Further development and innovation is left to the market. This policy option holds most of the actions of the first policy option, and some specific actions are added. The idea behind the third policy option is to create full support for the logistics market. It consists of a set of actions that could be seen as optimising the logistics market in the EU.

Some of the actions contribute to more than one policy option. The policy options should however be seen as three separate sets of actions, giving the general ideas of these options, as described above. It needs to be stated that the European Commission has more options than just these three. In any normal policy process there should be a further development of the specific actions. Furthermore, actions could be withdrawn from these proposals, or new ones added. The added value of having the policy options is the ability to develop the overall strategy.

4.4.2 The review of FTLAP 2007

The FTLAP 2007 includes concrete measures with deadlines aiming at a more efficient and sustainable logistics environment and freight transport system in Europe. In total, 34 different actions were identified that were grouped under 6 action areas:

- ITS and e-Freight;
- Sustainable quality and efficiency;
- Simplification of transport chains;
- Vehicle dimensions and loading standards;
- "Green" freight transport corridors;
- Urban freight transport logistics.

A review of FTLAP actions was carried out based on the results of these actions and a discussion with representatives of the European Commission. The assessment was done by addressing the following questions:

- To what extent have FTLAP actions been accomplished?
- Are the FTLAP actions still relevant for current/future problems and should actions continue to solve these problems?
- Are FTLAP actions still feasible today?

The review is described per domain and gives a judgment on whether FTLAP actions should be continued.

E-Freight and ITS

This domain was supported by a variety of actions. All actions continue to be relevant in the current status of European transport and logistics policy. Significant progress has been made for all these actions, as is described in more detail below:

- *E-Freight roadmap*. The objective of this action is to develop, in cooperation with stakeholders, a roadmap for implementing e-Freight, to expand the concept of "Internet for cargo" and identify problem areas where EU action is required. An e-Freight Roadmap has been developed during the Swedish Presidency of the EU (second half of 2009). This roadmap identifies the motives for e-Freight implementation, the objectives and the action areas, and proposes an implementation schedule until 2019. Recommendations in the 2009 e-Freight Roadmap related to i) a single window and one-stop shop for administrative procedures in all modes, and ii) liabilities of intermodal transport that have been included in the 2011 White Paper "Towards a Competitive and resource efficient transport system" (COM(2011) 144 final). Therefore, this action is considered as completed/accomplished and is, of course, still relevant

in the present setting of European transport and logistics policy. While the development of the roadmap typically completes this action, further accomplishments can be monitored by assessing whether the suggested time schedule for the implementation of the roadmap has been adhered to;

- *Open data architecture and standard set to describe freight*. The objective of both actions is to develop open data architecture for information flows among freight transport and logistics stakeholders that will ensure the interoperability and integration of transport modes, and will facilitate B2B and B2A information flows. e-Freight has developed a framework and infrastructure for information exchange, connectivity and interoperability in the freight transport and logistics sector for B2B and B2A relationships. This includes an open data architecture. Standardisation issues have been identified and addressed. The implementation of the B2B and B2A standards is still an issue to date which has not yet been accomplished. It is possible to follow up this action in terms of the actual level of accomplishment/implementation of the e-Freight framework by the European Commission and the degree of "achievability" of the implemented framework, i.e., the degree to which the implementation of the framework by the European Commission conforms to the description and specifications of the e-Freight information exchange framework;
- *Initiate work towards e-Maritime*. The objective of this action is to develop a proposal on the development of a framework for an integrated e-Maritime solution that will address all aspects of maritime transport (including customs, border control and environmental issues) and will provide interoperability among maritime administrative functions. A draft proposal on e-Maritime was prepared in 2009 document, entitled "Scoping the EU e-Maritime initiative". In 2010, a public consultation and a stakeholder conference were organised for presenting and discussing the stakeholder consultation results. In late 2010, Directive 2010/65/EU on reporting formalities for ships was adopted; this is considered an important milestone for the use of e-maritime services. While the objective was to publish a Directive for the use of e-Maritime Services by 2011, this has still not been done. This action is still relevant, given the importance of interoperability and integration highlighted in the White Paper. It is also achievable, given that e-Maritime is part of the e-Freight initiative. The degree of accomplishment of this action can be measured through the publication of the Directive on the use of e-Maritime services, while the degree of accomplishment can be monitored through the timing of the publication of the Directive, in coordination with the Common Maritime Policy objectives (set out for 2018);
- *ITS Framework*. The establishment of the framework for the development of ITS applications was formalised through Directive/2010/EU ("ITS Directive")[156]. This Directive is an important instrument for the coordinated implementation of ITS in Europe. It aims to establish interoperable and seamless ITS services while leaving Member States the freedom to decide which systems to invest in. Member States were obliged to report[157] to the European Commission on 27 August 2011 on the state of Intelligent Transport Systems in their country. In the next step, Member States were asked to draft a National ITS plan, describing the ITS strategy in the country for the next five

[156] Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport.

[157] In addition, 11 country reports are publically available; for 21 countries strategy reports for the next 5 years are publically available (source: http://ec.europa.eu/transport/themes/its/road/action_plan/its_national_reports_en.htm).

years. These National ITS plans were submitted in August 2012. A substantial number of studies have been commissioned and performed on the various priority areas and actions set out in the Directive and the respective Action Plan already established in 2008 (COM(2008) 886 final). However, until 2011 the view was that while technical deployment of ITS solutions was fast, the uptake across Europe was slow and fragmented. While the goal of developing an ITS framework has been accomplished, the fragmentation in the actual uptake of ITS solutions suggests that further action can be taken. The feasibility of this action depends on the adoption, at national level, of European standards (e.g., through their incorporation in national regulatory frameworks) and the availability of appropriate and adequate funding sources/instruments. If feasibility is ensured, then the degree of achievability of the intended objectives is estimated to be high. The progress of this action can be monitored by: i) the degree of accomplishment/implementation of the various actions of the national ITS action plans and the adherence to the respective timeframes; ii) the level of interoperability between the different ITS solutions/services introduced at European level as well as between National ITS plans; iii) the assessment of operational benefits from the introduction of ITS solutions on the freight transport logistics system;

- *Single interface (on-board unit).* The objective of this action was to develop a specification for an in-vehicle platform for ITS services based on open data that will also facilitate communication and exchange of information at B2B and B2A level. A report on the establishment of an open in-vehicle platform concept for the provision of ITS services and its application in heavy vehicles was completed in 2013 (ITS Action 4.1 - Phase 2 -service contract TREN/G4/FV-2008/475/01); it has analysed various layers of system architecture (regulatory, governance, technical, business) and provided recommendations to facilitate its development and take-up. This action is still relevant and should be continued, given the importance of the provision of in-vehicle ITS services as a basic pillar of the ITS Action Plan, and as an action that is expected to significantly contribute to the efficiency of the European freight transport logistics system. Its feasibility depends on the adoption of the recommendations for facilitating the development of the in-vehicle platform; special emphasis is placed on the regulatory requirements regarding interoperability, certification and security. The progress of this action can be monitored through the processes leading to the adoption of the platform architecture by the European Commission. The level of accomplishment of the goals of this action can be further assessed by the actual rates of adoption of vehicle on-board units that have been developed based on the open data architecture platform and framework specifications;
- *Road charging/Electronic Fee Collection*. The objective of this action is to put forward the implementation of electronic fee collection systems by developing a single interface. EC Decision 2009/750/EC defined the European Electronic Toll Service (EETS) and its technical elements. Interoperability constituents of the EETS were defined in the report "EETS - Guide for the Application of the Directive on the Interoperability of Electronic Road Toll Systems" (EC, 2011). This action has been completed in terms of the definition of interoperability requirements for EETS, but until August 2012, when an EC Communication (COM (2012) 474 final) on the implementation of the EETS was issued, the progress of the deployment of EETS was considered low. As this action is largely achievable, it should continue. The progress of this action can be monitored by following the actual implementation process of the EETS system. Given the importance of this action and the currently low level of accomplishment, an assessment of the level of accomplishment of this action should be made at regular intervals.

Sustainable quality and efficiency

This domain was further substantiated by a variety of actions. The extent to which progress has been made varies greatly by action. This is described in more detail below:

- *Freight transport logistics bottleneck exercise*. In early 2007, an initial call for stakeholders to participate in the identification of bottlenecks in the development of freight transport logistics in Europe was made. Until early 2009, more than 500 bottlenecks (often related to individual Member States) had been identified by stakeholders but by late 2009, the onset of the economic crisis resulted in the suspension of the exercise. Since then, no further progress on this action can be identified; however, bottlenecks in the European freight transport system remain. Therefore, this action is still very relevant. The update of bottlenecks identified in 2007 and the identification of additional bottlenecks is of crucial importance for improving the efficiency of the European freight transport logistics network. Therefore, this action should be continued. The progress of this action can be monitored through achievement of several milestones, such as: the identification of stakeholder consultation meetings/workshops, the production of an updated list of bottlenecks and an overview of measures to overcome these bottlenecks. The degree of accomplishment, which is currently low, can be monitored through regular assessment of the bottlenecks that have been addressed/rectified, and of the resulting operational/efficiency improvements in the freight transport logistics network performance;
- *Qualifications and training requirements*. Only recently, some progress has been made with this action. The STARTS project, initiated in 2012, aims to: develop a detailed study on the implementation impact and challenges of Directive 2003/59/EC (driver training pillar); develop a study on related employment trends and job definitions, good training and employment practices for non-mobile logistics workers (logistics pillar); and make joint recommendations for resolving specific problems related to both pillars. In 2014, the European Logistics Association issued a report on European Qualification Standards for Logistics Professionals which have been aligned with the European Quality Framework standards. The results of the STARTS project can provide significant input for training practices and qualifications of logistics professionals. Therefore, this action is still relevant and should be continued. The current degree of accomplishment of this action is still low. Achievability of its intended purposes depends on the connection between the qualification standards and training practices with the actual requirements of the logistics profession that are in turn affected by the structure, organisation and management of the freight transport logistics activity at European level. The progress of this action can be reviewed through monitoring, the compilation of a list of training requirements and qualifications and the relevant stakeholder consultation processes, and the incorporation of qualifications and training requirements in relevant legislation. The level of accomplishment can then be monitored in terms of the actual number of logistics employees receiving qualifications and participating in training exercises under the common training and qualification framework;
- *Dialogue on the attractiveness of transport logistics professions*. No evidence of EC consultation with social partners and stakeholders for improving the attractiveness of the logistics profession has been found. Improving the attractiveness of the logistics profession is even more vital today, as the current workforce is ageing and the sector is less successful in recruiting younger workers. Therefore, this action should be continued. It is possible to further follow-up the progress of this action through the observation of social dialogue between the European Commission and the involved stakeholders. The potential to make logistics a more attractive career choice depends on whether the output of this dialogue results in specific (legislative/regulatory,

informational, networking etc.) measures that are directly related to working conditions, compensations, and safety/security issues. Career attractiveness can be assessed through relevant surveys with logistics personnel/workforce performed at regular intervals (e.g., biannually) in order to capture the actual impact of the measures in place during each period;

- *Indicators for performance, sustainability and efficiency*. Substantial research work has been performed on this topic: projects such as ASSESS, SEALS, BE LOGIC, and PROMIT have developed (to a different extent) lists of performance indicators for freight transport logistics chains. To date, no "establishment of a core set of generic indicators" or a "consultation with stakeholders" has been performed. In 2014, the European Commission published the first ever EU Transport Scoreboard, assessing the performance of EU-27 Member States in terms of 22 transport-relevant categories with data from various sources (e.g., Eurostat, EEA, OECD, World Bank). The topic of harmonisation of performance indicators for freight transport chains continues to be very important and relevant for the attainment of FTLAP goals in the future; it is included in the recommendations suggested in Task 2 of this study. Therefore, its continuation is of high importance. The feasibility of this action is considered to be high, as substantial relevant research work already exists as the basis for establishing a core set of EU-wide logistics performance indicators. Based on this current status, the progress of this action is considered to be moderate. This action can be monitored through a regular review of open EC calls for stakeholder consultation for this issue, monitoring of the stakeholder consultation process and assessment of the output of this process. The level of accomplishment of the action can be monitored through: i) the actual publication of a core set of performance indicators for freight transport logistics developed by the European Commission following the consultation process, and ii) an assessment of the extent of their use by freight transport logistics chain stakeholders as well as in relevant policy studies;
- *Benchmarks for terminals*. Studies have addressed the issue of terminal benchmarking (e.g., PROMIT (D4.1, D4.2 / 2007), and BE LOGIC (2009)). Both studies provided very good results, although more or less research driven and with focus on the transport modes rather than on intermodal transport or terminals. Studies for specific categories of terminals have also been conducted (e.g., PWC-Panteia study for DG MOVE on efficiency and quality of port services, 2013) and projects are currently underway (e.g., PORTOPIA project for the development of a port observatory for performance indicators analysis). To date, no "list of generic benchmarks for terminals" or "voluntary code of best practice" has been identified. The topic of terminal performance assessment and benchmarking is of very high importance for the attainment of FTLAP goals in the future and therefore should be continued. Again, substantial preparatory work has been performed, which suggests achievement of the action goals is highly likely. However, feasibility of this action depends also on its focus towards intermodal transport and the benchmarking of terminal performance when terminals are viewed as nodes in an intermodal freight transport network. The progress towards the implementation of this action can be monitored through a regular overview of calls for consultation with terminal authorities/operators on this issue, monitoring of the consultation process and assessment of the output of this process. The level of accomplishment of the action objectives can be monitored through: i) the actual publication of a core set of terminal benchmarking indicators by the EC, ii) the identification of best practices in terminal performance, iii) an assessment of the extent of their use by terminal authorities/operators, and d) an assessment of the realised operational benefits for terminals;
- *Short sea promotion centres*. Following a feasibility study on the expansion of SPCs to Intermodal Promotion Centres (IPCs) (2007), there appears to have been no further development in this area. Indeed, SPCs continue to operate in

the same way, meaning the degree of accomplishment of this action is still low. The promotion of intermodal transport can benefit from the development and operation of national Promotion Centres under a European Network. The deployment of SPC into IPCs and the concurrent development of a European Network of Intermodal Centres are achievable. The overall goal of the White Paper on the promotion of intermodal transport sets out the need for this development and should therefore be continued. The progress of this action can be monitored through: i) an overview of the current status of expansion of national Shortsea Promotion Centres to Intermodal Promotion Centres (e.g., through a study commissioned by the EC); ii) the development of a roadmap (and the associated time plan) for this expansion; and iii) the implementation of the roadmap. The level of accomplishment of this action can be measured through: i) a regular review of the implementation of the roadmap in relation to the associated timeplan; and ii) the assessment of the operational benefits brought about by the operation of IPCs to intermodal transport (e.g., modal share of intermodal transport, volumes of goods carried through intermodal transport, environmental benefits from the use of multiple transport modes etc.) in each country and Europe-wide;

- *Data on freight transport logistics*. No evidence of a report/study on the determination of data requirements for freight transport logistics across modes has been encountered. Data on freight transport is still collected on a per-mode basis, based on frameworks provided by different EC Regulations. Eurostat was consulted on the willingness and availability to collect more data on freight transport (i.e. in SEALS-study), mainly by consolidating data collected by the Member States. Common data collection standards should be designed for that purpose. Improvement of data collection and data harmonisation across transport modes is still very important and relevant for the attainment of FTLAP goals in the future; in fact, it is one of the recommendations proposed in Task 2. Therefore, its continuation is of high importance, but it is clear from the above that its degree of accomplishment is still low. The feasibility of this action may be affected by factors such as the willingness of private stakeholders to share data that can be considered as proprietary and the efficiency of a data collection processes at national level. The progress of this action can be monitored through: i) a regular overview of EC open calls for service contracts (to determine whether a contract for said study has opened/been awarded); ii) participation in the consultation with stakeholders; and iii) adherence to the time plan. The level of accomplishment can be further assessed by the achievement of the common data collection standards milestone, and of the degree of conformance with national data performance standards.

Simplification of transport chains

This section includes actions aimed at simplification of transport chains through the decentralisation of freight-related information exchange. The actions built on the initiatives taken following the Commission's proposal for a paperless environment for customs and trade[158].

The One Stop administrative Shopping and Single Window projects were welcomed when the FTLAP was founded. This allowed single windows for maritime, e-Maritime and increased the legal basis. The Blue Belt initiative[159] focuses on problems with

[158] COM (2005)609.

[159] On 5th November 2013, he European Commission adopted a modification to the Implementing Regulation of the Customs Code in other to facilitate the Regular Shipping Service (RSS) scheme. The Blue Belt is a concept according to which ships can operate freely within the EU internal market with a minimum of administrative burden and in which safety, environmental protection as well as customs

mixed cargo (EU and export) and developed the e-manifest, customs involvement boundaries and common tax rules. The update of the blue belt initiative resulted in an upgrade of the single transport document. The single transport window does exist but its application is limited to the maritime sector. e-Maritime aims to foster the use of advanced information technologies for working and doing business in the maritime transport sector.

On the issue of liability, only small steps have been made – a uniform, cross-modal regime is lacking, which results in friction costs for multimodal transport operations -. The port security standards were set up, as well as the e-Freight standards for dangerous goods. The future should focus on data protection and data security.

Actions within this domain are still very relevant today as they directly simplify procedures within (complex) transport chains. If procedures become less complex, administrative costs will decrease and therefore logistics costs will decrease. This will make the EU logistics sector more competitive.

Concerning the single window for administrative procedures, it is widely acknowledged that cross-modal regime on liability is lacking uniformity. This point should be added to the action on administrative procedures. Within the action there needs to be a focus on data protection and data security. For the action on the single transport document it is advised also to look at international, non-EU, rules. It is feasible to further follow-up the progress of actions within this domain through the observation of social dialogue between the EC and the involved stakeholders (consultation meetings and workshops) and the examination of whether the output of this dialogue consists of measures that are directly related to data protection and data security, and simplification of procedures in general.

Vehicle dimensions and loading standards

This domain includes a discussion of alternative standards on vehicle weights and dimensions. It also comprises proposals for standardising load units in order to improve the compatibility of freight transport modes. If transhipment between modes is improved, intermodal transport will become more competitive compared to road-only alternatives. Intermodality enables the effective combination of the benefits of two or more transport modes, for instance the high transport capacity, safety and environmental performance of rail, or of inland navigation with the flexibility of road over short distances and in crowded urban settings. Standardisation of load units plays a crucial role here in making intermodal transport more attractive, as it will decrease friction costs in handling operations between modes.

The discussion on actions in this domain is ongoing, particularly when it concerns the introduction of longer and heavier vehicles in road freight transport. Various studies[160] have been conducted which analysed the impacts of introducing longer and heavier vehicles on a large scale and the technical aspects related to longer and heavier trucks. Some of the current provisions on weight and dimensions date back to the 1980's.

Directive 96/53/EC sets the respective maximum authorised length, width, height and weight (total weigh and weight per axle). In light of the evolving market and the available technologies, the question today is whether the choices made when the

and tax revenues are ensured by an optimal use of existing capabilities to monitor maritime transport and the cargo concerned.

[160] Effects of adapting the rules on weights and dimensions of heavy commercial vehicles as established within Directive 96/53/EC, European Commission, 6 November 2008; Longer and Heavier Vehicles for freight transport, European Commission Joint Research Centre, 2009.

Directive was adopted in 1996 are still relevant. Revision of this directive is ongoing[161] and currently being discussed in the European Parliament and Council.

With regard to the standardisation of load units the new EN 13044 standard for the marking of intermodal load units simplifies access to combined transport and brings efficiency improvements for all stakeholders involved in intermodal transport. For load units being mainly used within Europe (swap bodies and semi-trailers), a technically compatible 'ILU4-Code' has been introduced by the European EN 13044 standard, which will be administered by the International Union of Combined Road-Rail Transport Companies (UIRR).

The expected efficiency improvements resulting from the use of standardised load units will become visible once only the new markings are used following the transition period. Follow up of the specific actions under FTLAP are not necessary.

Urban freight logistics

This domain comprises actions aimed at better integration of logistics in urban transport. Specific actions are encouraging the exchange of best practices, recommendations and standards for urban transport logistics, including freight deliveries and vehicles used; recommendations on performance indicators and benchmarks to measure efficiency of terminal operations; and reinforcement of the freight part within CIVITAS.

The subsidiarity principle limits the EU's ability to intervene with legislative actions in this domain. On the other hand there is a need for some comparable legislative standards. Every municipality or city sets different regulations (i.e. time windows set for delivering goods in cities, accessibility low-emission zones, vehicle sizes etc.), which lead to inefficiencies. Costs for the last mile increase. Actions within this domain are still relevant, as the problem of inefficient operations due to different regulations at the local level is still there. Therefore the Commission continues supporting the exchange of best practices in city logistics. The future approach will be a combination of a European framework (i.e. Preparation of EU guidelines on urban logistics[162]) and local responsibilities. The start is given by the city mayor's network, the CIVITAS studies, the harmonised standards etc. The EU's upcoming framework programme Horizon 2020 promises to bring important support to the next phase of the CIVITAS initiative − CIVITAS 2020 − through the area of Smart, Green and Integrated Transport. A key challenge of CIVITAS 2020 includes advancing carbon-free city logistics in major urban centres by 2030.

With regards to performance indicators and benchmarks, research has been done in projects like PROMIT, BESTUFS, BESTUFS II and BE LOGIC. No "recommendations on commonly agreed benchmarks/performance indicators" have been encountered however. The topic of benchmarking/performance assessment for various categories/types of freight transport remains of very high importance and relevance for the attainment of FTLAP goals in the future. Therefore it should be continued in order to establish a set of commonly agreed benchmarks and performance indicators. It is possible to further follow-up the progress of this policy action through a regular overview of open European Commission calls for consultation with stakeholders, monitoring of the consultation process and assessing of the final output.

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[161] Proposal for a Directive of the EP and the Council amending Directive 96/53/EC of 25 July 1996 laying down for certain road vehicles circulating within the Community the maximum authorised dimensions in national and international traffic and the maximum authorised weights in international traffic, Brussels, 15 April 2013.

[162] The preparation of the EU-guidelines will comprise six high quality non-binding guidance documents on different aspects of urban logistics for presentation to the EU Member States for their endorsement.

"Green" freight transport corridors

Green Corridors are an EU concept for long-distance freight transport corridors, where advanced technology and co-modality are used to achieve energy efficiency and reduce environmental impact. This domain comprises different actions to establish fair and non-discriminatory access to the corridors and transhipment facilities: defining green transport corridors and organising cooperation between the relevant stakeholders, reinforcing and promoting the green corridor concept within TEN-T and Marco Polo (i.e. through better co-ordination of different funds), promoting the establishment and recognition of Motorways of the Sea, and implementing the NAIADES programme for inland waterway transport.

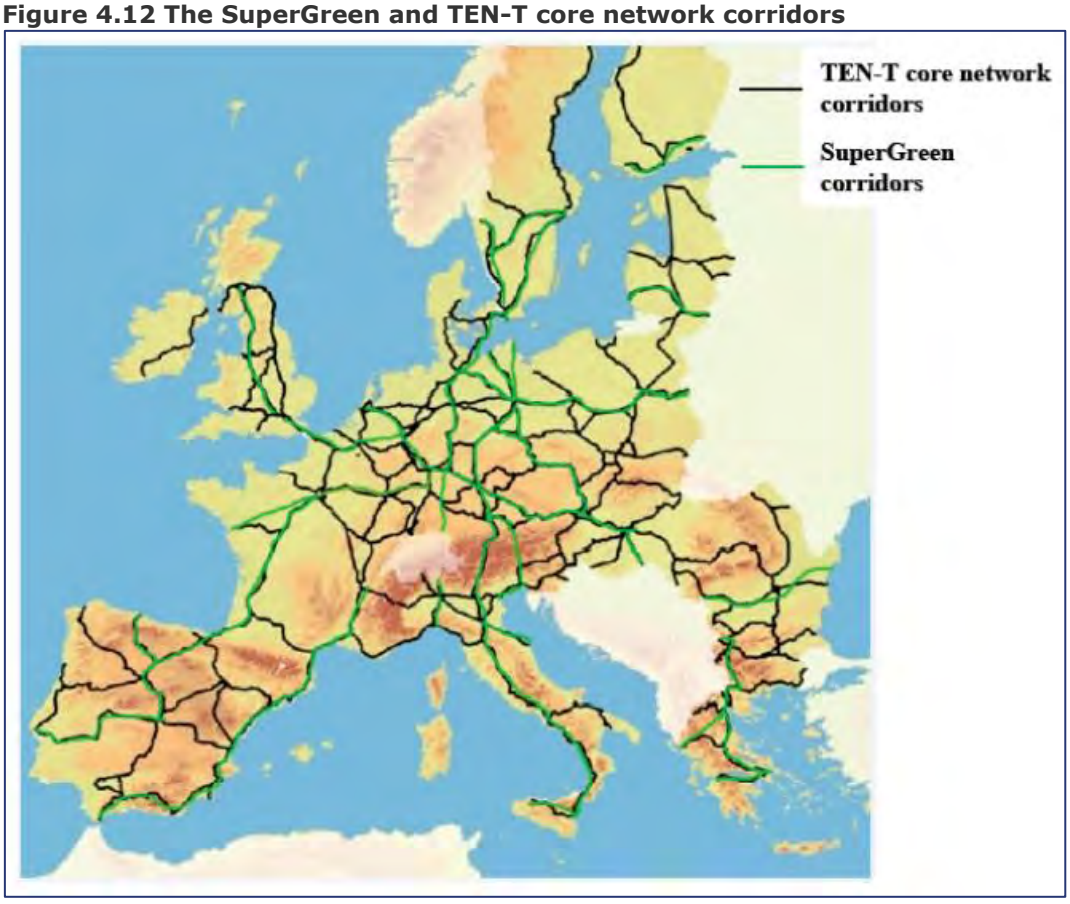
Launched at the beginning of 2010, the project SuperGreen has assisted the Commission with developing the Green Corridor concept. The project ended in 2013. The project defined nine SuperGreen corridors. The overlap with the TEN-T network is evident, as the following picture shows. The SuperGreen project recommended to further enhance certain requirements that supported the greening of corridors (i.e. harmonisation and development of ICT solutions and transport documents, harmonisation and development of policies and regulations, development and harmonisation of transport infrastructure, an increase of available, quality personnel, improvement in the transparency of information and increased co-operation in co-modal supply chains).

The Motorways of the Sea concept aims to introduce new intermodal maritime-based logistics chains in Europe, which should bring about a structural change in transport organisation within the next few years. To help Motorways of the Sea develop, the White Paper states that European funds should be made available. It is up to industry, Member States and the community to implement financially and operationally sound projects to use these maritime resources better for new intermodal maritime-based transport systems. Within FTLAP one action was to improve co-ordination of different funding sources to develop Motorways of the Sea. In its recent communication the Commission confirmed that the Marco Polo programme will no longer be continued in its current form. Instead, a new funding scheme (NFS) for freight transport services will be fully integrated within the framework of the revised Trans-European Transport network programme (TEN-T) and implemented via the Connecting Europe Facility (CEF), a dedicated instrument for financing EU policies in the area of transport, energy and telecommunication. The Commission also stressed the NFS should take account of lessons learned from past projects (such as Marco Polo), be aligned with the actual market needs and address relevant failures on the freight transport market, taking into account expected transport and socio-economic developments for the 2014-2020 period. The NFS is to support European transport policy objectives within a broader framework established by the new TEN-T programme and the CEF. According to Art. 32 of the TEN-T guidelines, the NFS should improve sustainable use of transport infrastructure, including its efficient management and promotion of deployment of innovative transport services, including through motorways of the sea.

The NAIADES programme is a Commission imitative to enhance the use of inland navigation as part of intermodal freight solutions, in order to create a sustainable, competitive and environmentally friendly European wide transport network. Implementation of NAIADES has been supported by the European Coordination Action PLATINA 1 and 2. PLATINA 1 resulted, among others, in the European web portal on inland navigation, keeping stakeholders informed about all policy actions and interesting events as well as offering an online database providing all national and EU funding mechanisms. Furthermore, it developed the European hull database to allow correct vessel identification across Europe, a Good Practice Manual on how to reconcile waterway and environmental interests, and a European IWT research and innovation agenda. Last but not least, two highly successful side projects were established: the EDINNA platform, bringing together all European inland navigation schools to work on

a common curriculum, and the Barge-to-Business event, gathering shippers and logistics service providers to make better use of inland waterway transport. PLATINA 1 ended in 2012, PLATINA 2 is ongoing and will be finalised in 2016. PLATINA 2 will support the development of waterway projects in accordance with the priorities of EU transport infrastructure investment plans. Furthermore, a handbook on waterway infrastructure maintenance will be created and the RIS user portal will become more user-friendly with new and improved services.

Figure 4.12 The SuperGreen and TEN-T core network corridors



Source: SuperGreen project (FP7), Green Corridors Handbook, Volume II, 15 January 2013.

4.4.3 The development of policy options

The proposed policy options are given on the next page. It shows the domains for which they are developed, as well as the accompanying objectives.

Figure 4.13 Alternative policy options

Domains	Innovation and clean technologies	Resource utilization	Interoperability and coordination	Regulatory and administrative	Energy and renewables		The logistics profession
Objectives	Stimulate innovation and faster adaptation of new technologies, especially within SME	Improve utilization of resources	Improved interoperability and supply chain coordination	Reduce red-tape	Improve environmental behaviour, speed up use of alternative solutions (fuel, technology and business models)	Reducing negative externalities	Improve the attractiveness and education of logistics professions
Option 1: Baseline, continue relevant FTLAP actions		Open data architecture					Qualifications and training requirements
		Data on freight transport logistics	Multi-modal liability regime	Single window for administrative procedures			Dialogue on the attractiveness of transport logistics professions
			European standards to facilitate secure interconnectivity in the logistic chain	Single transport document			
			Ensure open and non-discriminatory access to relevant transhipment platforms				
			CIVITAS continue				
Option 2 : Minimum intervention	Sharing and promoting best practices on CO2 calculation methodologies	Open data architecture			Support awareness campaigns to change unenviromental behaviour		Qualifications and training requirements
	Allow more SMEs in innovative projects such as in Horizon 2020	Raise awareness by final consumers to show last-mile impact through e-commerce	Multi-modal liability regime	Single window for administrative procedures	Stimulate investments in initial level of charging points in urban areas		Financial support for training and qualifications via loans or subsidies where training costs are high and national funding is lacking
	Create a framework for clean technology standards		European standards to facilitate secure interconnectivity in the logistic chain	Single transport document			Support the exchange of national timetables for periodic training of drivers
Option 3: Creating full support for the logistics market	Create a framework for clean technology standards	Open data architecture			Stimulate the uptake of cleaner technologies through tax measures	Ensure internalization of external costs through legislation	Qualifications and training requirements
	Increase access (through NFS) to financial means for innovations	Stimulate the pricing or differentiation of return trips for e-commerce	Increase the awareness of the availability of intermodal logistics service providers	Single window for administrative procedures	Financial support for upgrading new vehicles, vessels		Dialogue on the attractiveness of transport logistics professions
	Provide subsidies for SME's to adapt to clean technologies and standards	Campaigns to make LSPs (particularly SME) more aware of the benefits of existing fleet and advanced logistics management systems	Investment support (under TEN-T)	Harmonize regulations and (trade) standards between MS.	Organise campaigns and support training courses for horizontal load coordination		Financial support for training and qualifications via loans or subsidies in all MS
	Stimulate cooperation between national innovation platforms (i.e. Dinalog) and SME's	Follow up recommendations for performance indicators and data gathering out of this study	Take initiative for an independent and protected data storage facility to allow for open data architecture	Support coordination between MS by developing EU level infosystems (e-Freight, e-Maritime)	Stimulate investments in initial level of charging points in urban areas		Create a legal framework for the exchange of national timetables for periodic training
	Organise campaigns and support training courses		Ensure open and non-discriminatory access to relevant transhipment platforms				Improve the sector image through campaigns
	Create a standard CO2 calculation methodology for all modes of transport		CIVITAS continue				

Policy option 1: Continuation of the Freight Transport Logistics Action Plan

The first option is the baseline option, consisting of actions of the FTLAP 2007. The review as presented in the last section aimed at defining the actions that could be continued. Given this review it is clear that policy option 1 focuses on the objectives "improved interoperability and supply chain coordination", "reduce red tape" and "improve the attractiveness of logistics professions".

The starting point of this policy option is the combination of the actions on "open data architecture" and "data on freight transport logistics". Just as in FTLAP 2007 this can be seen as a requirement to tackle the lack of interoperability. Transparency of information is one of the requirements for further enhancing interoperability. It is clear that the existing logistics industry could perceive these actions as threats to their businesses. They fear that the information on their competitive advantages would be available to competitors. Therefore, careful attention needs to be paid to the introduction of these actions. However, the fact that the logistics industry has these fears also shows that the problem really exists. There is a level of non-transparency and decreasing it would further enhance logistics.

Secondly, two important actions are included in policy option 1: "European standards to facilitate secure interconnectivity in the logistics chain" and "Ensure open and non-discriminatory access to relevant transhipment platforms". These options will improve interoperability and supply chain coordination possibilities. Standardisation will result in fewer obstacles to using different assets in the EU. It will be easier to develop new logistics concepts and focus on the demands of the market. Competition will be based on clear differences in logistic characteristics and less on market distorting aspects (lack of standardisation). This last point is also important for the transhipment platforms action. These platforms are often developed with public support and so it is vital that they can be used by any party capable and willing to do so. In order for multimodal solutions to be used on efficiently and on a sufficient level, one of the issues that still requires attention is the "multi-modal liability regime". Therefore a continuation of this action is proposed.

Two other actions that will be the core of policy option 1 are aimed at reducing red tape. They are the "single window for administrative procedures" and the "single transport document". The basic idea behind these actions should not change. Therefore, actors in the logistical market should have easy access to the required administrative procedures; it should be clear where they need to go and what is required of them. These actions will lead to an optimisation of the required administrative procedures. There should always, in any policy option, be resources for this.

Finally two actions are defined that will improve the attractiveness and education of logistics professions. They are "Qualification and training requirements" and "Dialogue on the attractiveness of transport logistics professions". These actions will ensure that throughout the EU, the logistics profession is seen as important and that people are attracted to it.

These actions together form policy option 1. The table below summarises this, showing the actions, the objectives, and the domains.

Table 4.5 List of action of policy option 1 "Continuation of FTLAP"

	Description	Objectives	Domain
1.1	Open data architecture	Improve utilisation of resources, improve interoperability and supply chain coordination, reduced red tape	Resource utilisation, interoperability and coordination, Regulatory and

	Description	Objectives	Domain
			administrative.
1.2	Data on freight transport logistics	Improve utilisation of resources	Resource utilisation
1.3	Multimodal liability regime	Improves interoperability and supply chain coordination	Interoperability and coordination
1.4	European standards to facilitate secure interconnectivity in the logistic chain		
1.5	European open and non-discriminatory access to relevant transhipment platforms		
1.6	CIVITAS continue		
1.7	Single window for administrative procedures	Reduce red tape	Regulatory and administrative
1.7	Single transport document		
1.9	Qualification and training requirements	Improve the attractiveness and education of logistic professions	The logistic profession
1.10	Dialogue on the attractiveness of the logistics profession		

Policy option 2: Minimum intervention

In order to develop the second policy option, some of the FTLAP actions were dropped as it is assumed that in these areas the market could come up with the essential actions. It suits the general idea of policy option 2, being a minimum intervention in the market. The actions dropped are:

- Data on freight transport logistics;
- European open and non-discriminatory access to relevant transhipment platforms;
- CIVITAS continue;
- Dialogue on the attractiveness of the logistics profession.

These dropped actions imply that policy option 2 is less focused on the interoperability aspect. The second policy options can be characterised as the option in which innovation as well as improvement of the environmental behaviour are added to the objectives. Specific actions were also added to enhance the attractiveness of the logistics profession.

In the area of innovation and clean technologies, three actions are defined: "Sharing and promoting best practices on CO_2 calculation methodologies"; "allow more SMEs in innovative projects such as in Horizon 2020"; and "create a framework for clean technology standards". It is thought that these minimum interventions should primarily be aimed at SMEs. SMEs are important in generating new concepts and ideas, however they do not have the same resources and structure to pursue them. The potential benefits of the best practices on CO_2 emissions and clean technology standards will lead to lower levels of energy consumption and emission. Within the logistics sector the innovators and early adopters of new technology have shown positive results (e.g. in programmes such as Lean and Green in the Netherlands, in which companies succeed in reducing CO2-emmissions by implementing operational and technical measures). In order to get the majority of relevant companies to adopt these new concepts, it is vital to promote the actual activities and behaviours that are required to reach the possible results. When the technology is developed on a sufficient level, a specific standard could be developed. This standard offers ways to enforce the introduction and application of proven and effective technologies.

A specific action is defined in the area of "improving utilisation of resources", namely "raise awareness by final customers to show last-mile impact through e-commerce". This action relates to the strong development of last-mile logistics, based on the development of home-shopping via the internet. Other policy actions also relate to this development. The intention of raising awareness of final customers is to persuade them to demand more from logistics service providers. The number of vehicles (often mini-vans with a bad track record on noise and emissions) that use the local roads for this last mile delivery is substantial. The efficiency of transport capacity is very low. At the moment, the positive impact of being able to buy products on the internet and getting them delivered at home is high, and customers value the convenience of this option. However, the negative impacts related to the inefficient use of fleet capacity are not taken into account. Greater awareness would lead to a different set of requirements, forcing the service providers to change their market offer. This market segment is small, but shows high growth figures. The potential for improving the fleet capacity utilisation is high.

No new actions were defined in the area of "interoperability and coordination" and "regulatory and administrative". The actions of FTLAP are seen as the minimum requirements in these domains.

Two actions are defined in the area of "energy and renewables". They are "support awareness campaigns to change non-environmental friendly behaviour" and "stimulate investments in charging points in urban areas". These actions also partly relate to the increase in last mile logistic concepts, where there is still room for improvement. The actions do not, however, dictate the way in which the market should deal with energy and renewables, as this approach would not suit the general idea of minimum intervention. The potential benefits of these actions relate to the better use of capacity for last mile delivery and have the same logic. Market forces will result in better performances.

Two additional actions were defined in the area of the logistic profession: "Financial support for training and qualifications via loans or subsidies where training costs are high and national funding is lacking" and "support the exchange of national timetables for periodic training of drivers". The definition of these two actions is driven by the fact that between the EU countries there seems to be different attitudes to training in general, and also in the follow up of trained employees. Levelling these requirements for the logistic profession is beneficial to the international character of logistics. The potential benefits of these actions relate to the quality of staff, which would be substantially improved. Additionally, these actions would help to even out the differences concerning the quality and operating principles within the sector throughout the European Union. This is a desired development, given the international character of the logistics sector.

These actions together form policy option 2. The table below summarises this, showing the actions, the objectives at which they aim and the domains.

Table 4.6. List of action of policy option 2 " Minimum intervention"

	Description	Objectives	Domain
2.1	Sharing and promoting best practices on CO2 calculation methodologies	Stimulation innovation and faster adaption of new technologies, especially within SMEs	Innovation and clean technologies
2.2	Allow more SMEs in innovative projects such as in Horizon 2020		
2.3	Create a framework for clean technology standards".		
2.4	Open data architecture	Improve utilisation of	Resource

	Description	Objectives	Domain
		resources, improved interoperability and supply chain coordination, reduced red tape	utilisation, interoperability and coordination, Regulatory and administrative.
2.5	Raise awareness by final customers to show last-mile impact through e-commerce	Improve utilisation of resources	Resource utilisation
2.6	Multimodal liability regime	Improved interoperability and supply chain coordination	Interoperability and coordination
2.7	European standards to facilitate secure interconnectivity in the logistic chain		
2.8	Single window for administrative procedures	Reduce red tape	Regulatory and administrative
2.9	Single transport document		
2.10	Support awareness campaigns to change non-environmental behaviour	Improve environmental behaviour, speed up use of alternative solution's (fuel, technology and business models)	Energy and renewables
2.11	Stimulate investments in charging points in urban areas		
2.12	Qualification and training requirements	Improve the attractiveness and education of logistic profession	The logistic profession
2.13	Financial support for training and qualifications via loans or subsidies where training costs are high and national funding is lacking		
2.14	support the exchange of national timetables for periodic training of drivers		

Policy option 3: Creating full support for the logistic market

The third policy option is developed to create a full support system for the logistics market in the EU. Several actions were defined that go beyond facilitating the market, but rather focus on pro-actively tackling the problems at hand. Compared with the first two policy options, this policy option is therefore very ambitious and would require a great deal more effort. For instance, the investment support would require funds to be allocated to specific projects. A specific programme needs to be developed, including coordination, selection of projects, project management and monitoring and evaluation.

The assistance to SMEs in order to innovate and adapt new technologies goes beyond those of policy option 2 in the area of innovation and technologies. The generic action to create a framework for clean technology standards is also part of policy option 3. Several actions are defined to allow for innovation and adaption. They are:

- Increase access (through NSF) to financial means for innovation;
- Provide subsidies for SMEs to adapt clean technologies and standards;
- Stimulate cooperation between national innovation platforms (i.e. Dinalog) and SMEs;
- Organise campaigns and support training courses;
- Create a standard CO_2 calculation methodology for all modes of transport.

These actions suit the general idea of creating full support. The focus remains with the SMEs, since their capabilities to innovate and adapt are vital for these new technologies. Policy option 3 also holds subsidy programmes for this goal, which would really enhance SMEs' potential to innovate. Concerning CO_2, there is a clear difference

between policy options 2 and 3. Policy option 2 merely provides best practices and leaves it up to other parties to work towards that, whilst policy option 3 will generate a standard calculation for all transport modes. This specific element clearly shows the differences between these two policy options: minimum intervention versus creating full support. The measures proposed potentially have high impact on the use of efficient technologies. Within the subsidy provision measure for the adaption of clean technologies, a toolkit would be introduced that would enable the SMEs to introduce these technologies sooner and to greater effect.

Three actions are defined in the area of resource utilisation. They are:

- Stimulate the pricing or differentiation of return trips for e-commerce;
- Campaigns to make LSP's (particularly SMEs) more aware of the benefits of existing fleet and advanced logistics management systems;
- Follow-up recommendations for performance indicators and data gathering out of this study.

These actions are defined in this way in order to actively intervene in the area of the last-mile logistics and also to actively assist the SMEs to better utilise their (small) fleet. These actions focus, just as in policy option 2, on the distribution processes, mainly in the cities. The potential benefits relate to the reduction of empty running directly (via the pricing mechanism), and indirectly via the awareness campaigns. The leading companies in the sector have competitive edges based on devices such as appropriate fleet and logistics management systems. Finding ways to get other companies to look for potential savings, based on these devices, would lead to an increase of efficiency in transport chains. Knowledge on the subject and insight into the actual developments, based on transparent and consistent data gathering, will enable policy developers to define appropriate measures.

The area of interoperability and coordination also has several ambitious actions that aim to address the problems. These actions are:

- Increase the awareness of the availability of intermodal logistic service providers;
- Investment support (under TEN-T);
- Take initiative for an independent and protected data storage facility to allow for open data architecture;
- Ensure open and non-discriminatory access to relevant transhipment platforms;
- CIVITAS continue.

In the difficult area of interoperability these actions, especially the investment support, show the ambition of this policy action. This policy action will need further development. Problem areas need to be further defined and funds need to be guided towards investments that would optimise the possibility for interoperability. The potential benefit of this measure depends on the level of investment and the specific projects that will be supported. The results of these projects will be a more efficient transport network in which it will be easier (less costly) to use more transport modes and will therefore provide customers with a better service. In order to optimise the action, it should also be made clear that all service providers are able to benefit from these measures, hence why the measure on open and non-discriminatory access is introduced. Also in the area of the open data, architecture a pro-active approach of the Commission is defined, not only towards defining the open data architecture, but also by providing a protected data storage facility. This would also show that the Commission acknowledges the main fears of the sector concerning open data issues.

Two actions were defined regarding the regulations and administrative procedures that try to minimise the differences between Member States. They are: "harmonise regulations and (trade) standards between Member States" and "Support coordination

between Member States by developing EU level info systems (e-Freight, e-Maritime)". These actions also take on board the development of new possibilities and try to make the logistics industry a frontrunner in their adoption within the administrative and regulatory processes.

The following actions are defined in the area of energy and renewables:

- Stimulate the uptake of cleaner technologies through tax measures;
- Financial support for upgrading new vehicles, vessels;
- Organise campaigns and support training courses for horizontal load coordination;
- Stimulate investments in initial level of charging points in urban areas;
- Ensure internalisation of external costs through legislation.

These actions will require specific efforts in order to be adapted. The financial support scheme for the upgrade of new vehicles needs to be developed and made specific for each of the transport modes. Combined with the way in which external costs are internalised, this would provide the Commission with powerful tools to optimise the freight transport and logistics market towards improved environmental behaviour. These measures have far-reaching effects for the logistics sector, but not all are perceived as positive. Internalisation in particular would lead to major shifts in the way companies behave and use resources. This behaviour will ultimately lead to the desired impacts on the environment. The use of new vessels and vehicles, with new technologies will have immediate and positive effects. The financial support proposed for this measure will enable policy makers to introduce the use of these vehicles in areas of interest (within cities for instance).

The last domain is that of the logistics profession. Policy option 3 holds a number of actions that would actively improve the attractiveness of the profession. They are (next to the FTLAP 2007 actions):

- Financial support for training and qualifications via loans or subsidies in all Member States;
- Create a legal framework for the exchange of national timetables for periodic training;
- Improve the sector image through campaigns.

Two of these actions (financial support and national timetables) were also part of the second policy option. These actions are broadened in policy option 3. Financial support is not just foreseen in the Member States with high training costs, but in all EU Member States. The national timetables for periodic training policy option 3 foresees a legal framework, instead of just enabling the exchange of information. This legal framework will enable policy makers to influence the periodic training and set standards, instead of just reporting and sharing information.

These actions together form policy option 3. The table below summarises the actions and the objectives at which they aim, as well as the domains.

Table 4.7. List of action of policy option 3 "Creating full support for the logistics market"

	Description	Objectives	Domain
3.1	Create a framework for clean technology standards	Stimulation innovation and faster adaption of new technologies, especially within SMEs	Innovation and clean technologies
3.2	Increase access (through NFS) to financial means for innovation		
3.3	Provide subsidies for SMEs to adapt clean technologies and standards		

	Description	Objectives	Domain
3.4	Stimulate cooperation between national innovation platforms (i.e. Dinalog) and SMEs		
3.5	Organise campaigns and support training courses		
3.6	Create a standard CO2 calculation methodology for all modes of transport		
3.7	Open data architecture	Improve utilisation of resources, improved interoperability and supply chain coordination, reduced red tape	Resource utilisation, interoperability and coordination, Regulatory and administrative.
3.8	Stimulate the pricing or differentiation of return trips for e-commerce	Improve utilisation of resources	Resource utilisation
3.9	Campaigns to make LSP's (particularly SME) more aware of the benefits of existing fleet and advanced logistics management systems		
3.10	Follow up recommendations for performance indicators and data gathering out of this study		
3.11	Increase the awareness of the availability of intermodal logistic service providers	improved interoperability and supply chain coordination	interoperability and coordination
3.12	Investment support (under TEN-T)		
3.13	Take initiative for an independent and protected data storage facility to allow for open data architecture		
3.14	Ensure open and non-discriminatory access to relevant transhipment platforms		
3.15	CIVITAS continue		
3.16	Single window for administrative procedures	Reduce red tape	Regulatory and administrative
3.17	Harmonise regulations and (trade) standards between MS's		
3.18	Support coordination between MS by developing EU level info systems (e-Freight, e-Maritime)		
3.19	Stimulate the uptake of cleaner technologies through tax measures	Improve environmental behaviour, speed up use of alternative solution's (fuel, technology and business models)	Energy and renewables
3.20	Financial support for upgrading new vehicles, vessels		
3.21	Organise campaigns and support training courses for horizontal load coordination		
3.22	Stimulate investments in initial level of charging points in urban areas		
3.23	Ensure internalisation of external costs through legislation	Reducing negative externalities	

	Description	Objectives	Domain
3.24	Qualification and training requirements	Improve the attractiveness and education of logistic profession	The logistic profession
3.25	Dialogue on the attractiveness of transport logistics professions		
3.26	Financial support for training and qualifications via loans or subsidies in all MS		
3.27	Create a legal framework for the exchange of national timetables for periodic training		
3.28	Improve the sector image through campaigns		

4.5 Analysis of impacts

The objective of this section is to provide input for the analysis of the economic, social and environmental impacts stemming from the implementation of alternative policy options. The analysis follows the subsequent steps:

1. The identification of a broad list of potential impacts per policy option, as well as the stakeholders affected by the implementation of the policy options;
2. The specification of the most important impacts identified, as well as the magnitude and likelihood of occurrence of these impacts per stake-holding group identified;
3. Further analysis of the most important impacts of the policy actions through a multi-criteria analysis based on most important factors.

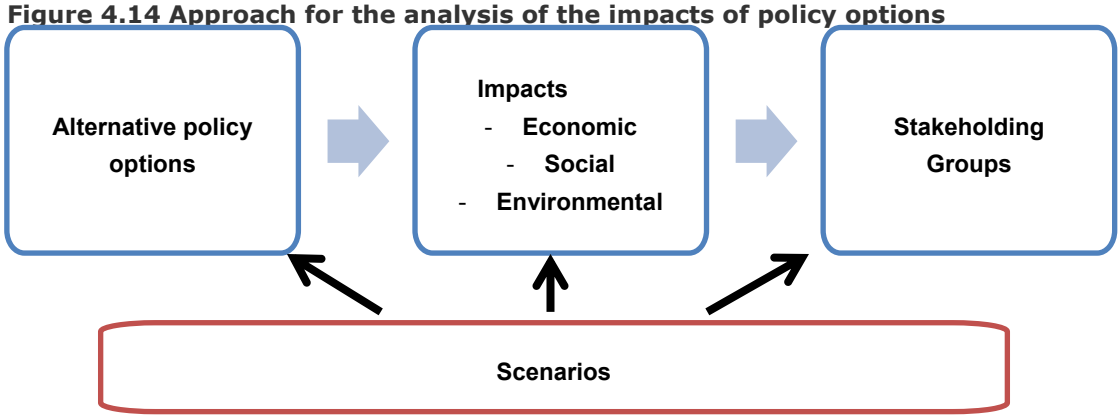
4.5.1 Analytical approach

The approach to the impact analysis of alternative policy options suggests that each policy option has different economic, social and environmental impacts, given their focus on different policy issues and the degree of policy intervention it represents. Moreover, each policy option affects a different set of stake-holding groups. Therefore, impacts and stakeholders groups should be identified and assessed per policy option.

Moreover, the impacts of policy options are affected by the future evolution of the economic environment and of the logistics sector. This environment is represented by the scenarios developed in chapter 3. Four scenarios, which are combinations of factors of the external environment and logistics trends, have been identified in chapter 3. Each scenario represents a different future state of the economic environment and logistics sector in terms of: i) spatial organisation of production and consumption (regional to global); and ii) economic development of Europe (stagnant to dynamic and prosperous). Therefore, the analysis of the impacts of the policy options for each stake-holding group will also be performed for each of the identified scenarios.

This approach is schematically illustrated in the figure below.

Figure 4.14 Approach for the analysis of the impacts of policy options



4.5.2 Alternative policy options

Each of the proposed alternative policy options constitutes a "bundle" of policy actions under different domains of the FTLAP. Each policy option aims to provide a continuation of several FTLAP actions at a different level of policy intervention (business-as-usual vs. partial additional intervention vs. full additional intervention), as well as new policy actions. The policy options are briefly described as follows:

- **Policy Option 1:** Baseline Option. This policy option proposes the partial continuation of the actions included in the FTLAP;
- **Policy Option 2**: Minimum Intervention. This policy option proposes some measures from option 1 and some additional policy actions aimed at "creating a framework for business to operate";
- **Policy Option 3:** Full Support. This policy option includes the full set of available policy instruments for supporting the logistics sector, with some also proposed in the other options.

The alternative policy options and the policy actions under each domain were described more extensively under section 4.4.

4.5.3 Step 1: Identification of economic, social and environmental impacts

The objective of this section is: i) to develop a comprehensive set of impacts likely to occur from the implementation of each alternative policy option; and ii) to identify the stake-holding groups affected by the actions included in each policy option. The impacts are categorised as economic, social and environmental. Besides intentional impacts, i.e., the impacts related to the objectives of the policy actions, unintended impacts are attempted to be identified. Compliance with Fundamental Rights has also been taken into account and is noted where applicable.

For the three alternative policy options proposed, the following superset of impacts has been identified for each impact category. The identification of the policy impacts has taken into account the following sources of information:

i) Objectives of the policy options, i.e., what the policy actions in each policy option aims to achieve;
ii) Impact assessment of the FTLAP 2007[163];
iii) General impacts suggested in the Impact Assessment Guidelines of the European Commission (EC, 2009).

[163] European Commission, 2007. Freight Transport Logistics Action Plan and accompanying document Impact Assessment of the Freight Transport Logistics Action Plan. SEC (2007) 1320, 18.10.2007, Brussels, Belgium.

Table 4.8 Identified impacts of policy options

Category	Impact
Economic (costs, efficiency, innovation)	Competitiveness of logistics SMEs
	Innovation and R&D of logistics SMEs
	Compliance, adjustment and transaction costs for logistics companies
	Administrative costs
	Predictability of administrative processes
	Speed of administrative processes
	Security of data exchange in the logistics chain
	Accuracy of order fulfilment by LSPs
	Service punctuality by LSPs
	Transport infrastructure utilisation
	Efficiency of vehicle use (idle time, empty runs, route planning efficiency)
	Utilisation of vehicle capacity
	Efficiency of inventory management
	Utilisation of stock-keeping facilities
	Modal split
	Share of intermodal transport
	Logistics costs
	Logistics safety
	Logistics security
	Proprietary/personal data protection
	Openness and accuracy of data flows between logistics stakeholders
	Integration/interoperability of transport modes
	Integration between different types of transport (passenger/freight)
Social	Attractiveness of logistics labour market
	Professional skills of logistics employees
	Access to vocational training for logistics employees
	Employment levels in transport logistics professions
	Logistics sector compensation
	Logistics employee mobility
	Logistics employee safety
	Logistics employee security
	Age/gender equality in the logistics profession (attract young staff and female staff)
	Social responsibility of logistics companies
Environmental (emissions, fuel, efficiency)	CO_2/GHG emissions
	Noise emissions
	Pollution
	Energy efficiency of transport (fuel efficiency, use of clean vehicles)
	Fuel mix (use of alternative fuel sources)

The review of the policy actions included in each policy option has led to the identification of the stake-holding groups that are concerned/affected by the implementation of each of policy options. The major stake-holding groups are described below, together with a brief statement on which policy options measures affect each one and to what extent:

- Shippers (SH);

- Logistics Service Providers (LSP);
- Freight transport operators (FTO).

These three stake-holding groups constitute the main participants in the freight transport process and are the primary subjects of the impacts stemming from the implementation of the policy options/measures, as practically all policy options/measures affect them:

- Terminal infrastructure operators (TIO):
  - Policy measures affecting terminal operations related to data exchange, administrative simplification, environmental awareness, and intermodality.
- Logistics employees (LE) (e.g., trade unions, freight drivers associations, logistics workers associations):
  - The FTLAP makes specific reference to actions targeted towards the logistics profession. This stake-holding group is therefore mostly affected by measures related to training and qualifications, and measures related to the attractiveness of the logistics profession.
- End consumers (e.g., consumer associations) (EC):
  - Consumers are the receivers of the impacts of measures aimed at increasing the efficiency of logistics operations (e.g. administrative simplification) and the level of customer service offered to them, and at changing consumer behaviour (e.g., environmental awareness).
- Logistics professional organisations (LPO);
- Public authorities (e.g. customs, administrative authorities) (PA);
- Educational and vocational training institutions (EDU);
- European Commission (EC);
- EU institutions providing financial support (EUF);
- Financial institutions/banks (FIB);
- National ministries of finance (NMF).

For the purpose of our analysis, the stake-holding groups can be classified in two categories: those which exert an impact on the implementation of the various policy measures and those who are affected by them, i.e., are the subjects of the effects from the implementation of the policy measures. For the present analysis, the main interest is with the stake-holding groups who are affected by the policy options/measures.

Therefore, the outcome of this first step of the analysis is to identify for each policy option and measure: i) the stake-holding groups that are involved in the implementation of the policy measures and those that are affected by it, and ii) the specific impact categories and actual impacts from the implementation of the policy measures. Assessment of the effect of the various policy measures is conducted only for the second category of stake-holding groups (stake-holding groups belonging to the first category are only mentioned).

In addition, policy measures may have positive effects for certain aspects of the operations of stake-holding groups, and negative effects for others. The columns titled "S/H groups involved/affected and magnitude/direction of effect for S/H groups affected" in each Policy Option table present the expected net effect of each policy measure for the affected stake-holding groups. The discussion following each table provides more detailed insight into the various (positive and/or negative) effects of policy measures on stake-holding groups.

For the assessment of the magnitude of the effect of policy measures on stake-holding groups, a three-point scale for positive effects (Slightly Positive = +, Moderately Positive, = ++, Highly Positive = +++) and for negative effects (Slightly Negative = -, Moderately Negative = --, Highly Negative = ---) is applied. At this point it should be

stated that at this level of analysis it is not possible to perform a one-to-one matching between the policy measures and the various impacts and their magnitudes for each stakeholder. What is presented in the following tables is the overall impact of the related policy measure for each stakeholder, taking into account all impact categories that are applicable to each policy measure.

Option 1: Baseline Option			
Domains	**Policy actions**	**S/H groups involved/affected and magnitude / direction of effect for S/H groups affected**	**Impacts**
RESOURCE UTILISATION	Open data architecture	SH (++), LSP (++), FTO (++), PA (++), TIO (+)	▪ Openness and accuracy of data flows; ▪ Compliance, adjustment and transaction costs; ▪ Commercial data protection; ▪ Logistics costs; ▪ Energy efficiency; ▪ Noise emissions; ▪ Pollution.
	Data on freight transport logistics	SH (++), LSP (++), FTO (++), PA (++)	▪ Openness and accuracy of data flows; ▪ Commercial data protection.
INTEROPERABILITY AND COORDINATION	Open data architecture	SH (++), LSP (++), FTO (++), PA (++), TIO (+)	▪ Openness and accuracy of data flows; ▪ Compliance, adjustment and transaction costs; ▪ Commercial data protection; ▪ Logistics costs; ▪ Energy efficiency; ▪ Noise emissions; ▪ Pollution.
	Multi-modal liability regime	SH (+++), LSP (+++), FTO (+++), TIO (+++)	▪ Modal split; ▪ Compliance, adjustment and transaction costs; ▪ Logistics costs.
	EU standards to facilitate secure interconnectivity in logistic chain	SH (+++), LSP (+++), FTO (+++)	▪ Modal split; ▪ Compliance, adjustment and transaction costs.
	Open and non-discriminatory access to transhipment platforms	LSP (++), FTO (++), TIO (++), PA (++)	▪ Modal split; ▪ Energy efficiency.
	CIVITAS continue	SH (+), LSP (+), FTO (+)	▪ Integration/interoperability of transport modes; ▪ Integration between passenger and freight transport; ▪ Energy efficiency; ▪ Noise emissions; ▪ Pollution.
REGULATORY AND ADMINISTRATIVE	Open data architecture	SH (++), LSP (++), FTO (++), PA (++), TIO (+)	▪ Openness and accuracy of data flows; ▪ Compliance, adjustment and transaction costs; ▪ Commercial data protection;

Option 1: Baseline Option			
Domains	**Policy actions**	**S/H groups involved/affected and magnitude / direction of effect for S/H groups affected**	**Impacts**
			▪ Logistics costs; ▪ Energy efficiency; ▪ Noise emissions; ▪ Pollution.
	Single window for admin. procedures	SH (++), LSP (++), FTO (++), PA (+), TIO (++), FC (+)	▪ Administrative costs; ▪ Predictability of administrative processes; ▪ Speed of administrative processes; ▪ Compliance, adjustment and transaction costs; ▪ Logistics costs.
	Single transport document	SH (++), LSP (++), FTO (++), PA (+), TIO (++), FC (+)	▪ Administrative costs; ▪ Predictability of administrative processes; ▪ Speed of administrative processes; ▪ Compliance, adjustment and transaction costs; ▪ Logistics costs.
LOGISTICS PROFESSION	Qualifications and training requirements	SH (++), LSP (++), FTO (++), TIO (++), LE (+++), EC (++), LPO, EDU	▪ Access to vocational training for logistics employees; ▪ Professional skills of logistics employees; ▪ Level of employment in transport logistics professions; ▪ Logistics employee mobility; ▪ Logistics employee safety; ▪ Logistics employee security; ▪ Logistics costs.
	Dialogue on the attractiveness of transport logistics professions	SH (+), LSP (+), FTO (+), TIO (++), LE (+++),EC (++), LPO, EDU	▪ Attractiveness of logistics labour market; ▪ Level of employment in transport logistics professions.

Policy Option 1 comprises measures that relate to the improvement of interoperability and coordination among supply chain partners, regulatory and administrative simplification, education and attractiveness of the logistics profession and utilisation of resources. Essentially, it involves the development of information standards to facilitate information flows for business-to-administration and administration-to-administration data flows, the establishment of single administrative window and single transport document, the secure integration of transport modes in the logistics chain, and the setting of minimum training and certification standards and of a dialogue on the attractiveness of the logistics profession.

The intended and unintended impacts that can be identified from the potential implementation of Policy Option 1 and the affected stakeholders can be summarised as follows:

Economic

- The development and introduction of open data architecture; the collection of data on logistics performance; the introduction of single transport document; the establishment of single windows; the establishment of multi-modal interoperability regimes, the establishment of EU standards to the open and non-discriminatory access to transport platforms; and the establishment of qualification and training requirements entail compliance and adjustment costs for companies involved in freight movement (Shippers, LSPs, Freight Transport Operators), Terminal Infrastructure Operators and Public Authorities (e.g., customs and tax authorities). These compliance and adjustment costs relate to the adaptation of existing information systems, the re-design of business processes and work flows, and the training of personnel to work in the new business environment. In addition, compliance and adjustment requirements may have the unintended consequence of reducing the operational efficiency of the affected stakeholders in the transition period to the new systems/requirements;
- On the other hand, the introduction of the above stated policy options may significantly reduce administrative costs related to the logistics and transport of goods in the long run. These cost reductions will in turn benefit: i) Final Consumers, through the reduction of prices of services and goods, ii) competitiveness of Shippers, as they will be able to reduce logistical costs, iii) competitiveness of LSPs and FTOs, as they will be able to offer services at lower costs, and d) Public Authorities, and National economies, through the reduction of transaction costs, and the increase of productivity and competitiveness;
- The introduction of the single transport document, single window, open data architectures, multimodal liability regime, EU standards to facilitate secure interoperability in the logistics chain, and open and non-discriminatory access to transport platforms, will facilitate intermodal decisions for Shippers and LSPs, which in turn may affect modal split through the reduction of the share of road freight transport;
- The introduction of the single transport document, single window for administrative procedures, open data architecture, the EU standards for secure interoperability in logistics chain will reduce time spent in administrative clearance processes and increase the predictability of the process. These reductions will contribute to the reduction of the total transportation time and the increase of total transportation time reliability for Shippers, LSPs and FTOs;
- According to the FTLAP impact assessment, the development of a multi-modal liability regime is expected to have significant savings for Shippers, LSPs and FTOs in friction costs related to loss, damage or delays incurred during freight transport (EC, 2007). It will also facilitate intermodality which in turn may affect modal split;

- The development of open data architecture for information flows between companies and Public Authorities is expected to lead to an increase in the openness and accuracy of data flows between logistics stakeholders. It is also expected to increase interoperability across transport modes with beneficial inter-modality and modal split impacts. Open data architecture will facilitate the exchange of information along the Supply Chain with beneficial impacts in terms of inventory levels and costs, supply chain responsiveness, accuracy of order fulfilment, and better vehicle utilisation. These impacts will in turn create economic benefits for Shippers, LSPs, FTOs and Final Consumers, as well as positive environmental impacts. However, issues related to the fundamental right of proprietary data protection may arise. Open architectures that foster increased data openness may unintentionally lead to an increase in the unwillingness of stakeholders to share potentially sensitive and proprietary information. The perceived benefits, risks and costs of sharing have not been mapped and communicated clearly to all the stakeholders;
- Training and benchmarking/performance data collection requirements may (in the short term) increase logistics costs for Shippers, LSPs and FTOs (EC, 2007).

Social

- The introduction of a logistics certification scheme and minimum certification standards may create benefits for Logistics Employees, through an increase in access to vocational training for the improvement of professional skills, and will implicate Logistics Professional Organisations and Educational and Vocational Training institutions, through their increased participation in the training process. Improvement of professional skills will in turn increase employee mobility, advancement, safety, and security;
- The dialogue on the attractiveness of the logistics profession may affect the following stake-holding groups: Logistics Employees, Logistics Professional Organisations and Educational and Vocational Training institutions and may lead to an improvement of working conditions of logistics professions allowing attracting higher-skilled personnel.

Environmental

- Training and certification of qualifications of Logistics Employees may allow them to make more informed decisions on transport modal choices and transport asset/vehicle utilisation, thus leading to the selection of environmentally friendlier transport modes (EC, 2007);
- The reinforcement of the CIVITAS Initiative can lead to improved integration between freight and passenger transport, which in turn may have positive economic and environmental results due to better utilisation of the transport system;
- The introduction of the single transport document, single window, open data architectures, multimodal liability regime, EU standards to facilitate secure interoperability in the logistics chain, and open and non-discriminatory access to transport platforms, will contribute to the reduction of energy consumption and air pollution, and to the reduction of transport costs per tonne-km for Shippers, LSPs and FTOs, through the change of the modal split (reduction of road freight transport).

Option 2: Minimum Intervention			
Domains	**Policy actions**	**S/H groups involved/affected and magnitude / direction of effect for S/H groups affected**	**Impacts**
INNOVATION AND CLEAN TECHNOLOGIES	Share and promote best practices on CO_2 calculation methodologies	SH (++), LSP (++), FTO (++)	▪ Energy efficiency; ▪ CO2 / GHG emissions; ▪ Noise emissions; ▪ Pollution; ▪ Fuel mix.
	Allow more SMEs in innovative projects such as in Horizon 2020	LSP (+), FTO (+)	▪ Competitiveness of logistics SMEs; ▪ Innovation and R&D of logistics SMEs.
	Create a framework for clean technology standards	SH (++), LSP (++), FTO (++)	▪ Energy efficiency; ▪ CO2 / GHG emissions; ▪ Noise emissions; ▪ Pollution; ▪ Fuel mix.
RESOURCE UTILISATION	Open data architecture	SH (++), LSP (++), FTO (++), PA (++), TIO (+)	▪ Openness and accuracy of data flows; ▪ Compliance, adjustment and transaction costs; ▪ Commercial data protection; ▪ Logistics costs; ▪ Energy efficiency; ▪ CO2 / GHG emissions; ▪ Noise emissions; ▪ Pollution; ▪ Fuel mix.
	Raise awareness of final consumers on last-mile impact through e-commerce	SH (++), LSP (++), FTO (++), FC (+)	▪ Modal split; ▪ Energy efficiency; ▪ Fuel mix.
INTEROPERABILITY AND COORDINATION	Open data architecture	SH (++), LSP (++), FTO (++), PA (++), TIO (+)	▪ Openness and accuracy of data flows; ▪ Compliance, adjustment and transaction costs; ▪ Commercial data protection; ▪ Logistics costs; ▪ Energy efficiency; ▪ Noise emissions; ▪ Pollution.

Option 2: Minimum Intervention			
Domains	**Policy actions**	**S/H groups involved/affected and magnitude / direction of effect for S/H groups affected**	**Impacts**
	Multi-modal liability regime	SH (+++), LSP (+++), FTO (+++), TIO (+++)	▪ Modal split; ▪ Compliance, adjustment and transaction costs; ▪ Logistics costs.
	EU standards to facilitate secure interconnectivity in the logistic chain	SH (+++), LSP (+++), FTO (+++)	▪ Modal split; ▪ Compliance, adjustment and transaction costs.
REGULATORY AND ADMINISTRATIVE	Open data architecture	SH (++), LSP (++), FTO (++), PA (++), TIO (+)	▪ Openness and accuracy of data flows; ▪ Compliance, adjustment and transaction costs; ▪ Commercial data protection; ▪ Logistics costs; ▪ Energy efficiency; ▪ Noise emissions; ▪ Pollution.
	Single window for admin. Procedures	SH (++), LSP (++), FTO (++), PA (+), TIO (++)	▪ Administrative costs; ▪ Predictability of administrative processes; ▪ Speed of administrative processes; ▪ Compliance, adjustment and transaction costs; ▪ Logistics costs.
	Single transport document	SH (++), LSP (++), FTO (++), PA (+), TIO (++)	▪ Administrative costs; ▪ Predictability of administrative processes; ▪ Speed of administrative processes; ▪ Compliance, adjustment and transaction costs; ▪ Logistics costs.
ENERGY AND RENEWABLES	Support awareness campaigns to change non-environment friendly behaviour	SH (++), LSP (++), FTO (++), FC (++)	▪ Energy efficiency; ▪ CO2/GHG emissions; ▪ Noise emissions; ▪ Pollution; ▪ Fuel mix.

Option 2: Minimum Intervention			
Domains	**Policy actions**	**S/H groups involved/affected and magnitude / direction of effect for S/H groups affected**	**Impacts**
	Stimulate investments in initial level of charging points in urban areas	LSP (+), FTO (+)	▪ Energy efficiency; ▪ CO2 / GHG emissions; ▪ Noise emissions; ▪ Pollution; ▪ Fuel mix.
LOGISTICS PROFESSION	Qualifications and training requirements	SH (++), LSP (++), FTO (++), TIO (++), LE (+++), EC (++), LPO, EDU	▪ Access to vocational training for logistics employees; ▪ Professional skills of logistics employees; ▪ Level of employment in transport logistics professions; ▪ Logistics employee mobility; ▪ Logistics employee safety; ▪ Logistics employee security; ▪ Logistics costs.
	Financial support for training and qualifications via loans or subsidies where training costs are high and national funding is lacking	SH (++), LSP (++), FTO (++), LE (+++), EC (++), LPO, EDU, EUF, FIB	▪ Access to vocational training for logistics employees; ▪ Professional skills of logistics employees; ▪ Level of employment in transport logistics professions; ▪ Logistics employee mobility; ▪ Logistics employee safety; ▪ Logistics employee security.
	Support the exchange of national timetables for periodic training of drivers	LSP (+), FTO (+), LE (+), LPO, EDU	▪ Professional skills of logistics employees.

Policy Option 2 introduces additional measures related to the support for innovation and promotion of clean technologies, and the improvement of environmental behaviour of stakeholders. The additional measures refer to sharing and promoting best practices on CO_2 calculation, awareness rising on environmentally-unfriendly behaviour, awareness of final consumers on the impacts of last mile operations, and provision of financial support for training and qualifications.

In addition to the impacts of Policy Option 1, the following impacts (and the affected stakeholders) can be identified from the potential implementation of Policy Option 2:

Economic

- The increase of the participation of LSPs and FTOs which are SMEs in innovative research projects (e.g., Horizon 2020) may increase their levels of innovation and Research and Development and have positive effects on their competitiveness.

Social

- The provision of financial support for training and qualification actions, through EU institutions providing financial support, Private Financial Institutions (banks) and National Financial Authorities will facilitate further development of Logistics Employees' professional skills.

Environmental

- The exchange of best practices on CO_2 calculation, the awareness of environmentally unfriendly behaviour and the creation of a framework for the introduction of clean technology standards may improve the environmental performance of Shippers, LSPs and FTOs in terms of adoption of operational practices that lead to the reduction of emissions (CO_2, greenhouse gases, noise) and changes in the fuel mix (switch to cleaner fuels that produce less emissions). However, the introduction of cleaner technologies and operational practices that reduce the negative environmental effects of road transport may lead to the unintended consequence of reducing the potential for shift towards more environment friendly transport modes (e.g., inland waterways, rail);
- The stimulation of investments in charging points for electric vehicles in urban areas may affect positively the environmental performance of LSPs and FTOs by allowing them to use electric vehicles in urban freight transport, and especially in last-mile operations. However, other criteria (e.g., purchase cost) besides the availability of charging points may have a more significant effect on the decision to use electric vehicles.

Option 3: Full Support			
Domains	**Policy actions**	**S/H groups involved/affected and magnitude / direction of effect for S/H groups affected**	**Impacts**
INNOVATION AND CLEAN TECHNOLOGIES	Create a framework for clean technology standards	SH (++), LSP (++), FTO (++)	▪ Energy efficiency; ▪ CO /GHG emissions; ▪ Noise emissions; ▪ Pollution; ▪ Fuel mix; ▪ Compliance, adjustment and transaction costs.
	Increase access (through Normal Finance Schemes) to financial means for innovations	LSP (++), FTO (++)	▪ Competitiveness of logistics SMEs; ▪ Innovation and R&D of logistics SMEs.
	Subsidies for SMEs to adapt to clean technologies and standards	LSP (++), FTO (++)	▪ Energy efficiency; ▪ CO2/GHG emissions; ▪ Noise emissions; ▪ Pollution; ▪ Fuel mix.
	Cooperation between national innovation platforms (i.e. Dinalog) and SMEs	LSP (++), FTO (++)	▪ Competitiveness of logistics SMEs; ▪ Innovation and R&D of logistics SMEs.
	Organise campaigns and support training courses for innovation and clean technologies	SH (+), LSP (+), FTO (+)	▪ Energy efficiency; ▪ Emissions; ▪ Fuel mix.
	Create a standard CO2 calculation methodology for all modes of transport	SH (+), LSP (+), FTO (+)	▪ Energy efficiency; ▪ CO2/GHG emissions; ▪ Noise emissions; ▪ Pollution; ▪ Fuel mix; ▪ Compliance, adjustment and transaction costs.

Option 3: Full Support			
Domains	**Policy actions**	**S/H groups involved/affected and magnitude / direction of effect for S/H groups affected**	**Impacts**
RESOURCE UTILISATION	Open data architecture	SH (++), LSP (++), FTO (++), PA (++), TIO (+)	▪ Openness and accuracy of data flows; ▪ Compliance, adjustment and transaction costs; ▪ Commercial data protection; ▪ Logistics costs; ▪ Energy efficiency; ▪ Noise emissions; ▪ Pollution.
	Stimulate pricing or differentiation of return trips for e-commerce	SH (+), LSP (+), FTO (+)	▪ Efficiency of vehicle use; ▪ Utilisation of vehicle capacity.
	Campaigns to make LSPs aware of benefits of existing Fleet and Advanced LMS	LSP (++), FTO (++)	▪ Efficiency of vehicle use; ▪ Utilisation of vehicle capacity; ▪ Efficiency of inventory management; ▪ Utilisation of stock-keeping facilities; ▪ Transport infrastructure utilisation; ▪ Accuracy of order fulfilment by LSPs; ▪ Service punctuality by LSPs.
	Follow up recommendations of this study for perf. indicators and data collection	SH (+), LSP (++), FTO (++), PA (++), TIO (+), EC (+)	▪ Openness and accuracy of data flows.
INTEROPERABILITY AND COORDINATION	Open data architecture	SH (++), LSP (++), FTO (++), PA (++), TIO (+)	▪ Openness and accuracy of data flows; ▪ Compliance, adjustment and transaction costs; ▪ Commercial data protection; ▪ Logistics costs; ▪ Energy efficiency; ▪ Noise emissions; ▪ Pollution.
	Increase awareness on availability of intermodal LSPs	SH (++), LSP (++), FTO (++)	▪ Modal split; ▪ Share of intermodal transport.

Option 3: Full Support			
Domains	**Policy actions**	**S/H groups involved/affected and magnitude / direction of effect for S/H groups affected**	**Impacts**
	Investment support (under TEN-T)	PA (++), TIO (++)	▪ Efficiency of vehicle use; ▪ Utilisation of vehicle capacity; ▪ Modal split; ▪ Transport infrastructure utilisation.
	Initiative for independent and protected data storage facility to allow for open data architecture	SH (+), LSP (+), FTO (+)	▪ Openness and accuracy of data flows; ▪ Commercial data protection; ▪ Security of data exchange in the logistic chain.
	Open and non-discriminatory access to relevant transhipment platforms	LSP (++), FTO (++), TIO (++), PA (++)	▪ Modal split; ▪ Energy efficiency.
	CIVITAS continue	SH (+), LSP (+), FTO (+)	▪ Integration / interoperability of transport modes; ▪ Integration between passenger and freight transport; ▪ Energy efficiency; ▪ Noise emissions; ▪ Pollution.
REGULATORY AND ADMINISTRATIVE	Open data architecture	SH (++), LSP (++), FTO (++), PA (++), TIO (+)	▪ Openness and accuracy of data flows; ▪ Compliance, adjustment and transaction costs; ▪ Commercial data protection; ▪ Logistics costs; ▪ Energy efficiency; ▪ Noise emissions; ▪ Pollution.

Option 3: Full Support			
Domains	**Policy actions**	**S/H groups involved/affected and magnitude / direction of effect for S/H groups affected**	**Impacts**
	Single window for admin. Procedures	SH (++), LSP (++), FTO (++), PA (+), TIO (++)	▪ Administrative costs; ▪ Predictability of administrative processes; ▪ Speed of administrative processes; ▪ Compliance, adjustment and transaction costs; ▪ Logistics costs; ▪ Efficiency of vehicle use; ▪ Utilisation of vehicle capacity.
	Harmonise regulations and (trade) standards between MS	SH (++), LSP (++), FTO (++), PA (++), TIO (+)	▪ Administrative costs; ▪ Predictability of administrative processes; ▪ Speed of administrative processes; ▪ Compliance, adjustment and transaction costs; ▪ Logistics costs.
	Support coordination between MS by developing EU level info-systems	SH (+), LSP (+), FTO (+)	▪ Administrative costs; ▪ Predictability of administrative processes; ▪ Speed of administrative processes; ▪ Compliance, adjustment and transaction costs; ▪ Logistics costs.
ENERGY AND RENEWABLES	Stimulate uptake of cleaner technologies through tax measures	SH (++), LSP (++), FTO (++), PA, EUF, NMF	▪ Energy efficiency; ▪ CO2/GHG emissions; ▪ Noise emissions; ▪ Pollution; ▪ Fuel m.
	Financial support for upgrading new vehicles, vessels	SH (++), LSP (++), FTO (++),EUF, FIB, NMF	▪ Efficiency of vehicle use; ▪ Utilisation of vehicle capacity.
	Campaigns and support training courses for horizontal load coordination	SH (+), LSP (+), FTO (+)	▪ Efficiency of vehicle use; ▪ Utilisation of vehicle capacity.

Option 3: Full Support			
Domains	**Policy actions**	**S/H groups involved/affected and magnitude / direction of effect for S/H groups affected**	**Impacts**
	Stimulate investments in initial level of charging points in urban areas	LSP (+), FTO (+)	▪ Energy efficiency; ▪ CO2/GHG emissions; ▪ Noise emissions; ▪ Pollution; ▪ Fuel mix.
	Ensure internalisation of external costs through legislation	SH (-), LSP (-), FTO (-), TIO (-)	▪ Logistics costs; ▪ Compliance, adjustment and transaction costs; ▪ Energy efficiency; ▪ CO2/GHG emissions; ▪ Noise emissions; ▪ Pollution; ▪ Fuel mix.
LOGISTICS PROFESSION	Qualifications and training requirements	SH (++), LSP (++), FTO (++), TIO (++), LE (+++), EC (++), LPO, EDU	▪ Access to vocational training for logistics employees; ▪ Professional skills of logistics employees; ▪ Level of employment in transport logistics professions; ▪ Logistics employee mobility; ▪ Logistics employee safety; ▪ Logistics employee security; ▪ Logistics costs.
	Dialogue on the attractiveness of transport logistics professions	SH (+), LSP (+), FTO (+), TIO (++), LE (+++),EC (++), LPO, EDU	▪ Attractiveness of logistics labour market; ▪ Level of employment in transport logistics professions.

Option 3: Full Support			
Domains	**Policy actions**	**S/H groups involved/affected and magnitude / direction of effect for S/H groups affected**	**Impacts**
	Financial support for training/ qualifications via loans or subsidies in MS	SH (++), LSP (++), FTO (++), LE (+++), EC (++), LPO, EDU, EUF, FIB	▪ Access to vocational training for logistics employees; ▪ Professional skills of logistics employees; ▪ Level of employment in transport logistics professions; ▪ Logistics employee mobility; ▪ Logistics employee safety; ▪ Logistics employee security.
	Legal framework for exchange of national timetables for periodic training	LSP (+), FTO (+), LE (+), LPO	▪ Professional skills of logistics employees.
	Improve sector image through campaigns	LSP (+), FTO (+), LE (+), LPO	▪ Logistics sector compensation; ▪ Age/gender equality in the logistics profession (attract young staff and female staff); ▪ Social responsibility of logistics companies.

Policy Option 3 constitutes an extensive bundle of measures that aim to have a substantial effect on each of the policy domains. It refers to: the increase of access to financial schemes for innovation and the stimulation of dialogue between innovation platforms; the provision of subsidies to logistics SMEs (LSPs and FTOs) to adapt to clean technologies and standards under a total framework for clean technology standards; the improvement of resource utilisation through the demonstration of the benefits of Advanced Fleet and Logistics Management Systems to LSPs and FTOs; the promotion of intermodal transport through the awareness of intermodal LSPs; the harmonisation of regulations and trade standards between Member States and the coordination of EU-level information systems for transport and logistics (e.g., e-Freight); the financial and tax support for up-take of cleaner technologies and new, cleaner vehicles; the internalisation of external costs; and a complete set of training and qualification activities.

Additionally to Policy Option 2, intended and unintended impacts that can be identified from the potential implementation of Policy Option 3 and the affected stakeholders can be summarised as follows:

Economic

- Raising the awareness of LSPs on the benefits of Advanced Fleet and Logistics Management Systems may have a profound effect on the efficiency of logistics operations, such as payload optimisation (efficiency of vehicle use, vehicle capacity utilisation), the efficiency of inventory management and the utilisation of stock-keeping points (warehouses, distribution centres). This may lead to substantial positive effects on the service levels of LSPs and FTOs in terms of accuracy of order fulfilment and service punctuality;
- The increase of the awareness of the availability of intermodal LSPs may lead to changes in modal split (shifting from road to road and other transport modes in an intermodal setting);
- Support on logistics and transport-related investments through TEN-T may lead to higher utilisation of transport infrastructure and reduction of infrastructure bottlenecks, thus having a positive effect for TIOs, but also for Shippers, LSPs and FTOs.

Social

- The improvement of the image of the logistics sector may have a positive effect on the attraction of younger and female workers in the sector, thus leading to more balanced age structure and gender equality;
- The suggested full set of policy interventions for the logistics profession may lead to additional improvements in the attractiveness of the profession and have significant positive effect on the working conditions of Logistics Employees, such as increase in compensation levels, improved working conditions, etc. A logistics personnel that is more satisfied with its working environment and conditions may, in turn, lead to improvement of the efficiency of operations of Shippers, LSPs and FTOs, as well as their social image and performance.

Environmental

- The provision of financial and tax support for the up-take of cleaner technologies and new, cleaner vehicles may have a significant positive impact on the environmental performance of Shippers, LSPs and FTOs.

4.5.4 Step 2: Identification of the most important impacts

The objective of this section is to identify, among the list of impacts described in Step 1, those which are considered to be the most important following the implementation

of the Policy Options. At the outset, a discussion and pre-selection of the most important impacts is made. Then, their likelihood and the magnitude of their effect on the stakeholders are illustrated.

Economic impacts

The analysis of the three alternative Policy Options (see Section 4) have shown that their implementation has a distinguishable set of important economic impacts:

- Administrative costs: Administrative costs for companies are highly relevant for a number of policy actions included in the Policy Options, such as single transport document, single administrative window, harmonisation of regulations and trade standards, open data architecture, benchmarking data on logistics, either from a positive (reduction) or negative (increase) viewpoint. The Impact Assessment of the FTLAP estimates the impact from the introduction of various measures on administrative costs, both positive (reduction) and negative (increase), as a separate category of impacts. Administrative costs are also very important for public administration authorities; it has been estimated (EC, 2007) that the implementation of a single administrative window and trade-related reporting requirements will cost the EC and Member States between €90 million and €110 million over eight years. Additional costs related to standardisation and harmonisation (e.g., for regulations and trade standards) will also have to be borne by the public administrations;
- Predictability/speed of administrative processes: The improvement of the performance of administrative processes are highly relevant in policy documents such as the FTLAP Impact Assessment, the Logistics Performance Index study (LPI, 2014) and are influenced by a number of policy actions included in the Policy Options, such as open data architecture, data on logistics, multimodal interoperability regimes, single window, and single transport document;
- Compliance and adjustment costs: Numerous policy actions included in the Policy Options may entail compliance and adjustment costs, such as adoption of new standards (e.g., clean technology, open data exchange and interconnectivity of transport modes), performance measurement and benchmarking, and open data architecture, qualifications and training requirements, for both companies and public administrations;
- Commercial data protection: As policy actions related to increased information connectivity between logistics stakeholders are introduced (e.g., open data architecture for business-to-business and business-to-administration information exchange), growing concerns are expressed by stakeholders with regards to the sensitivity of commercial information from the application of ICT in logistics (EC, 2007);
- Total logistics costs: Total logistics costs are influenced by the majority of the policy actions included in the Policy Options. A Total Logistics Costs approach is the main performance target in the FTLAP Impact Assessment (EC. 2007);
- Efficiency of vehicle use/vehicle capacity utilisation: The efficient use and capacity utilisation of vehicles are two key operational benefits that are envisaged to be derived from the implementation of numerous policy actions (e.g., increase of awareness of Advanced Fleet and Logistics Management Systems, pricing of return trips, awareness of final consumers impacts of last mile operations);
- Modal shift: Policy objectives such as the improvement of environmental, the utilisation of resources and the stimulation of adaptation of clean technologies and the associated actions (e.g., awareness of advanced Fleet and Logistics Management Systems, the interconnectivity/integration of transport modes) practically aim at a shift towards cleaner and more efficient transport modes. The examination of the impact of the policy options on modal split may help illustrate the potential for such a shift in a clearer way;

- Openness and accuracy of data flows between logistics stakeholders: The development of open data architectures for information flows between logistics stakeholders, the coordination between EU Member States for the development of EU-wide logistics information systems (e.g., eFreight, eMaritime), and the improvement of performance data collection at EU-wide level aim at greater openness and accuracy of data and information flows between logistics stakeholders. Open data architecture will facilitate the exchange of information along the Supply Chain with beneficial impacts in terms of inventory levels and costs, supply chain responsiveness, accuracy of order fulfilment, and better vehicle utilisation. These impacts will in turn create economic benefits for shippers, carriers, consumers and will also have positive environmental impacts;
- Innovation and R&D: An entire policy domain, which is especially promoted in Policy Option 3 and less so in Policy Option 2, refers to the increase of innovation and R&D levels by companies. It is therefore important to include this impact in the detailed assessment process.

Social impacts

From the analysis of the three alternative Policy Options, the main impacts of the various policy actions refer to:

- Attractiveness of the logistics profession: Policy actions such as dialogue between stakeholders and image improvement campaigns aim to increase the attractiveness of the logistics profession in order to attract employees with higher skills and also change the age and gender profile of the employees (younger and more female employees − see Policy Option 3). The increase of the attractiveness of the logistics profession is also expected to contribute to the increase of employee mobility and professional advancement;
- Professional skills of logistics employees: Policy action such as minimum training and certification schemes, financial support for training and qualifications, and framework development for period trainings aim to increase the professional skills of employees in the logistics and transport sector. The increase of professional skills and the certification schemes also contribute to the increase of employee mobility and professional advancement.

Environmental impacts

From the analysis of the three alternative Policy Options, the following environmental impacts are considered as important:

- CO_2 emissions: Reduction of CO_2 emissions is a key goal of the White Paper for Transport (EC, 2011) and is also reflected in the FTLAP. The environmental policy actions (e.g., financial incentives for cleaner vehicles, clean technology standards, tax measures for cleaner technologies) included in the Policy Options also lead to this impact;
- Energy efficiency of transport: Energy efficiency, which also constitutes a major goal in the White Paper for Transport (EC, 2011) is affected by the above-mentioned environmental policy actions. However, energy efficiency is affected by numerous other policy actions as well. The streamlining of administrative barriers (e.g., through the introduction of single transport document, single transport window), securing interoperability in the logistic chain and the open access to transhipment platforms can improve the efficiency of logistics operations and thus lead to higher energy efficiency of the transport activity. An increase in the openness and accuracy of data flows between logistics stakeholders can increase interoperability across transport modes with beneficial intermodality and modal split impacts, which in turn can lead to higher transport energy efficiency. Moreover, training and certification of logistics employees may allow them to make more informed decisions on energy efficient transport modal choices.

Likelihood of impacts and magnitude of impact on affected stakeholders

The objective of this section is to present a preliminary assessment of the likelihood of occurrence of the selected impacts that are applicable to each Policy Option, and the magnitude of the impacts on the affected stakeholders. For the assessment of the likelihood of occurrence of the impacts, a three point scale (Low − Moderate − High) is applied, while for the magnitude of the impacts, a three-point scale for positive impacts (Slightly Positive = +, Moderately Positive, = ++, Highly Positive = +++) and for negative impacts (Slightly Negative = -, Moderately Negative = --, Highly Negative = ---) is applied. Brief justifications of the selection of the likelihood and magnitude values for each impact are also provided.

Overall, the likelihood of the impacts included in each Policy Option is connected to the likelihood of implementation of each Policy Option. Policy Option 1, which advocates a continuation of the implementation of the policy actions that have been included in the FTLAP (EC, 2007a) and evaluated in terms of their impacts, has a high likelihood of implementation, since it already constitutes a batch of measures decided and institutionalised. Moreover, the opinions of logistics and transport industry stakeholders on the policy actions included are positive (EC, 2007), which showcases an overall acceptance of the measures.

Policy Option 2, which includes several additional measures to Policy Option 1 related to the stimulation of innovation, the improvement of environmental behaviour and the provision of financial support for training and qualifications, also has a moderate to high likelihood of implementation, since the additional measures that are included are mostly related to awareness raising, best practice sharing, as well as financial support for investments and for training/qualifications. Barriers to the implementation, which may reduce the likelihood of implementation of the Policy Option, include potential scarcity of resources for financial support and stimulation of investments, and agreement between involved stakeholders in establishing a common framework for clean technology standards.

Finally, Policy Option 3, which includes an extensive set of policy actions aimed at providing full support for logistics companies, has a low to moderate likelihood of being implemented in its entirety. While the effect of the full implementation of Policy Option 3 seems to be profound, and covers the priority of the logistics sector for action on measures to resolve infrastructure inefficiencies and reduce administrative costs (EC, 2007), there are numerous barriers that hinder its full implementation, with the main ones being: i) long time-frame for its implementation (e.g., support for TEN-T investments, harmonisation of trade regulations between Member States) vs. logistics operators favouring of measures with immediate impacts (EC, 2007), ii) very significant financial requirements for the implementation of the measures included, iii) significant compliance and adjustment costs and burdens for the adaptation of stakeholders to the proposed measures, iv) concerns on sensitivity of commercial information stemming from the measures.

This step will provide input for a more detailed analysis of the impacts per stake-holding group and policy option.

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
Policy Option 1	Administrative costs	H	The likelihood of impact of Policy Option 1 measures on the reduction of administrative costs is very high, as these measures do not face any substantial implementation risk due to technological and administrative / organisational factors: a single administrative window and single transport document have long been advocated as a measure for the reduction of administration costs and is included in the FTLAP. Therefore the likelihood of its implementation is considered high.	- Shippers; - LSPs; - FTOs; - TIOs; - National Authorities; - Final Consumers.	+++	The introduction of a single administrative window and single transport document will have a significant impact on the affected stakeholders in terms of reduction of administrative costs.
	Predictability of administrative processes	H	The likelihood of an impact of Policy Option 1 on predictability and speed of administrative processes is expected to be high, as they do not face any substantial implementation risk and constitute already agreed measures in the FTLAP (EC, 2007) for improving the efficiency of administrative processes. Therefore, it is not expected to face any opposition in terms of their acceptability and implementation.	- Shippers; - LSPs; - FTOs; - TIOs; - National Authorities; - Final Consumers.	+++	The impact on the predictability of the administrative processes of the affected stakeholders from the introduction of single administrative window and single transport document is expected to be very significant in terms of lower delays for clearances (EC, 2007).
	Speed of administrative processes	H			+++	
	Compliance and adjustment costs	H	The likelihood of an impact of Policy Option 1 on compliance and adjustment costs is expected to be high, as the	- Shippers; - LSPs; - FTOs; - TIOs;	--	The introduction of the single transport document, the multimodal liability regime (through higher liability rates

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
			policy actions included in Policy Option 1 require adjustment of existing operations/business practices by both companies and public authorities for conformance to newly developed standards and procedures, which generate relevant costs. Therefore, the likelihood of compliance and adjustment costs is high.	- National Authorities.		and insurance premiums) and the standards on open data and secure interconnectivity are expected to generate substantial one-off adjustment costs for companies (EC, 2007) as well as public authorities.
	Commercial data protection	H	The likelihood of an impact of Policy Option 1 on the protection of commercial data is expected to be high. An open data culture supported by ICT, involving increased exchange of information among stakeholders, affects technological and institutional issues related to the sharing of sensitive commercial information as well as substantial concerns among involved stakeholders (EC, 2007). This in turn affects the likelihood of an impact on the protection of commercial data.	- Shippers; - LSPs; - FTOs; - National Authorities; - EC.	--	The policy actions included in Policy Option 1 are expected to have a significant negative impact on stakeholders' concerns related to commercial data protection.
	Total logistics costs	H	The likelihood of an impact of Policy Option 1 on total logistics costs is expected to be high, as the policy actions included in Policy Option 1 generate costs in various categories (e.g., compliance, administrative) which are included in the	- Shippers; - LSPs; - FTOs; - National Authorities.	+++	The policy actions included in Policy Option 1 are expected to lead to a slight one-off increase in total logistics costs for the affected stakeholders due to the compliance/adoption with new measures. However, the net benefits between administrative

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
			estimation of total logistics costs.			costs, compliance costs, and actual logistics operation costs are expected to be significant and positive.
	Modal shift	H	The likelihood of an impact of Policy Option 1 on modal shift is expected to be moderate, as the measures through the simplification of administrative processes, the development of a multi-modal liability regime, the EU standards to facilitate secure interoperability in the logistics chain, and open and non-discriminatory access to transport platforms change the modal split (reduction of road freight transport – increase of share of intermodal transport). The implementation of these actions is not expected to face acceptability and technological problems on behalf of the involved stakeholders.	- Shippers; - LSPs; - FTOs; - TIOs; - National Authorities.	++	The effect of the measures included in Policy Option 1 on modal split is expected to be moderate as the shift from road transport to other modes may require a change in the behaviour of logistics partners regarding the value of the trade-off between road transport externalities and flexibility offered by road transport.
	Openness and accuracy of data flows	H	The likelihood of an impact of Policy Option 1 on openness and accuracy of data flows is expected to be high, as the increased exchange of information among logistics stakeholders, which is the goal of the relevant policy actions, is a prerequisite for greater accuracy and openness of data flows.	- Shippers; - LSPs; - FTOs; - TIOs; - National Authorities.	+++	The expected impact of open data architecture for information flows and the determination of data collection requirements on freight transport logistics on the affected stakeholders is expected to be substantial in terms of facilitating the openness and the accuracy of data flows across logistics stakeholders and between

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
						transport modes.
	Attractiveness of the logistics profession	H	The likelihood of impact of the initiation of a dialogue between EC and stakeholders on the attractiveness of the logistics profession is expected to be high, as all affected stakeholders are expected to benefit from this development and therefore will accept to participate and contribute to this dialogue.	- Shippers; - LSPs; - FTOs; - EC; - National Authorities; - Logistics employees; - Logistics professional associations.	++	The impact on the affected stakeholders is expected to be moderately positive as the increase of the attractiveness of logistics professions will provide employers with a larger pool of qualified potential employees.
	Professional skills of logistics employees	M	The likelihood of impact of minimum professional qualifications and training requirements is expected to be moderate, as long as they are not incorporated in an EU-wide framework and incentives for companies to implement them are not provided.	- Shippers; - LSPs; - FTOs; - EC; - National Authorities; - Logistics employees; - Educational / vocational training organisations; - Logistics prof. associations.	+++	The expected impact of professional qualifications and training standards on the professional skills of the affected stakeholders is expected to be substantial.
	Energy efficiency of transport	L	The likelihood of an impact of Policy Option 1 on energy efficiency of transport is expected to be low, as this policy does not include direct	- Shippers; - LSPs; - FTOs; - TIOs; - EC.	+	The magnitude of the impact of increased energy efficiency of transport modes will mainly result indirectly though the potential increase of the freight

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
			energy efficiency measures.			transport system due to changes in modal shift. Therefore, the expected magnitude of this impact will be low.
Policy Option 2	Administrative costs	H	The likelihood of impact of Policy Option 2 measures on the reduction of administrative costs is very high, as these measures do not face any substantial implementation risk due to technological and administrative/organisational factors: a single administrative window and single transport document have long been advocated as a measure for the reduction of administration costs and is included in the FTLAP. Therefore the likelihood of its implementation is considered high.	- Shippers; - LSPs; - FTOs; - TIOs; - National Authorities; - Final Consumers.	+++	The introduction of single administrative window and single transport document is expected to have a significant impact on the affected stakeholders in terms of reduction of administrative costs.
	Predictability administrative processes	H	The likelihood of an impact of Policy Option 2 on predictability and speed of administrative processes is expected to be high, as they do not face any substantial implementation risk and constitute already agreed measures in the FTLAP (EC, 2007) for improving the efficiency of administrative processes.	- Shippers; - LSPs; - FTOs; - TIOs; - National Authorities; - Final Consumers.	+++	The impact on the predictability of the administrative processes of the affected stakeholders from the introduction of single administrative window and single transport document is expected to be very significant in terms of removing unproductive/idle time and delays in the clearance processes and thus reducing delays for clearances (EC, 2007).
	Speed of administrative processes	H			+++	
	Compliance and	H	The likelihood of an impact of	- Shippers;	--	The introduction of the single

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
	adjustment costs		Policy Option 2 on compliance and adjustment costs is expected to be high, as the policy actions included in Policy Option 1 require adjustment of existing operations/business practices by both companies and public authorities for conformance to newly developed standards and procedures, which generate relevant costs. Therefore, the likelihood of compliance and adjustment costs is high.	- LSPs; - FTOs; - TIOs; - National Authorities.		transport document, the multimodal liability regime (through higher liability rates and insurance premiums) and the various standards to be developed (clean technology, open data and secure interconnectivity) are expected to generate substantial one-off adjustment costs for companies (EC, 2007) as well as public authorities.
	Commercial data protection	H	The likelihood of an impact of Policy Option 2 on the protection of commercial data is expected to be high. An open data culture supported by ICT, involving increased exchange of information among stakeholders, affects technological and institutional issues related to the sharing of sensitive commercial information as well as substantial concerns among involved stakeholders (EC, 2007). This in turn affects the likelihood of an impact on the protection of commercial data.	- Shippers; - LSPs; - FTOs; - National Authorities; - EC.	--	The policy actions included in Policy Option 2 are expected to have a substantial negative impact on stakeholders' concerns related to commercial data protection.
	Total logistics costs	H	The likelihood of an impact of Policy Option 1 on total logistics costs is expected to be high, as the policy actions included in Policy Option 1 generate costs in	- Shippers; - LSPs; - FTOs; - National Authorities.	+++	The policy actions included in Policy Option 2 are expected to lead to a slight one-off increase in total logistics costs (both at company and national level) due

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
			various categories (e.g., compliance, administrative) which are included in the estimation of total logistics costs.			to the compliance/adoption with new measures but also have a positive effect due to the adoption of clean standards, best practices on CO2 calculation and administrative simplification. It is expected that the long-term balance will be positive but this needs to be further investigated.
	Modal shift	H	The likelihood of an impact of Policy Option 1 on modal shift is expected to be moderate, as the measures through the simplification of administrative processes, the development of a multi-modal liability regime, the EU standards to facilitate secure interoperability in the logistics chain, and open and non-discriminatory access to transport platforms may change the modal split (reduction of road freight transport – increase of share of intermodal transport)	- Shippers; - LSPs; - FTOs; - TIOs; - National Authorities.	+++	The effect of the measures included in Policy Option 2 on modal split is expected to be high.
	Openness and accuracy of data flows	M	The likelihood of an impact of Policy Option 1 on openness and accuracy of data flows is expected to be high, as the increased exchange of information among logistics stakeholders, which is the goal of the relevant policy actions, is a prerequisite for greater accuracy and openness of data flows.	- Shippers; - LSPs; - FTOs; - TIOs; - National Authorities.	++	The expected impact on the affected stakeholders is expected to be substantial in terms of facilitating data flows across logistics stakeholders and between transport modes, as well as determining the requirements for improvement of logistics data collection.

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
	Innovation and R&D	L	The likelihood of SME incentives for stronger participation in innovation-related research projects to have an impact on their innovation and R&D level is expected to be low, as it constitutes a one-off action that is not accompanied by financial support for innovation and R&D activities, awareness raising measures etc.	- LSPs; - FTOs; - EC.	+ +	The impact of Policy 2 actions on innovation and R&D on is expected to be moderately positive due to the one-off nature of the proposed action.
	Professional skills of logistics employees	M	The likelihood of the impact of minimum professional qualifications and training requirements is expected to be moderate, as they are not incorporated in an EU-wide framework and incentives for companies to implement them are not provided.	- Shippers; - LSPs; - FTOs; - EC; - National Authorities; - Logistics employees; - Educational / vocational training organisations; - Logistics prof. Associations; - EU institutions providing financial support; - Financial institutions	+ + +	The expected impact of professional qualifications and training standards on the professional skills of the affected stakeholders is expected to be substantial.

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
				(banks); - National ministries of finance.		
	CO_2 emissions	M	The likelihood of impact of the awareness campaigns against non-environmentally friendly behaviour, development of clean technology standards, best practices for CO_2 calculation methodologies and investments on charging areas for electric vehicles is expected to be moderate, as the measures included may require substantial adjustment effort and costs and do not provide financial incentives for incorporation of new, cleaner technologies.	- Shippers; - LSPs; - FTOs.	+++	The proposed policy actions are expected to have a high positive impact on CO2 emissions. This is due to the nature of the proposed actions, e.g. a mix of behavioural, technological, and managerial actions, and the potential synergies that can be developed among them.
	Energy efficiency of transport	M	The likelihood of an impact of Policy Option 2 on the energy efficiency of transport is expected to be moderate, as the mix of policy actions included (awareness campaigns development of clean technology standards, the best practices for CO_2 calculation methodologies, investments for electric vehicles in urban areas) does not include of measures related to the operation of the transport activity (e.g., measures for changing fuel mix and upgrading to cleaner and more energy	- Shippers; - LSPs; - FTOs; - TIOs; - EC.	+++	The impact of transport energy efficiency actions included in Policy Option 2 has the potential to realise high positive impacts in terms of increasing the energy efficiency of freight transport. This is due to the nature of the proposed actions, e.g. a mix of behavioural, technological, and managerial actions, and the potential synergies that can be developed among them.

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
			efficient vehicles), which have a more direct impact on transport energy efficiency.			
Policy Option 3	Administrative costs	H	The likelihood of impact of Policy Option 3 measures on the reduction of administrative costs is very high, as these measures do not face any substantial implementation risk due to technological and administrative /organisational factors: a single administrative window and single transport document have long been advocated as a measure for the reduction of administration costs and is included in the FTLAP. Therefore the likelihood of its implementation is considered high.	- Shippers; - LSPs; - FTOs; - TIOs; - National Authorities; - Final Consumers.	+++	The introduction of single administrative window and single transport document is expected to have a significant impact on the affected stakeholders in terms of reduction of administrative costs.
	Predictability of administrative processes	H	The likelihood of an impact of Policy Option 1 on predictability and speed of administrative processes is expected to be high, as they do not face any substantial implementation risk and constitute already agreed measures in the FTLAP (EC, 2007) for improving the efficiency of administrative processes.	- Shippers; - LSPs; - FTOs; - TIOs; - National Authorities; - Final Consumers.	+++	The impact on the predictability of the administrative processes of the affected stakeholders from the introduction of single administrative window and single transport document is expected to be very significant in terms of removing unproductive/idle time and delays in the clearance processes and thus reducing delays for clearances (EC, 2007).
	Speed of administrative processes	H			+++	
	Compliance and adjustment costs	H	The likelihood of an impact of Policy Option 1 on compliance	- Shippers; - LSPs;	---	The compliance costs for companies and public authorities

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
			and adjustment costs is expected to be high, as the policy actions included in Policy Option 1 require adjustment of existing operations/business practices by both companies and public authorities for conformance to newly developed standards and procedures, which generate relevant costs. Therefore, the likelihood of compliance and adjustment costs is high.	- FTOs; - TIOs; - National Authorities.		in adopting all these measures are expected to be significant.
	Commercial data protection	H	The likelihood of an impact of Policy Option 1 on the protection of commercial data is expected to be high. An open data culture supported by ICT, involving increased exchange of information among stakeholders, affects technological and institutional issues related to the sharing of sensitive commercial information as well as substantial concerns among involved stakeholders (EC, 2007). This in turn affects the likelihood of an impact on the protection of commercial data.	- Shippers; - LSPs; - FTOs; - National Authorities; - EC.	---	The policy actions included in Policy Option 2 are expected to have a significant negative impact on stakeholders' concerns related to commercial data protection.
	Total logistics costs	H	The likelihood of an impact of Policy Option 3 on total logistics costs is expected to be high, as it comprises measures aimed at reducing operational costs for all affected stakeholders, as well as	- Shippers; - LSPs; - FTOs; - National Authorities.	+++	The policy actions included in Policy Option 3 are expected to lead to a slight increase in total logistics costs (both at company and national level) due to the compliance/adoption with new

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
			administrative costs.			measures and the internalisation of external costs. The actions are also expected have a substantial positive effect due to the adoption of Fleet and Logistics Management Systems, the upgrade of vehicles, the financial incentives for uptaking cleaner technologies, the adoption of clean standards, best practices on CO2 calculation and administrative simplification. It is expected that the long-term balance will be highly positive but this needs to be further investigated.
	Efficiency of vehicle use	H	The likelihood of impact of Policy Option 3 on efficiency of vehicle use and vehicle capacity utilisation is expected to be high as the measures included (e.g., adoption of Logistics and Fleet Management Systems, upgrade to more efficient vehicles, horizontal load coordination, awareness of intermodal LSPs, the administrative facilitation measures, the pricing differentiation for return trips) affect directly the transport operations of FTOs and LSPs.	- Shippers; - LSPs; - FTOs.	+++	The impact on the vehicle efficiency and utilisation of the affected stakeholders is expected to be very significant, since it will lead to higher utilisation rates of vehicle capacity, reduced number of empty runs, and reduced idle times, and higher revenues for the affected stakeholders.
	Vehicle capacity utilisation	H			+++	
	Modal shift	H	The likelihood of an impact of Policy Option 3 on modal shift is expected to be high, since, in addition to the already included	- Shippers; - LSPs; - FTOs; - Terminal	+++	The impact of modal shift on the affected stakeholders is expected to be high.

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
			measures, policy actions affecting development of inter-/multimodal logistics chains (e.g., promotion of intermodal LSPs) and development of physical and IT infrastructure (EC, 2011) are included in this package of measures.	- Infrastructure Operators; - National Authorities.		
	Openness and accuracy of data flows	H	The likelihood of an impact of Policy Option 3 on openness and accuracy of data flows is expected to be high, as increased exchange of information among stakeholders is a prerequisite for greater accuracy of information flows and leads to greater levels of openness of data.	- Shippers; - LSPs; - FTOs; - Terminal infrastructure operators; - National Authorities.	++	The expected impact on the affected stakeholders is expected to be substantial in terms of facilitating data flows across logistics stakeholders and between transport modes, as well as determining the requirements for improvement of logistics data collection.
	Innovation and R&D	H	The likelihood of impact of Policy Option 3 on innovation and R&D levels of SMEs is expected to be significant, as it entails a package of measures that may be successful in fostering innovation and R&D in SMEs.	- LSPs; - FTOs; - EC; - EU institutions providing financial support; - Financial institutions (banks); - National ministries of finance.	+++	The impact of Policy Option 3 on the innovation and R&D of the affected stakeholders is expected to be highly positive, since it can lead to innovative solutions that improve operational efficiency, reduce costs and strengthen their competitive position.
	Attractiveness of the logistics profession	M	The likelihood of impact of the initiation of a dialogue between EC and stakeholders on the	- Shippers; - LSPs; - FTOs;	++	The impact on the affected stakeholders is expected to be positive as the increase of the

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
			attractiveness of the logistics profession is expected to be high, as all affected stakeholders are expected to benefit from this development.	- EC; - National Authorities; - Logistics employees; - Logistics professional associations.		attractiveness of logistics professions will provide employers with a larger pool of qualified potential employees.
	Professional skills of logistics employees	H	The likelihood of impact of Policy Option 3 on the professional skills of employees is expected to be high, as the obstacle related to the lack of financial support for training and qualification activities (identified in the previous Policy Options) has been addressed.	- Shippers; - LSPs; - FTOs; - EC; - National Authorities; - Logistics employees; - Educational / vocational training organisations; - Logistics prof. Associations; - EU institutions providing financial support; - Financial institutions (banks); - National	+++	The expected impact of professional qualifications and training standards on the professional skills of the affected stakeholders is expected to be substantial.

Policy Options	Impact	Likelihood of impact	Description	Stakeholders affected by impact	Magnitude of impact on affected stakeholders	Description
				ministries of finance.		
	CO_2 emissions	H	The likelihood of impact of the bundle of policy action of Policy Option 3 on CO_2 emissions is expected to be high, as it now includes financial measures and tax incentives which may help companies tackle the compliance, adjustment and technological costs.	- Shippers; - LSPs; - FTOs.	+++	The impact of the reduction of CO_2 emissions on the affected stakeholders is significant from various viewpoints: costs, environmental performance, and social responsibility performance.
	Energy efficiency of transport	H	The likelihood of an impact of Policy Option 3 on the energy efficiency of transport is expected to be high, as the mix of policy actions included (awareness campaigns development of clean technology standards, the best practices for CO_2 calculation methodologies, investments for electric vehicles in urban areas, financial support for upgrading to cleaner and more energy efficient vehicles) now includes policy actions that have a direct impact on transport energy efficiency (as compared to the other Policy Options which did not include such measures).	- Shippers; - LSPs; - FTOs; - TIOs; - EC.	+++	The impact of energy efficient transport on the affected stakeholders is significant from various viewpoints: costs, environmental performance, social responsibility performance. The awareness campaigns against environmentally unfriendly behaviour, the development of clean technology standards, the best practices for CO_2 calculation methodologies and the investments on charging areas for electric vehicles in urban areas may have a moderate effect on the energy efficiency of transport as they may lead to the selection of more efficient transport modes.

From the above discussion, the impacts can be classified schematically in terms of their likelihood and magnitude as follows:

Figure 4.15 Likelihood-magnitude matrix of expected impacts of Policy Option 1

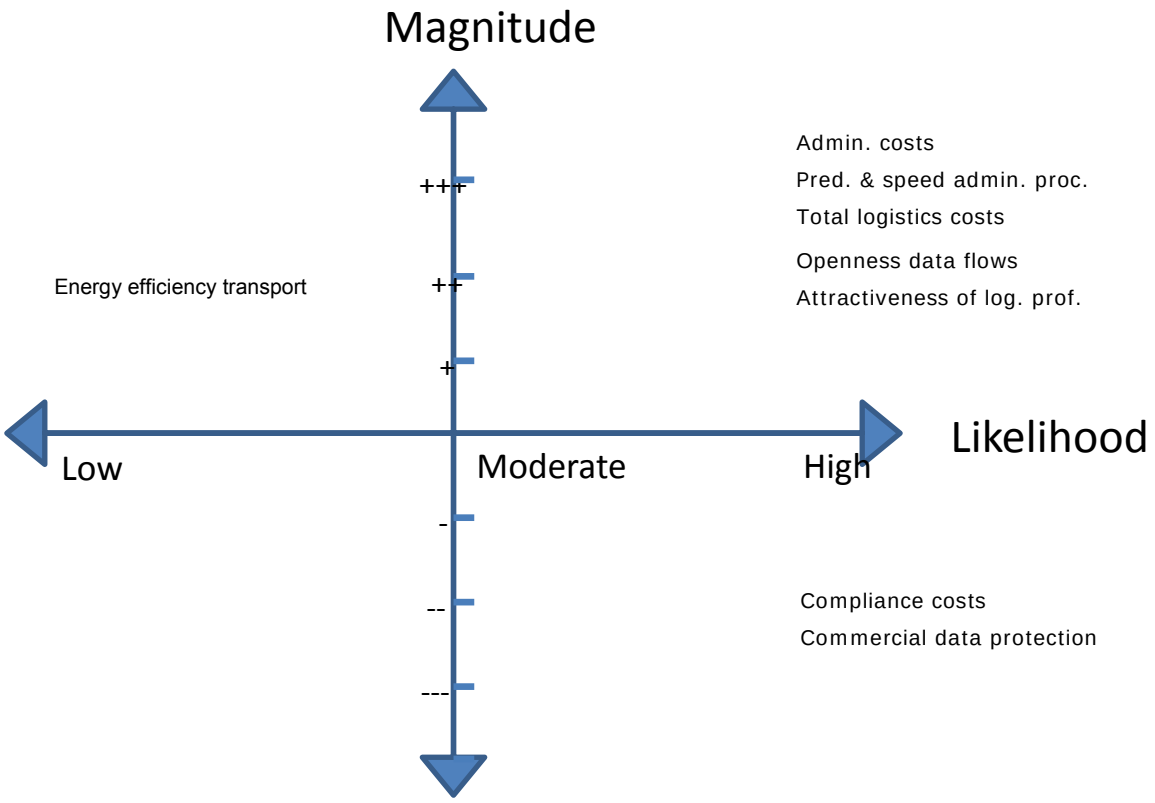


Figure 4.16 Likelihood-magnitude matrix of expected impacts of Policy Option 2

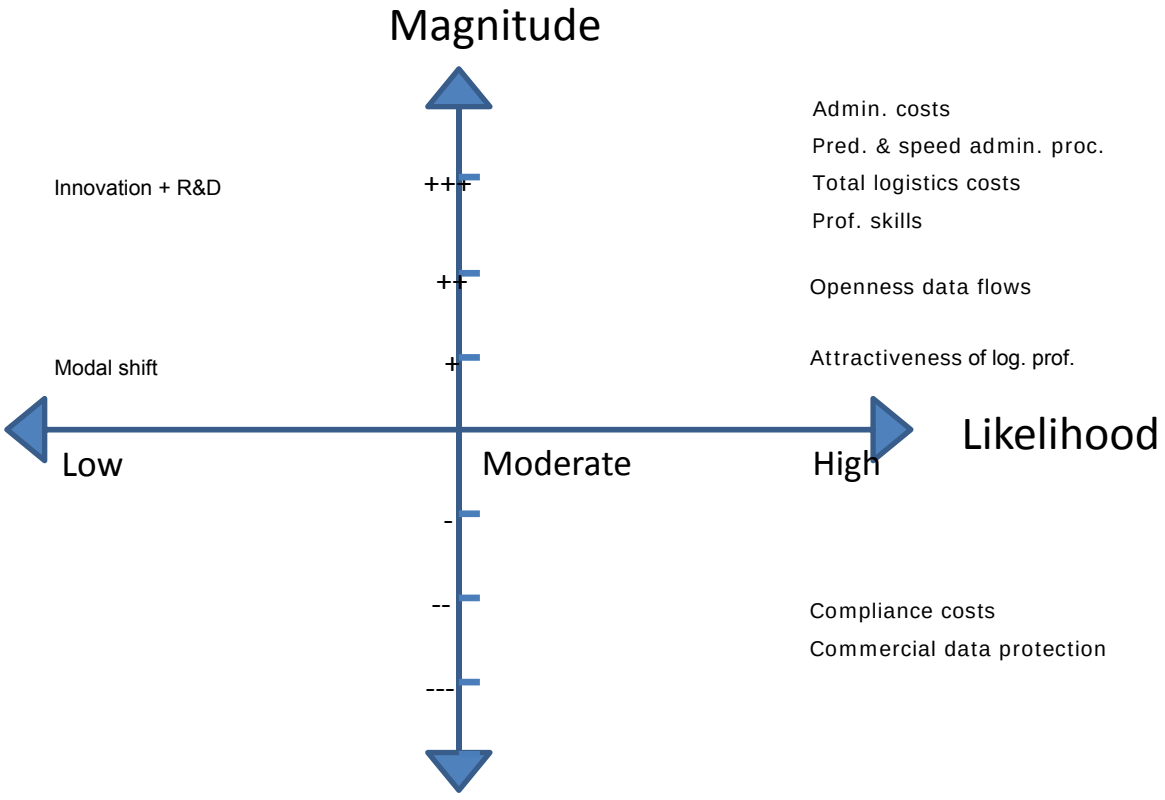
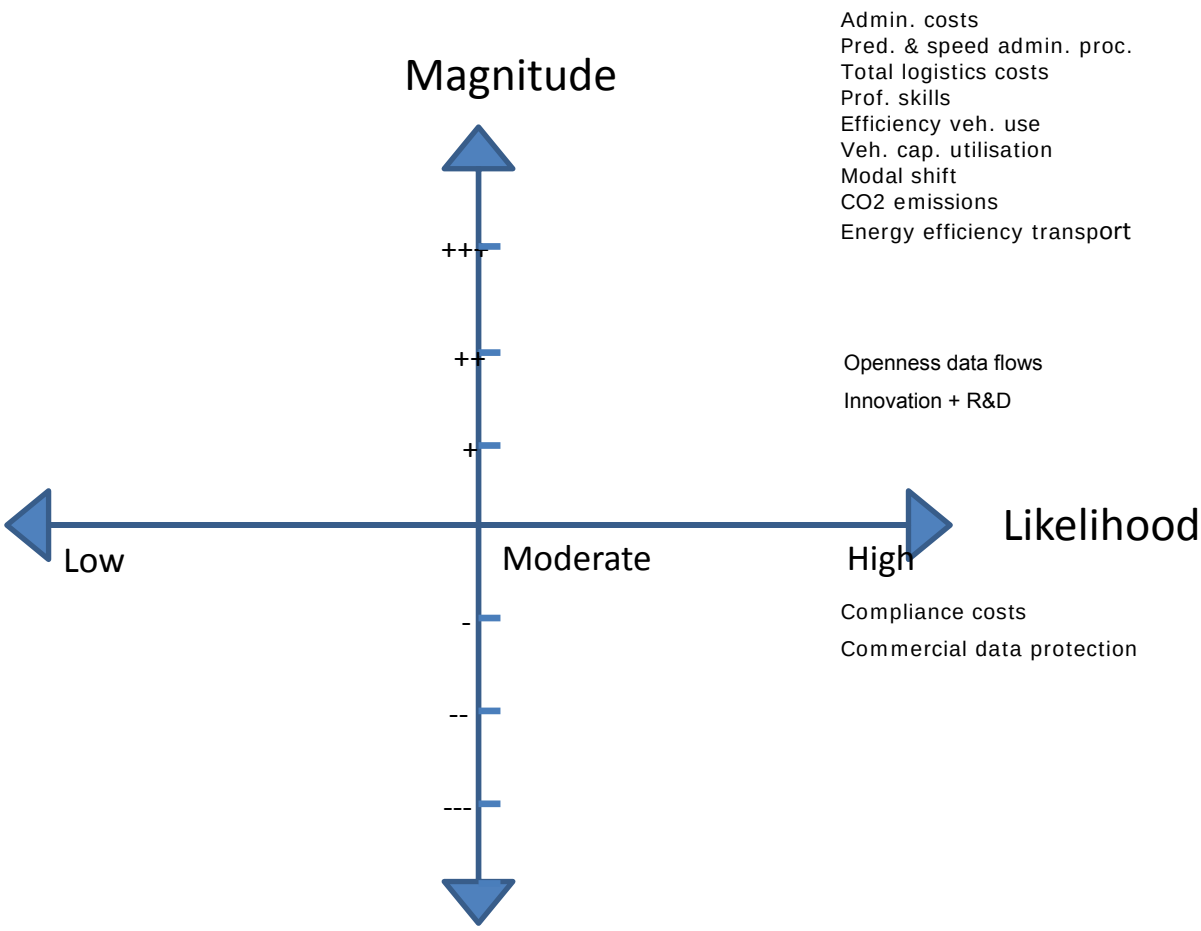


Figure 4.17 Likelihood-magnitude matrix of expected impacts of Policy Option 3



The analysis in the previous section and the likelihood-magnitude matrices of the expected impacts for each Policy Option show that there is a set of impacts that have a high likelihood of occurrence and a high impact (positive or negative) on stakeholders in all Policy Options in which they are applicable. These are:

- Administrative costs;
- Predictability and speed of administrative processes;
- Total Logistics costs;
- Efficiency of vehicle use;
- Vehicle capacity utilisation;
- Professional skills of logistics employees.

These impacts should be further examined with the highest priority.

Also, there is a set of impacts that have high magnitude, but whose likelihood of occurrence is low or moderate. However, the combined likelihood-magnitude value of these impacts increases with each of Policy Options up to the highest possible value. These impacts are:

- Compliance and adjustment costs;
- Commercial data protection;
- Energy efficiency of transport;
- CO_2 emissions;
- Modal shift.

It is suggested that these impact should be further examined as second highest priority.

Finally, there is a set of impacts that increases in terms of likelihood-magnitude with each Policy Option but do not reach the highest possible likelihood-magnitude value. These impacts are:

- Openness and accuracy of data flows;
- Attractiveness of the logistics profession;
- Innovation and R&D.

It is suggested that these impacts should be examined as third priority.

The impact "Openness and accuracy of data flows" is expected to be moderate, although the measures included in Policy Options make this impact highly likely to be realised. One issue that fosters this moderate impact relates to the focus of the measures on the technological side of data exchange and openness (data architecture, standards etc.) and does not consider cultural/behavioural factors (such as trust, commitment, mutuality and reciprocity) that should be in place in order for stakeholders to be willing to exchange information. The behavioural aspect of collaboration, which would enable higher openness of data exchange, between logistics stakeholders is not addressed in the Policy Options.

The impact "Attractiveness of the logistics profession" is expected to be moderate in likelihood and magnitude, as more concrete measures should be taken (as a result of the stakeholder dialogue). Such measures could include incentives for greater employee mobility, more favourable working conditions and work-life balance. Moreover, the effectiveness of awareness raising campaigns for increasing the attractiveness of the logistics profession depends on national/local factors such as levels of general employment and perceptions of the profession.

Following the identification of the most important impacts in terms of their magnitude and likelihood of occurrence, the next step of the analysis of impacts is to estimate quantitatively and qualitatively the expected impacts for each of the identified scenarios.

4.5.5 Step 3: Multi-criteria analysis based on most important impacts

Methodology of performing the multi-criteria analysis

In this section a multi-criteria analysis is performed, based on the most important impacts, as identified in the last section. The impacts with the first and second highest priority have been chosen to perform the analysis. For each of the impacts a matrix is developed in which the impacts are assessed qualitatively. For this a scale ranging from 1 to 9 was used (1 being the most negative impact, 9 being the most positive impact, for that factor). This analysis was done for each of the policy actions and for the scenarios as developed in the last chapter. This way, each policy option's impact is estimated per type of impact, per scenario.

A multi-criteria analysis (MCA) has been applied because it is a structured method which forced us to compare the policy options in an analytical way, even when the options are yet very uncertain. The MCA helps in developing a line of reasoning concerning the policy options. The reason for not choosing a more quantitative method such as a cost-benefit analysis (CBA) is that the policy options are not yet defined in a detailed manner which could allow us to use models and tools for CBA. It is advised however that in implementing some of the actions, these types of analysis should take place.

It should be mentioned beforehand that this analysis is by no means meant as an extensive impact analysis. It is meant as a tool to compare the policy options and

define statements and advice on these policy options with a consistent reasoning. There has been no model or quantitative analysis done. In order to do this the actions should be translated into concrete projects, with concrete analysis of the specific impacts. The development of the policy options at hand is not detailed enough to carry out this task.

Analysis of the criteria

Administrative costs

Regarding the administrative costs, major improvements will already be the result of Policy Option 1, since it holds actions like the single administrative window and single transport document. Policy Option 2 had no additional actions that will further reduce administrative costs. Policy Option 3 clearly has more in depth actions that will further reduce administrative costs. These impacts are not expected to differ much between the scenarios. In the case of an isolated Europe, however, the impact of harmonisation and coordination could be higher, since less of the logistical activities will have an intercontinental orientation.

The table below shows the results.

Table 4.9 Results multi-criteria analysis: administrative costs

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Policy 1	7	7	7	7
Policy 2	7	7	7	7
Policy 3	8	9	9	8

Predictability and speed of administrative processes

Regarding the predictability and speed of administrative processes, major improvements will result from each of the policy options. Policy Option 3, however, stands out since it holds additional actions on harmonisation and information systems. These impacts are expected to be bigger in an isolated Europe.

The table below shows the results.

Table 4.10 Results multi-criteria predictability and speed of administrative processes

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Policy 1	6	6	6	6
Policy 2	6	6	6	6
Policy 3	8	9	9	8

Total logistics costs

The total logistics costs are the main focus of the identified actions and policy options. With total logistics expenditures in the EU27 of €876 billion, and administrative cost at roughly €35 billion (4% share in total logistics expenditures, see also *section 2.3.1 The EU logistics market structure – macro data*) even a small efficiency improvement in administrative processes will have a huge impact in terms of cost savings. It is clear that, especially in the long run, that the expected results are positive. This will especially be the case in a prosperous Europe, in which the logistical challenges will be bigger, and thus all actions aimed at awareness, efficiency and innovation will have the highest impacts.

It needs to be said however, that Policy Option 3 is quite different from the other options, with respect to the number of actions that require specific funding, for instance, the investment support (under TEN-T). The impact (as well as the

compliance costs, see further) depends on the magnitude and specifics of those investments. It is assumed that these actions require significant inputs and will result in significant impacts.

The table below shows the results.

Table 4.11 Results multi-criteria logistic costs

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Policy 1	7	7	6	6
Policy 2	7	7	6	6
Policy 3	9	9	8	8

Efficiency of vehicle use

For the efficiency of vehicle use it is clear that Policy Option 3 holds far more relevant actions than the first two policy options. There are some specific actions aimed at this aspect, for instance the pricing stimulation of differentiation of return trips for e-commerce, and the campaigns to make LSPs more aware of the benefits of existing fleet and advanced logistics management systems, are actions that will further enhance the efficient use of vehicles. With an average of 40% of empty runs in freight traffic (representing approximately 35 billion empty road freight kilometres), even a small improvement in vehicle use will have a significant impact of terms of less vehicles on the roads, and therefore also emissions, safety and road damage. Again, in the scenarios with a prosperous Europe this will have a higher impact.

The table below shows the results.

Table 4.12 Results multi-criteria vehicle use

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Policy 1	5	5	5	5
Policy 2	6	6	5	5
Policy 3	9	9	8	8

Vehicle capacity utilisation

For the vehicle capacity utilisation the same reasoning applies as with the efficiency of vehicle use. This also means that Policy Option 3 stands out, and that in a prosperous Europe, the impacts are expected to be higher.

The table below shows the results.

Table 4.13 Results multi-criteria vehicle capacity utilisation

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Policy 1	5	5	5	5
Policy 2	6	6	5	5
Policy 3	9	9	8	8

Professional skills of logistics employees

For the professional skills of logistics employees there is a logical build-up between the policy options. Policy Option 1 already provides for qualifications and training requirements. Policy Option 2 builds on that, but financial support is added. This gives many more opportunities to look for higher impacts on this aspect. Finally, Policy Option 3 holds the most actions, containing also some actions from Policy Options 2 and 3. It is to be expected that prosperity in Europe will lead to higher impacts.

The table below shows the results.

Table 4.14 Results multi-criteria professional skills of logistics employees

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Policy 1	7	7	6	6
Policy 2	8	8	7	7
Policy 3	9	9	8	8

Compliance and adjustment costs

The compliance and adjustment costs are the impacts that need to be evaluated against the positive impacts on logistics costs/performances and other positive impacts. In general, the compliance and adjustment costs for public authorities increase with each policy option. Certainly Policy Option 3 will require substantially more costs; several actions rely on public funding. And also for the companies substantial adjustment costs are expected, the difference between the policy options is less, however, for companies compared to public authorities. In general it is expected that the compliance and adjustment cost for public authorities will be higher in case of a stagnating Europe.

The table below shows the results.

Table 4.15 Results multi-criteria adjustment costs

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Policy 1	6	6	6	6
Policy 2	6	6	6	6
Policy 3	1	2	2	1

Commercial data protection

The commercial data protection is a factor that worries different actors in the field of logistics. Several actions with positive impacts on interoperability and coordination, in the end leading to lower logistics costs have as a perceived negative side effect the fact that the data need to be shared in order to achieve these positive impacts. All policy options will have these negative impacts. Policy Option 3, however, holds specific actions that try to compensate for this negative impact. It is expected that these negative impacts are greater when Europe is in isolation.

The table below shows the results.

Table 4.16 Results multi-criteria commercial data protection

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Policy 1	2	1	1	2
Policy 2	3	2	2	3
Policy 3	5	4	4	5

Energy efficiency of transport

Energy efficiency (and CO_2 emission, see further) are impacts that are not directly affected by Policy Option 1. No specific actions are defined. Policy Option 2 however does provide for a number of specific actions. Policy Option 3 takes a significant further step in trying to improve the energy efficiency, also introducing some actions where financial support is given. It is expected that these actions will have higher impacts in a prosperous Europe.

The table below shows the results.

Table 4.17. Results multi-criteria energy efficiency of transport

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Policy 1	5	5	5	5
Policy 2	7	7	6	6
Policy 3	9	9	8	8

CO_2 emissions

For CO_2 emissions the same reasoning holds as for the energy efficiency. With greenhouse gas emissions (GHG) of approximately 1.2 billion tonnes per year for the transport sector as a whole (road share 73%) a small efficiency improvement in the sector can result in significant amounts of GHG emissions reduction. Specific actions for CO_2 are defined for policy options 2 and 3, whereas option 3 holds more effective actions (with financial support). Especially the upgrading of new vehicles and vessels is a promising action.

The table below shows the results.

Table 4.18 Results multi-criteria CO2 emissions

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Policy 1	5	5	5	5
Policy 2	7	7	6	6
Policy 3	9	9	8	8

Modal shift

All policy options will influence the modal shift towards a more efficient and effective use of existing modes. Road freight is still dominant in term of freight transport performance, as 76% of tonne-kilometres are moved by road freight vehicles, 18% by rail and 6% by inland waterways. A modal shift of only 1% from road is the equivalent of 5% of the current rail freight performance and 16% of the current performance of inland waterways. Also for this aspect, Policy Option 3 holds one specific action that could have a substantial additional impact. The internalisation of external costs could influence the modal shift substantially. But also other actions with potential high impact are part of this policy option (e.g. investment support under TEN-T). Policy Option 1 has even more actions with an impact on modal shift than Policy Option 2. These impacts are expected to be higher in a prosperous Europe.

The table below shows the results.

Table 4.19 Results multicriteria modal shift

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Policy 1	8	8	7	7
Policy 2	7	7	6	6
Policy 3	9	9	8	8

4.6 Comparison of options

4.6.1 Introduction

The results of the multi-criteria analyses were presented in the previous section. The comparison of the policy options is the subject of this section. In order to conduct this task, a quantitative approach, using the results of the multi-criteria analysis as well as a qualitative approach is taken. In this qualitative approach the negative and positive impacts are compared, looking at affected parties and types of impact.

4.6.2 Descriptive comparison of policy options

The first policy option holds actions that will have some economic effects via the reduction of logistics costs and the increased availability of staff. The second policy option improves on that and although it is a minimum intervention, it does impact the economics of the logistics market. The third option, since it was based on full support for the logistics market has the highest impact on economics.

The first policy option will have no real impact on the environmental, only a few actions might lead to a positive impact, but not directly. Policy Option 2 however does hold actions that are primarily aimed at better use of energy and other beneficial aspects towards the environment. The third policy option has the highest impact on the environment, although the differences with the second option are not as big as with some of the economic aspects.

The three policy options also differ with regard to their impact on the stakeholders. For the logistics sector, it is clear that the third policy option has the highest impact, as it creates full support for logistics sector. Some individual stakeholders might however perceive the third policy option as one in which the public authorities go beyond their role. A specific positive point of the third policy option is the fact that concrete actions are taken to deal with the commercial data problems.

For the general public there are no negative impacts to be expected from any of the three policy options. Those who are confronted the most with the negative impacts of logistics activity in general and more specifically transport activities will be the most affected in Policy Option 3, but also the second policy option holds interesting actions for them. The general public will have less positive impacts from the first policy option.

For the European Commission and other public authorities the differences between the policy options are large. The first policy option, as well as the second, relies mainly on actions with relatively low impact on compliance costs. It is here that the Policy Option 3 has a clear impact. It would require a lot more input from all public authorities to implement the third policy option. It has a few actions in which potentially large investments need to be made. It is simply not known at the moment how these actions will eventually be implemented, what projects could be financed, and how much money is involved. But it is clear that it is a strategic choice for maximising the impacts on the logistics sector by looking at the third policy option, which is also seen as a good option for the general public. The public authorities are confronted with the choice: investing a lot in the logistics market (Policy Option 3), or only in the actions that create conditions for market parties (Policy Options 1 and 2).

Given these uncertainties but also the importance of the logistics sector it is concluded here that the implementation of Policy Option 3 is advised. There needs to be a process in which the actual implementation is done, including more profound impact analysis of the individual actions. From this a new action plan will be drawn up, with potentially some of the actions dropped, others added, and others defined in more detail.

4.6.3 Quantitative analysis of the MCA results

In general, it can be observed that all policy options have a positive effect on all relevant indicators, except the compliance and adjustment costs and the commercial data protection.

In order to gain insight into the impacts of the policy options, within the different scenarios, the multi-criteria analysis was carried out using different sets of weights for the impacts taken in to account. This allows for a certain sensitivity analysis to

ascertain which policy option is the most effective under different circumstances. The applied sensitivities are:

- **Weight set 1**: equal weights for all impacts – Which policy option is most effective when all impacts have the same importance?
- **Weight set 2**: higher weight for priority 1 impacts - Which policy option is most effective when there are some impacts expected to be of more relevance than others? (cf. 4.5.4)
- **Weight set 3**: 50/50 set for compliance costs vs. other impacts – Which policy option is most effective when compliance costs impacts are of highest relevance?
- **Weight set 4**: factor specific weights – Which policy option is most effective when a reasonable weight is given per impact?

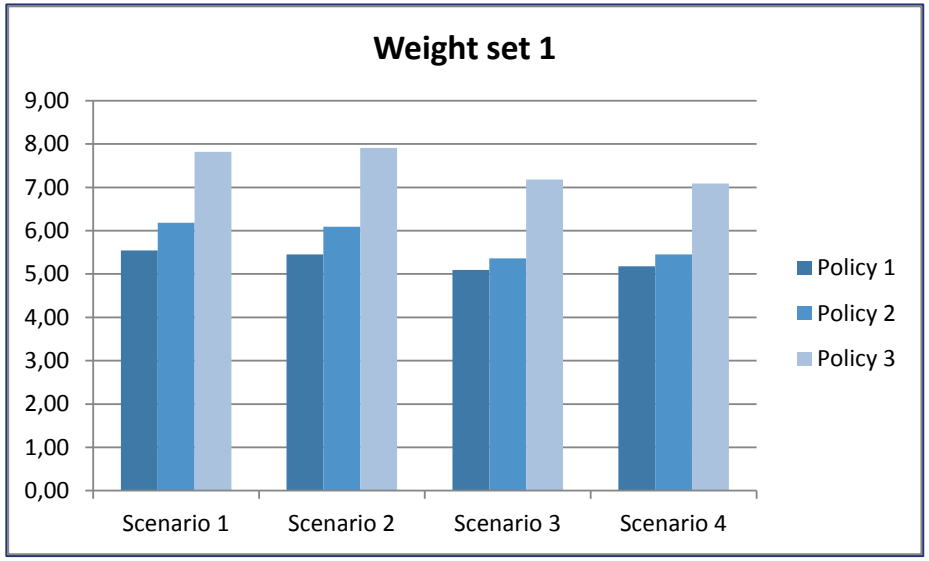
The reasoning behind this is that it is required to compare the compliance and adjustment costs with the (positive and negative) impacts of the actions taken. Therefore, next to the more straightforward weight set 1 and 2, other weight sets were developed. In weight set 3 all other aspects have the same weight. In weight set 4, specific attention is given towards a reasonable distribution between the impacts.

The table below shows the specific weights that were used.

Table 4.20 Weight sets used for the multi-criteria analysis

	Weight set 1	Weight set 2	Weight set 3	Weight set 4
Administrative costs	9%	12%	5%	8%
Predictability and speed of administrative processes	9%	12%	5%	
Total logistics costs	9%	12%	5%	20%
Efficiency of vehicle use	9%	12%	5%	8%
Vehicle capacity utilisation	9%	12%	5%	
Professional skills of logistics employees	9%	12%	5%	8%
Compliance and adjustment costs	9%	6%	50%	40%
Commercial data protection	9%	6%	5%	4%
Energy efficiency of transport	9%	6%	5%	8%
CO2 emissions	9%	6%	5%	
Modal shift	9%	6%	5%	4%
	100%	100%	100%	100%

Combining the assessment of the relevant impacts with these weights delivers the results for the policy options per scenario. These results are shown in the figures below.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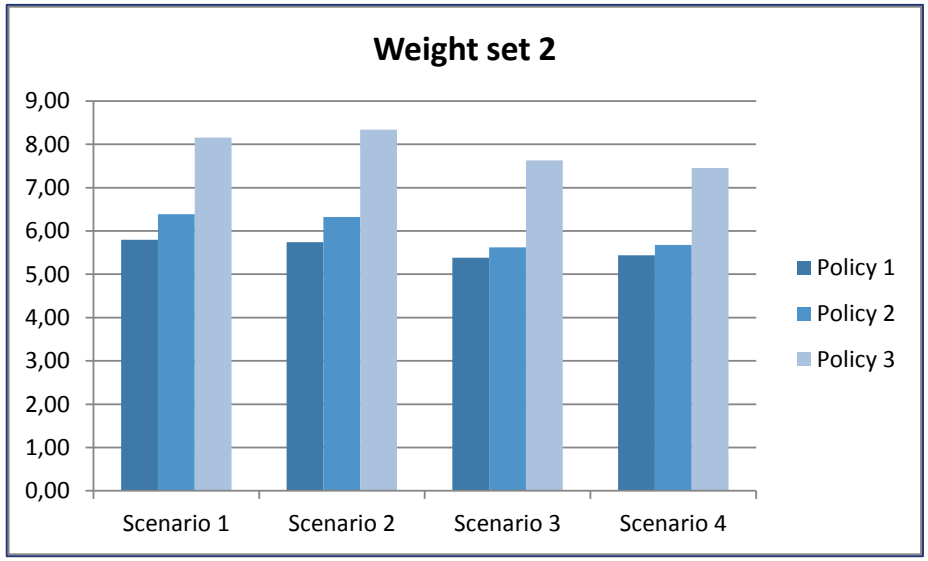
8,00
7,00
6,00
5,00
4,00
3,00
2,00
1,00
0,00
Scenario 1
Scenario 2
Scenario 3
Scenario 4
Policy 1
Policy 2
Policy 3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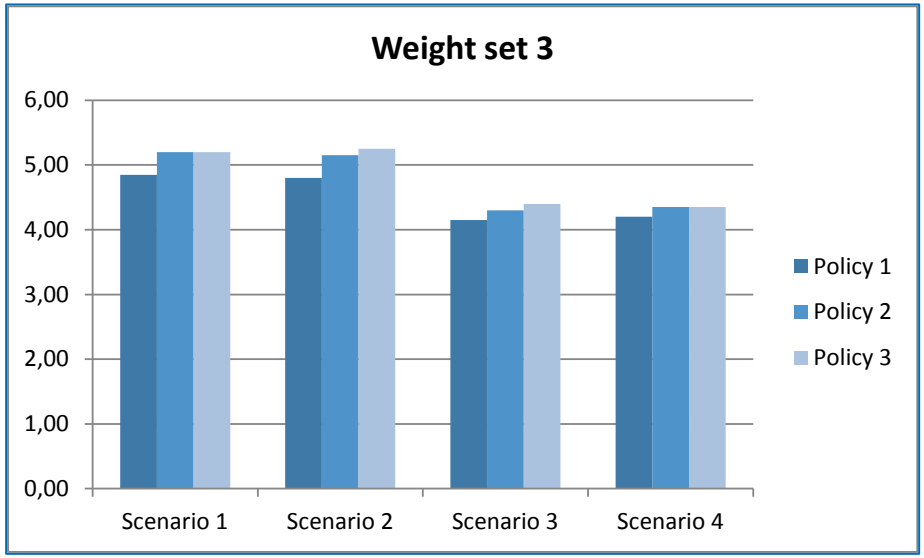
Scenario 4
Policy 1
Policy 2
Policy 3


Weight set 3
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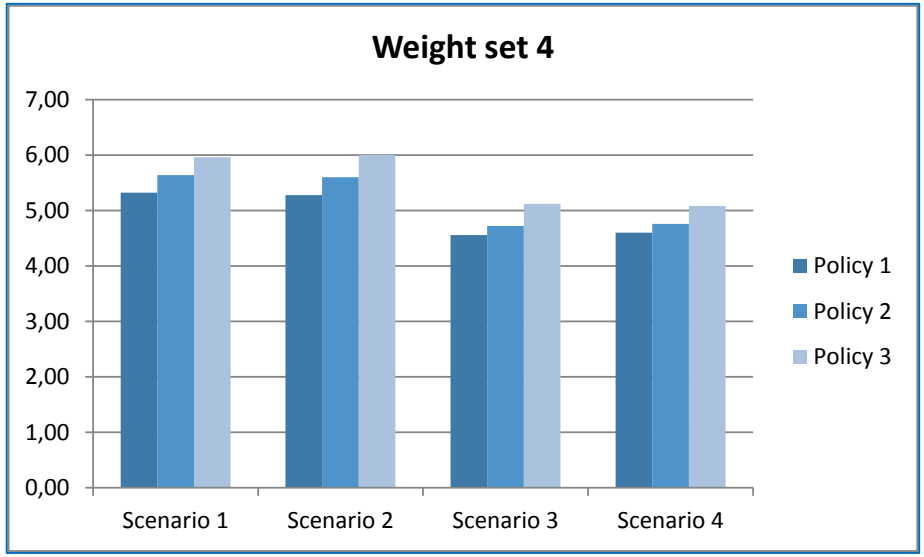
Scenario 1
Scenario 2
Scenario 3
Scenario 4
Policy 1
Policy 2
Policy 3


Weight set 4
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5,00
4,00
3,00
2,00
1,00
0,00
Scenario 1
Scenario 2
Scenario 3
Scenario 4
Policy 1
Policy 2
Policy 3

The following conclusions can be drawn from this analysis:

1. The ranking of the policy options is the same for all the weight sets. Policy option 3 has the highest aggregated result, followed by the other two policy options. These two are close, but the second policy option has in all cases the highest score;
2. The most important factor to be taken into account is the compliance and adaption costs. Even with a very high weight factor it can still be concluded that the third policy option has the highest result;
3. Policy Option 3 is clearly the policy option with the most positive impacts on the impact categories that are of importance looking at the problems to be solved, being reduction of logistics costs, the environmental impacts and the lack of staff;
4. The high compliance and adjustment costs, mainly for public authorities in this analysis, mean that Policy Option 3's dominance is lower when giving this factor a higher weight (in sets 3 and 4).

4.6.4 Conclusion

Based on these descriptions, it is concluded that the problems as identified in the previous chapters are best met by the third policy option: creating full support. For all important indicators it is found that Policy Option 3 has the best results. It is also the policy option with the highest negative impact on compliance costs for the European Commission. Therefore the development of a more defined action plan, with additional impact assessment, is advised.

4.7 Monitoring and evaluation

To the consortium's knowledge, the performance and impact of FTLAP 2007 as a programme has not been monitored. No ex-post evaluations have been found. Therefore, for a follow-up program, it is advisable to take monitoring and evaluation efforts.

The three policy options are tackling the root causes and problem divers which were presented in the problem tree, earlier. Each policy option is expected to result in economic, social and environmental impacts. In order to keep track of the influence of i) the implementation of the future policy and ii) its influence on the logistics' sector performance, it is vital to define a monitoring and evaluation framework. The monitoring of the impacts will be structured via KPIs and/or qualitative evaluations.

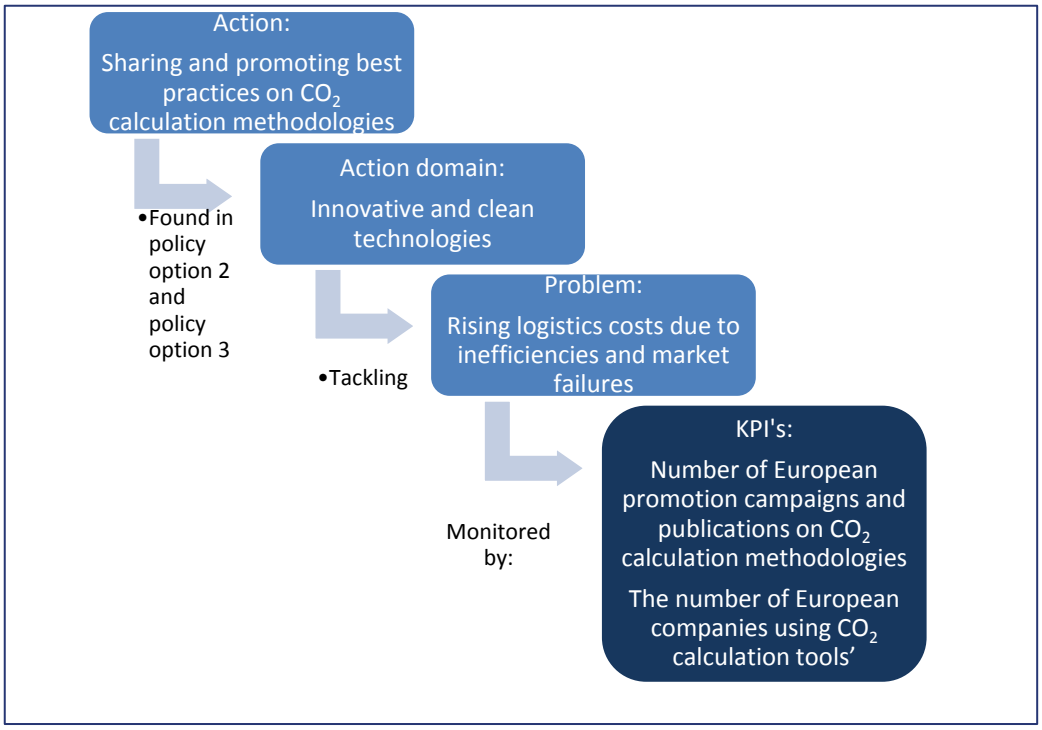
Through the policy actions, the three main problem categories are tackled by the policy options, and results in effects on the economic, social and environmental aspects.

For example:

- Policy action 'Sharing and promoting best practices on CO_2 calculation methodologies' (proposed in Policy Option 2 and Policy Option 3) is reflected in the action domain 'Innovation and clean technologies'. This action domain tackles the problem 'Rising logistics costs due to inefficiencies and market failures';
- Measuring the impact of this action domain is defined by "SMART" KPIs. These are split between policy and sector effects. The KPI 'Number of European promotion campaigns and publications on CO_2 calculation methodologies' measures the policy impact and the KPI 'The number of European companies using CO_2 calculation tools' measures the uptake of the sector;

- This exemple KPI is included in the first table below, referring to the environmental aspect of the first of three main problems, i.e. 'Rising logistics costs due to inefficiencies and market failures'.

Figure 4.18 Construction KPIs of the monitoring framework

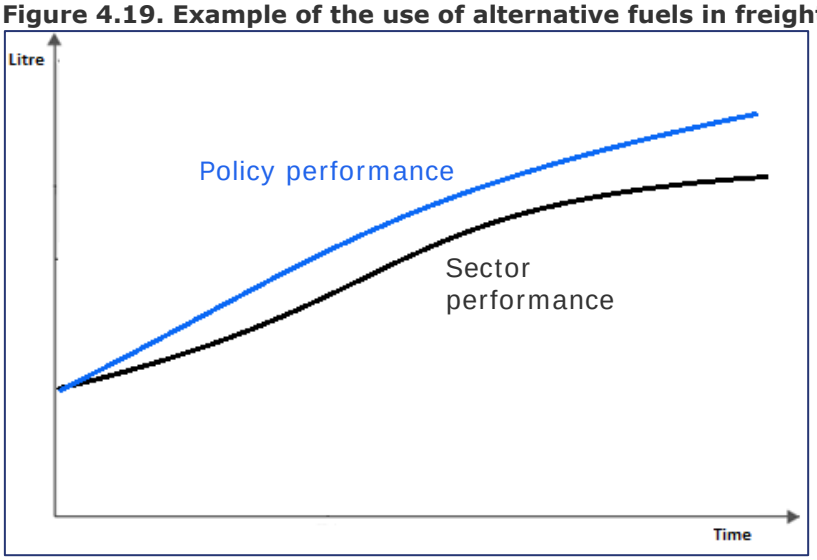


The policy can be monitored by the initiatives taken to realise changes at the root cause level. The likely effect and uptake by the sector can be monitored by more general KPA and KPIs related to the logistics sector, detailed in chapter 5.

The KPA and KPIs for the sector described in the next chapter define the overall behaviour of the sector, as sketched in the figure below. It is important to distinguish between policy performance and sector performance. Therefore, it might be possible that the policy performance is good; the policies are implemented and taken up by the industry, while sector performance shows a different trend, not being influenced by the policy performance. As example, the policy impact of for example stimulating the use of alternative fuels is shown by the blue coloured curve; the policy is well implemented. However, sector performance could be different, represented by the black curve.

The black curve is measured by the next chapter. The policy impact should be measured by the KPIs in this section, with respect to the baseline scenario.

Figure 4.19. Example of the use of alternative fuels in freight transport



Source: Ecorys.

The following tables provide suggestions of how to measure policy and sector performance that relate to the main problem categories. How likely data for the KPIs will be available is scored on the basis of the analysis on several data sources conducted in Chapter 2 and 5 (See Annex II, V and IX) and is evaluated via a scale of +++, ++, +. Where no data is available, the monitoring framework can rely on qualitative evaluations. These KPIs are additionally marked by 'Q'.

The next table summarises the KPIs for measuring the policy performance and sector uptake of the actions tackling the problem group **'Rising logistics costs due to inefficiencies and market failures'**.

Table 4.21 KPI's rising logistics costs due to inefficiencies and market failures

Domain	Policy performance	Sector performance
Economic	- Number of European campaigns on advanced fleet and management systems for LSP's (+++); - Number of European campaigns on using intermodal transport (+++); - Offered European investment support for multi-modal transport services (+++); - European initiatives taken for creating an independent and protected data storage facility (+++); - Number of European initiatives taken on the opening to all of transhipment platforms (+++); - Number of CIVITAS calls launched (+++); - Initiatives taken to reduce red tape (Measured in number of single windows opened) (+++); - Number of initiatives taken to harmonise regulations and (trade) standards between MS (+++); - Initiatives taken to introduce on multi-modal liability regime (+++); - Initiatives taken to create a framework for clean technology standards (+++); - Number of initiatives taken to support MS for developing e-systems (++).	- Number of European companies using advanced fleet and management systems (+, Q); - Number of European companies using intermodal transport (tonne-km of this transport mode) (+++); - Number of European companies using independent and protected data storage (+, Q); - Number of European companies using of open transhipment platforms (measured in transhipped tonnes) (+); - Participation rate of companies at CIVITAS calls (+++); - The use of single windows by the sector (measured in number of transactions) (+).

Domain	Policy performance	Sector performance
Social	- Number of European campaigns on creating a consumer awareness for environmental impact of last-mile transport (+++); - Number of European campaigns on price differentiation via environmental impact of last-mile transport (+++).	- Number of European companies using a tool for showing the environmental impact of last-mile transport to their customer (+, Q); - Number of European companies using a price differentiation via environmental impact of last-mile transport (+, Q).
Environmental	- Number of European promotion campaigns and publications on CO_2 calculation methodologies (+++); - Number of organised trainings on CO_2 calculation methodologies (+++); - Provided European subsidies to SME's for implementing innovative technologies and standards (+++); - Creation of a European standard CO_2 calculation methodology (+++).	- The number of European companies using CO_2 calculation tools (+, Q); - European SME's implementing innovative technologies (Q).

The next table summarises the KPI's for measuring the policy performance and sector uptake of the actions tackling the problem 'Negative environmental impact'.

Table 4.22 KPIs Negative environmental impact

Domain	Policy performance	Sector
Economic	- Number of tax measures implemented for stimulating cleaner technology uptake by the logistics sector (+++); - Number of campaigns organised for horizontal load coordination; - Number of trainings organised for horizontal load coordination (+++).	- Cleaner technology uptake by the logistics sector (e.g. measured in Euro 6 adoption) (++, Q); - Total of fuels used for logistics activities (++); - Total of alternative energy sources used by the logistics sector (++); - Participation to trainings organised for horizontal load coordination(+++); - Average load factor of road transport (+, Q); - Number of tonne-km performed by environmentally friendly vehicles (NGV and Electric) (+++).
Social		
Environmental	- Number of European promotion campaigns on environmental behaviour (+++); - Number of charging points in urban areas (+++); - Financial support offered to the sector for upgrading vehicles and vessels (+++); - Initiatives taken to internalised the external costs of freight transport (+++).	- The environmental behaviour of the sector (CO_2 emissions in total; per mode; per MS) (+++); - Uptake of the financial support offered to the sector for upgrading vehicles and vessels (+++); - External costs of freight transport per mode; per MS (++).

The last of three tables summarises the KPI's for measuring the policy performance and sector uptake of the actions tackling the problem 'Increase shortage of staff'.

Table 4.23 KPI's Increase shortage of staff

Domain	Policy performance	Sector
Economic		
Social	- Initiatives taken to harmonise qualifications and training requirements (+++) - Number of loans and subsidies offered to the sector for training and qualifications improvement (+++) - Initiatives taken to exchange timetables for periodic training of drivers (+++) - Number of European campaigns organised to improve the sector's image (+++)	- Number of open vacancies for truck drivers (+, Q) - Average age of the logistics work force (++) - Number of loans and subsidies taken up by the sector for trainings and qualifications improvement (+++) - Exchange of timetables for periodic training of drivers (+, Q) - Sector's image (Measured by a survey for the general audience on the sector's image) (+, Q)
Environmental		

5. Performance indicators and best practices

5.1 Introduction

Performance of the transport and logistics sector has been mentioned several times in the previous chapters (Ch.2.6 and 4.7). However, data gathering is still challenging. Often, operations and performance are not monitored and reported, both on national and sector/ company level. Therefore, this task of the study focused on the review and analysis of existing methods used to assess logistical performance at the national and company levels as well as the identification of the gaps in currently used methods.

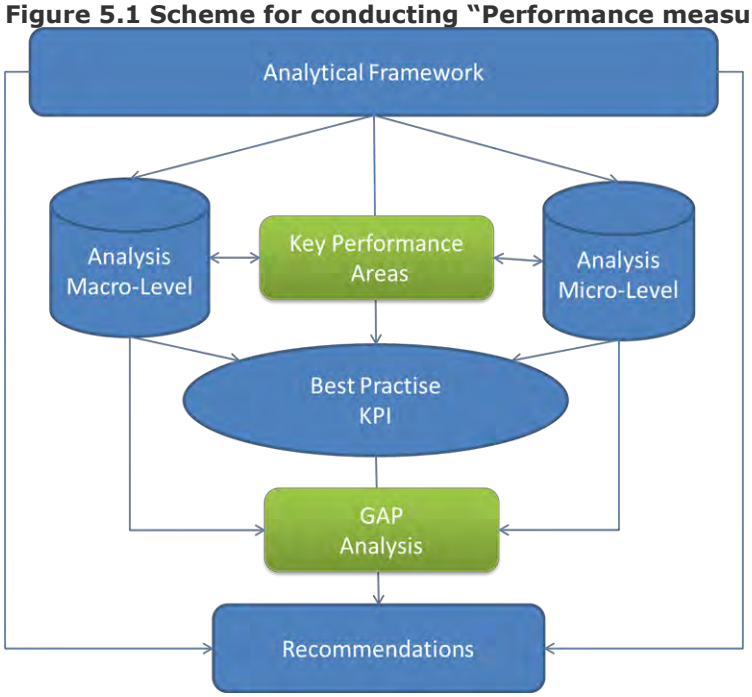
This is based on a consistent and common theoretical framework to identify the main factors, forces and indicators that are needed for each analysis level.

An analytical framework was used to identify Key Performance Areas (KPA) of the logistics sector for alternative levels of analysis (government, logistics industry (third party service providers- 3PL)). Based on this, existing methodologies and measures were reviewed and analysed on macro- level (national level) and micro-level (company level).

The obstacles concerning detailed and comparable statistical data of the logistics sector analysed in chapter 2 were taken into account. These findings are structured and assessed and best practises for different levels are identified. All these are incorporated and concrete proposals concerning the improvement of logistic performance measurement are provided. These recommendations provide references for the concrete evaluation and comparisons of the performance of the logistics sector analysed in chapter 2.

The outline of the approach can be seen in the following scheme:

Figure 5.1 Scheme for conducting "Performance measurement and Best Practice"



In summary, this task:

- identifies main factors, forces and areas to analyse performance of logistics on different levels;

- analyses existing measures to assess logistics performance at national level;
- analyses existing measures to assess logistics performance at company level;
- provides concrete proposals for developing and improving performance measurement in logistics.

5.2 Analytical framework

Much of the literature and research includes several approaches for analysing the external environment of the freight transport/logistics system. For example, the approach developed within the framework of the SUMMA project (SUMMA, 2005) identifies that the interactions of the transport system with the economic and social systems affect its characteristics in terms of demand and supply of freight transport services and output of the transport system with regard to modal choices and traffic streams. Another approach, developed in the BE LOGIC project (BE LOGIC, 2009) suggests that drivers of the external environment affect the characteristics and trends related to the structure, organisation and management of supply chains which in turn have an impact on the characteristics and performance of the freight transport system. While the two approaches identified above are focused on freight transport system performance, the scope of the analysis can be extended to assess and analyse the impact of the external environment on logistics performance. Such extended approach is briefly described below.

The broader external environment comprises multiple, policy goals and directions, evolving economic trends and practices, social and cultural forces, technological advancements, legal and environmental considerations. These drivers affect the development and spatial organisation of the production and consumption of goods and services which in turn influence the demand and supply trends for logistics services, and the performance of the logistics sector (adapted from BE LOGIC, 2009). Demand trends refer to the evolution of demand characteristics for logistics services such as quantities transported, distances over which transportation/distribution takes place, size of shipments, inventory levels, demand for external (third-party) logistics services, demand for different types of 3PL services or demand for value-added services (e.g., aftermarket). Supply trends refer to the evolution of supply characteristics of logistics services, including vehicle characteristics, service provision (e.g., number of 3PL service providers), infrastructure characteristics (e.g., development of transport corridor and terminal infrastructure, development of infrastructure for cargo handling, size/area and location of warehouse/storage facilities).

The analytical framework (adapted from BE LOGIC; 2009) for examining the impact of the external environment on the characteristics of the logistics system is explained in Chapter 3.2.

5.3 Analysis of Logistics Performance Measurement at national level

Currently used approaches to assess logistics performance at national level were reviewed, in particular on EU-country level, but also examples for the USA and China were analysed.

It can be seen that within these approaches the context of "national level" is used in different ways:

- Performance measurement of the logistic sector of a country compared with previous periods (single-country);
- Benchmarking of logistic performance of different sectors within a country and different periods;

- Cross-country performance benchmark between different countries and different periods (multi-country);
- Benchmarking of logistic performance of different sectors between different countries and different periods.

The detailed analyses of the reviewed approaches can be found in Annex VIII.

The SEALS Study (SEALS 2008) and the World Bank Logistics Performance Index (LPI) (World Bank 2014) are important examples:

- As part of the FTLAP, the SEALS study was commissioned to improve knowledge of the logistics sector in the European Union and obtain a better understanding of its characteristics, its development and needs by using available statistics and additional data sources (SEALS, 2008). The SEALS study proposed an assessment scheme based on selected logistics performance indicators that are grouped into the following three key areas: i) macro-economic indicators (e.g., sector employment, turnover, value added, logistics intensity), ii) micro-economic indicators (e.g., cost composition of transport by mode, cost composition of warehousing, profitability margin by transport mode and warehousing), and iii) terminal indicators (e.g., throughput of terminals for commodity groups, terminal/berth productivity, terminal capacity utilization, delivery reliability and days of inventory in distribution centres, port efficiency);
- In a study on the "Trade Logistics in the Global Economy", the World Bank (2014) develops and publishes every two years a global benchmark - the Logistics Performance Index (LPI) – to measure and rank countries in terms of their logistics performance. A multidimensional assessment of logistics performance compares the trade logistics profiles of 155 countries and rates them on a scale of 1 (worst) to 5 (best). The ratings are based on 6,000 individual country assessments by nearly 1,000 international freight forwarders, who rated the eight foreign countries their company serves most frequently. The LPI is unbundled into the following six components:
  I. efficiency of customs and border management clearance;
  II. quality of trade and transport infrastructure;
  III. ease of arranging competitively priced shipments;
  IV. competence and quality of logistics services;
  V. ability to track and trace consignments;
  VI. frequency with which shipments reach consignees within scheduled or expected delivery times.

Furthermore, the six LPI components are mapped into two main categories. The first category involves indicators related to areas for policy regulation as input to the supply chain (e.g., customs, infrastructure, services), while the second pertains to supply chain performance outcomes (e.g., timeliness, cost, reliability). The components were chosen based on recent theoretical and empirical research and on the practical experience of logistics professionals involved in international freight forwarding. The study also includes a set of domestic performance indicators for 143 countries. For these data, survey respondents assess the logistics environments in the countries where they work, providing information on the quality of infrastructure, the performance of core services, the friendliness of trade clearance procedures and the time, cost and reliability of import and export supply chains. These domestic indicators help to define logistics constraints within countries, not only at the gateways, such as ports or borders. They analyse the major determinants of overall logistics performance, focusing on country performance in the major determinants of overall logistics performance: infrastructure, services, border procedures and time, and supply chain reliability. The LPI uses standard statistical techniques to aggregate the data into a single indicator. This single indicator can be used to compare countries, regions, and income groups.

The detailed analyses of the reviewed approaches can be found in Annex VIII.

To summarize the analysis, the following conclusions can be made, which are also the bases for the further concrete evaluation and comparisons of the performance of the logistics sector analysed in chapter 2.

The overview and the fact sheets show that there are mainly three approaches regarding logistics performance measurement on national level: 1) statistics-based, 2) questionnaire-based and 3) case studies and other studies. The reviewed studies distinguish between national, multi-national studies and logistics performance measurement of different industry classes or logistics service providers and the logistics sector as a whole. Additionally the reviewed studies can be clustered regarding the thematic broadness and key performance areas covered:

- Questionnaire-based studies seemed to be the most popular study approach for logistics performance measurement on national or cross-country level (here 8 from 15);
- They are usually dealing with a broader thematic content and cover multi-key performance areas (here 6 from 8). While statistic-based studies (all 4) are in particular dealing with single thematic performance measurement;
- "Logistic costs" as the most commonly used key performance indicator for logistic performance measurement on national level are usually studied in all statistic-based and questionnaire-based studies as part of multi-theme study;
- Different metrics for "Logistics costs" as a performance indicator can be found:
- % of sales, % of total costs, % of turnover, % of GDP, % of purchases and absolute costs. The main used metrics used to benchmark logistics costs as performance measurement are:
    - % of GDP;
    - % of sales or turnover;
    - absolute costs.
- The commonly used components of "Logistics Costs" are:
    - transportation;
    - warehousing;
    - inventory carrying;
    - administration;
    - all other logistics-related costs.
- It is not possible to conclude, which study approach generates more reliable results. But the common factor of questionnaire-based surveys is that the results are based on subjective answers of chosen sample size and structure and difficult to compare between surveys;
- It may be concluded that available official statistics are sufficient and can be used to model and measure "logistics costs" as a key indicator in a valid and comparable way on national level;
- However, it seems that there is a lack of statistic-based studies and approaches to measure the performance of multi-thematic key performance areas, e.g. service levels (time, frequency, reliability, connectivity, responsiveness), environmental sustainability (emission, noise, energy use), social (safety, security), other (capacity, utilisation). The studies: "World Bank -Logistic Performance Index- LPI", "Finland State of Logistics" and "State of French Logistics" seem to gather the broadest view of logistics performance measurement on national level;
- Efficiency of trade facilitation especially of customs and border management clearance seems to be an important dimension of logistical efficiency at national level;
- There is a lack of consideration and measurement of sustainability, especially environmental sustainability, as part of an important Key Performance Area of the logistics sector on national level;

- Furthermore, most of the studied logistics performance measures are generally static and provide a cross-sectional analysis of performance rather than a dynamic picture of performance development.

5.4 Analysis of Logistics performance measurements on company level

The "Company level" analysis focussed on Logistics Service Providers and especially on "Third Party Logistics Service Providers" (3PL) or company´s logistics department who manages own account logistics and transports or hire / reward haulage.

In order to analyse the performance indicators for Logistics Service Providers, a literature review was conducted in several fields: literature on performance measurement in general, then focusing on Logistic Service Providers and on 3PL as special activity based service providers. With this literature review the question to be answered was: What performance measurement approaches and indicators for Logistics Service Providers are proposed in literature and how useful are they?

The detailed analyses can be found in Annex VIII.

To summarize, the following conclusions can be made:

- The literature review shows that Logistics Performance Measurement on company level is still a difficult task. It seems that in general there is a lack of unique adequate performance measurement systems especially for Logistics Service Providing companies which cover all relevant areas. It has been observed that available frameworks have different basic problems:
  - There is no specialisation of performance measurement for 3PL;
  - Consideration is mainly focused on financial or costs aspects;
  - One problem with performance measurement is that the main focus is given to individual business performance, instead of performance of the whole supply chain. To measure performance in the supply chain, with different owners, horizontal measurements instead of vertical are useful. Those measurements should cover aspects of productivity, cost, service and customer and employee satisfaction;
  - The specification of used indicators is very unclear and still not optimized. In a study of customer perception of 3PLs, over 90 % of the businesses said that they are considering further development of their KPIs to evaluate their 3PL business (Wilding & Juriado, 2004). This indicates dissatisfaction with the KPI that have currently been used.

To evaluate logistics performance a broad perspective has to be taken into account for all the parts of a business. In general commonly named KPAs are effectiveness, efficiency and productivity. Productivity merges effectiveness, efficiency and quality into one by comparing the input and output. The next important criterion is employee development, which means the attractiveness of the logistics profession. These are two subjective criteria that are difficult to measure. Profitability is often being used as the most important area to measure performance. Both hard and soft measurements have to be used to measure these criteria for performance.

It can be concluded that there is the need for standard performance metrics or indicators related not only to logistics costs but to a wide range of areas at the company level.

5.5 Key Performance Areas (KPA) and Key Performance Indicators (KPI)

As discussed, a variety of studies, frameworks and models have been developed to assess the performance of logistics. These tools may cover the needs for different levels of analysis, e.g. national, and company levels, may be used by particular types

of stakeholders, e.g. public agencies, large companies, SMEs etc. and may provide different types of capabilities, e.g. performance optimization, performance monitoring, performance assessment etc. However, as explained, most of the frameworks do not cover entirely the main elements of logistics. Therefore the identification of the key consideration areas (Key Performance Areas) and related indicator frameworks, related not only to logistics costs but to a wide range of areas at national and company level, are necessary.

5.5.1 Key Performance Areas (KPAs)

The objective of the identification of Key Performance Areas (KPAs) of the logistics system is to provide the basis for a more detailed analysis of logistics performance at national and company level. A KPA is one of the strategic dimensions in which logistics performance is disaggregated. Each KPA is measured by detailed performance indicators (Key Performance Indicators – KPIs).

The selection of logistics KPAs takes into account academic research and professional studies relevant to logistics performance assessment concepts and verifies this based on the results of the questionnaire. The study will identify weaknesses and gaps in the existing logistics performance assessment approaches and tools and will develop recommendations for logistics performance assessment.

At the outset, the selection of logistics KPAs should reflect the priorities of European policy set out in official policy documents such as White Paper on the Roadmap to a Single European Transport Area (European Commission, 2011c) and the Freight Transport Logistics Action Plan (FTLAP) (European Commission, 2007a; 2007b), and the main problems currently perceived as most relevant for the competitiveness of the EU logistic sector that were identified in the section of "Problem definition" in chapter 4.2 and also in the stakeholder consultation performed within the framework of this study. The selection of logistics KPAs should also enable the comparisons on national or company level.

Taking into account the key results of existing research and studies on logistics / supply chain performance, the key priorities and objectives of relevant policy documents, and the main current problems of the logistics sector analysed in chapter 5.3 and 5.4, a list of Key Performance Areas (KPAs) is suggested for the logistics sector for the different perspectives / levels of analysis (i.e., national, company). The table below summarizes the results of this review and highlights their linkage to the six KPAs.

Table 5.1 Main issues and problems in logistics sector, their association with the KPAs selected and applicable levels of analysis

KPA	Main issues / problems	National	Company (3PL/ industry)
Efficiency	▪ Improved loading factors;	✓	✓
	▪ Improved management of freight flows;	✓	✓
	▪ Frequency with which shipments reach consignees within scheduled or expected delivery times;	✓	✓
	▪ 3PL usage (e.g., revenues, % and composition of total logistic expenditures, outsourcing, consolidation of 3PL service providers, types of		✓

KPA	Main issues / problems	National	Company (3PL/ industry)
	services offered vs. demanded); ▪ Improved utilisation of transport and terminal infrastructure; ▪ Improved interoperability / interconnectivity of infrastructure; ▪ Improvement of harmonisation and uniform interpretation of rules and procedures; ▪ Trade facilitation (removal of administrative barriers / efficiency of customs and border management clearance).	✓ ✓ ✓ ✓	✓
Effectiveness	▪ Ability to track and trace consignments; ▪ Flexibility of service; ▪ Reliability of service.	✓	✓ ✓ ✓
Costs	▪ Energy costs; ▪ Operating costs; ▪ Cost of last-mile logistics; ▪ Costs of infrastructure use; ▪ Taxation.	✓ ✓ ✓	✓ ✓ ✓ ✓
Environmental sustainability	▪ Switch to cleaner fuels; ▪ Use of less energy; ▪ Improvement of energy efficiency of vehicles across all modes; ▪ Improvement of terminal environmental performance and energy efficiency; ▪ Reduction of negative impact on the environment and key natural assets.	✓ ✓ ✓ ✓ ✓	✓ ✓ ✓
Employment development	▪ Higher competence levels, mobility and attractiveness of logistics professions; ▪ Improvement of knowledge in the logistics sector.	✓ ✓	✓ ✓
Safety/ Security	▪ Identified through additional literature review as an important aspect of performance.	✓	✓

An elaborate discussion on the selected KPAs and their interpretation and possible draft KPIs is provided in the following:

Efficiency

Logistics efficiency is generally defined as "how well the resources expended are utilised" and can be defined as "the ratio between the normal level of outputs over the real level of inputs" (Mentzer and Konrad, 1991). It is a measure defining how wisely the logistics function manages available resources. There is no commonly accepted definition of logistical efficiency at national level. However, elements of efficiency that are in line with the definitions presented above are included in studies (e.g., World Bank, 2012) and statistical resources of logistics performance at national level. Such elements may include:

- Vehicle utilisation (utilisation of available capacity of vehicles in terms of load factors, empty runs etc.);

- Cargo handling efficiency (efficiency of use of cargo handling equipment at storage facilities and terminals / transhipment points);
- Infrastructure utilisation (efficiency of use of space and infrastructure of storage facilities and terminals / transhipment points);
- Frequency of on-time shipments arrival and despatch (World Bank, 2012).

Trade facilitation is probably the most important dimension of logistical efficiency at national level, which can be influenced by national logistics policies. The FTLAP considers simplification of trade (e.g., paperless information flows, simplification of transport documents) as one of its key dimensions. The Logistics Performance Index includes trade facilitation in its dimensions (World Bank, 2012) as "the efficiency of the clearance processes (speed, simplicity and predictability of formalities) by border control agencies, including customs".

Infrastructure utilisation is also a key dimension of efficiency at national and company level. At national level, infrastructure utilisation focuses on the reduction of congestion of the transport network, which constitutes a major concern, particularly in road and air transport, and compromises accessibility to transport services and efficiency of logistical services. It also refers to levelling of demand throughout the European transport system, and the development of special freight transport corridors optimised in terms of energy use and emissions, minimising environmental impacts, but also attractive for their reliability, limited congestion and low operating and administrative costs. Terminal and cargo handling infrastructure utilisation is positively related to the quantities of freight transported and handled through terminals and to the efficiency of the logistics system.

From a company/service provider's viewpoint, efficiency of the logistics system refers mainly to operational efficiency (Lai et al, 2003; Hamdan and Rogers, 2008, Fugate et al, 2010). Operational efficiency includes performance dimensions, such as:

- Capacity utilisation (warehouses and other cargo handling facilities, vehicles);
- Logistics process efficiency (proportion of time in which the cargo inventory is active/moving in logistics activities, average order cycle time);
- Stocking efficiency (inventory turns);
- Workforce efficiency (throughput and productivity of workforce).

Effectiveness

Logistics effectiveness can be defined as the ability of the logistics system to provide its services according to end-customer requirements and pre-specified service standards (Tsanos and Zografos, 2012). Stated otherwise, it is defined as "the degree to which a goal is achieved" (Mentzer and Konrad, 1991). On the basis of the characteristics of fulfilment of customer requirements and adherence to service standards, logistics effectiveness includes such aspects as service punctuality (e.g., delivery reliability), service consistency / predictability, service accuracy (e.g., error-free service fulfilment) and service traceability.

According to Christopher (2005), the reliability of the logistics system is strongly related to the capability of service providers to reduce uncertainty in the provision of logistics services. But also, reliability of the logistics system is influenced by national policies on customs, infrastructure and service quality. Dimensions of effectiveness of the logistics system include:

- Accuracy of order fulfilment (i.e., error-free orders);
- Punctuality (on-time provision of logistics services);
- Delays (not forced by external factors);
- Condition of cargo (cargo should reach the recipient undamaged);
- Cargo visibility / traceability through the supply chain.

From a national perspective, the dimensions of service punctuality and delays are highlighted. The LPI study (World Bank, 2012) investigates these dimensions in terms of percentage of shipments that are delayed and identifies categories of delays (e.g., compulsory warehousing, inspection, transhipment). Important dimensions of logistics effectiveness at national level are timeliness and the predictability of clearance procedures, the lack of which contributes to delays and overall declining logistics performance. Finally, the visibility of consignments throughout their movement in the logistics system also contributes to the overall effectiveness of logistics service provision.

From a company/3PL perspective, all of these dimensions are common in the relevant literature on logistics effectiveness (e.g., Lai, 2004; Liu and Lyons, 2011). In that context effectiveness from company perspective mainly refers to the extent to which customer requirements are met (Lai, 2004) and the main components are the performance and the quality level.

The targets of the performance level are mainly velocity, system utilization, flexibility and sustainability. The quality level aims for quality management, reliability and robustness of the system (Schmidt 2009).

Costs

"Logistics costs" is a commonly used business key performance indicator, both on national and company level. Typically logistics costs can be divided both on national and company level by the following cost components:

- transportation;
- warehousing;
- inventory carrying;
- administration;
- all other logistics-related costs.

The importance of the logistics sector in the European economy accentuates the significance of cost containment efforts from the point of view of both the government and the logistics sector. From the national (government) perspective, high logistics costs (in absolute values) are a significant factor hampering national competitiveness (Rantasila and Ojala, 2012). Indeed, countries with higher costs tend to have a lower ranking in the World Bank LPI Index (Rantasila and Ojala, 2012). In addition, the proportion of logistics costs in relation to GDP and over total sales or turnover are key indicators of logistics performance at macro level. In this respect, national authorities can reduce logistics costs as a percentage of GDP by intervening in the regulatory/administrative and infrastructure-related aspects of logistics activities.

From the industry viewpoint, logistics costs as a percentage of total production cost or sales or turnover is a major indication of company competitiveness. In this respect, the contribution of 3PL service providers in reducing logistics costs of shippers is of paramount significance; indeed, shippers and 3PL view their relationships as successful when 3PL providers report savings from logistics cost reductions, inventory cost reductions and fixed asset reductions (C. John Langley, Ph.D. and Capgemini, 2012). In addition, the proportion of logistics expenditures for outsourcing over the total logistics spending illustrates the relative size of the 3PL sector.

Environmental sustainability

From a public / national policy perspective, environmental sustainability in logistics is focused on reduction of negative externalities from transport such as emissions, contamination and noise as well as reducing the energy use of the sector. The European Union has set an ambitious goal of reducing transport-related emissions by at least 60% in 1990 levels by 2050 (European Commission, 2011c). Total carbon footprint estimation for freight trips is encouraged through the adoption of greenhouse

gas certification schemes and development of common EU standards. With regards to energy use, the use of less and cleaner energy is the most important goal of European transport policy. This can be achieved through modal shift (shift of 50% of long-haul road freight to rail and waterborne transport), green freight corridors, use of alternative energy and cleaner sources, eco-driving and fuel-saving techniques as well as more efficient technologies and supporting administrative measures (e.g., fuel taxes, speed limitations of freight vehicles etc.).

Environmental sustainability of logistics is gaining importance also among shippers and service providers (World Bank, 2012). From a 3PL/company perspective, the most important aspects of environmental sustainability aspects also relate to transport decisions, both because environmental performance of 3PLs is increasingly a contract requirement of customers as well as a means to reduce costs. Energy efficiency (e.g., shifting freight to more fuel-efficient modes, acquiring more fuel-efficient vehicles), emissions, use of alternative fuels and vehicle efficiency (reduction of idling time, freight consolidation) are mentioned by the largest 3PL service providers as steps towards sustainability (Lieb 2010).

Safety / Security

Security in the supply chain is defined as "the application of policies, procedures, and technology to protect supply chain assets (product, facilities, equipment, information, and personnel) from theft, damage, or terrorism and to prevent the introduction or unauthorized contraband, people or weapons of mass destruction into the supply chain" (Closs and McGarrell, 2004). Supply chain safety is defined as "the protection [of supply chain activities] from unintended hazards [and] random events such as natural catastrophes or carelessness and negligence" (Tandler and Essig, 2012). With regards to logistics, security and safety refer to the protection of logistics activities (i.e., freight transport, warehousing / inventory management, order processing) from intended malicious acts and from unintended hazards and random events respectively. Security refers to physical security of freight and logistics infrastructure (e.g., transport network, terminals, freight management infrastructure) and cyber-security for IT systems, networks, data and software of actors participating in logistics activities (e.g., 3PLs, government authorities, terminal operators).

The role of the public sector / government in supply chain security is to develop and endorse processes and standards that, when implemented by all parties concerned, ensure an acceptable level of security of physical (e.g., transport, terminals) and digital infrastructure (e.g., information networks, data exchange) and guarantee the proper operation of transport and logistics infrastructure under normal conditions but also their resilience in the event of an intentional disruption. This is also the focus of the FTLAP in the field of security, i.e., to develop standards for the secure integration of transport modes in the logistic chain (European Commission, 2007a). Thus, logistics security concerns of the public sector relates to preparedness and "prevention from crime, banditry and unlawful intentional acts such as terrorism" (European Commission, 2007a). On the other hand, logistics safety concerns of the public sector relate to issues such as transport mode safety (road, rail, air, maritime), accidents and other negative externalities that threaten the safety of cargo, workforce as well as that of the general population.

For the industry, the focus of logistics security is to ensure alignment and conformance with the national security procedures and standards that guarantee "delivery of a product that is uncompromised by intentional contamination, damage or diversion within the supply chain" (Marucheck et al, 2011), and the associated financial and information flows. Similar are the concerns related to safety, i.e. conformance with safety standards and procedures that minimise potential unintended damages in the handling, transport and stowage of cargo and in the relevant

infrastructure, and ensure the safety of the personnel involved in the logistical operations.

Employment development

The FTLAP stresses the importance of enhancing the attractiveness of the logistics profession and encouraging staff mobility across borders (European Commission, 2007a). Training, enhancement of qualifications, lifelong learning and certification of competences are suggested as ways to achieve these objectives. A central issue related to employee competences is the harmonisation of logistics skills across Europe through the development of training standards and a Europe-wide logistics qualification and skills certification scheme (European Commission, 2007a, 2007b). Research on employee development, i.e., the provision of organised learning experiences by the employer to enhance performance and personal growth of employees (Tansky and Cohen, 2001), identifies the following issues as important:

1. the lifelong development of employee competences (Birdi et al, 1997);
2. the creation of favourable working environment that can support e.g., work-life balance, family-friendly employment, flexible working schedule, workforce health and safety;
3. the improvement of employee flexibility in terms of being able to undertake different jobs within the logistics profession; and
4. the overall long-term career planning of employees (Birdi et al, 1997, Noe et al, 1997).

Thus, taking into account the objectives of the FTLAP, key aspects of employee development that can be achieved both at national and at company/3PL level are:

- Mobility, i.e., ability of employees to take up jobs in logistics across borders (European Commission, 2007a);
- Versatility/cross-training, i.e., ability of employees to satisfy labour requirements outside their primary skill (Brusco et al, 1998); and
- Career advancement, i.e., work experiences of employees in which their responsibilities, skills, authority, commitment and rewards increase over time (Brett, 1997).

5.5.2 Key Performance Indicators (KPIs)

Logistics KPIs were developed to measure the functioning of the logistics sector. They enable monitoring the evolution over time and compare=ing and benchmarking the performance of the sector across countries or across different companies. A general rule for KPIs is that they have to be simple, clear, concrete and limited to transparent numbers (Peterson/Zantvoord 2012).

Based on the previous analysis, in this section a Best Practice sample is suggested of the most important KPIs for the different levels of analysis- national and company level- and for the main Key Performance Areas (KPAs). In general most of the indicators are well known and use logistical parameters that could be measured and compared in a quantifiable way. But there are also performance indicators that are difficult to quantify and measure, e.g. flexibility of service providers. One way to deal with these kinds of soft measures is to seek expert assessment, e.g. giving a scale of 1 to 10. The sample is not meant to be exhaustive or final. The indicators specified constitute a starting point and the list may be modified as results of discussions and availability of new data.

The sample list of indicators presented in the following table includes the indication whether the indicators are mainly qualitative (QA) or quantitative (QF) measurable.

In addition an assessment of data availability for each indicator is included:

S - basic data currently available;
M - basic data partially available; needed efforts for improvement;
L – basic data not available; needed efforts for collection and concepts.

Table 5.2 Sample Good Practice of Key Performance Indicators for Logistics

KPA	Performance Indicators	
	National level	Company level
Efficiency	Logistics process efficiency (QF/M)	
	Capacity utilisation (QF/L)	
	Clearance processes(QA/M)	
		Profitability (QF/L)
Effectiveness	Value added of Logistics (QF/M)	Reliability (QF/L)
	Logistics turnover (QF/M)	Quality (QA/L)
		Flexibility (QA/L)
		Regularity (QA/L)
Costs	Logistics costs (QF/M)	
Environmental sustainability	Emissions of air pollutants (QF/M)	
	Energy consumption (QF/M)	
	Emissions of noise (QF/M)	
Safety / Security	Security of infrastructure and transport facilities (QA/L)	Damages / Losses /Accidents (QF/M)
Employee development	Logistics sector employment (QF/M)	Satisfaction of personnel (QA/L)
		Labour productivity (QF/M)
	Qualified labour (QA/L)	

The overview of the main objectives and description of the indicators can be found below.

In addition Annex IX shows the complete detailed aspects of the indicators e.g. objectives of the indicators, measurement possibilities, data quality and availability and reference studies or sources.

Efficiency:

- Logistics process efficiency:
  The indicator shows the logistics intensity as the percentage ratio of logistics costs (inputs) as share of total production cost. The indicator intends to show how efficient the "production" of logistics services in terms of costs is in comparison to the overall production costs. The measurement of logistics intensity can be used for inter-country comparison as well as for comparisons over time.

- Capacity utilisation:
  This indicator shows how much capacity is used and intends to quantify the extent to which the available resources are used. On national level it refers mainly to transport vehicle utilisation, cargo handling efficiency and Infrastructure utilisation. From the viewpoint of service provider, capacity utilisation refers mainly to operational performance dimensions, such as warehouses and other cargo handling facilities, and vehicles.

- Clearance processes
  This indicator intends to benchmark the efficiency of the clearance processes by border control agencies, including customs. This important trade facilitation dimension relates mainly to national level. The efficiency of international logistics

processes is strongly related to the clearance processes by border control agencies, including customs. Complex and inefficient customs clearance processes create serious bottlenecks.

- Profitability:
  This indicator shows the efficiency of performance on company or sector level. To monitor the profitability performance of logistics companies is to look on the profit margins per company or per sector.

Effectiveness:

- Value added of logistics:
  The indicator represents the contribution of the logistics sector to national economy. The benchmark and analyses of the indicator between countries and over time shows the interdependences between logistics activities and economic development. It measures the economic performance and effectiveness of the sector at national level.

- Logistics sector turnover:
  The indicator is closely related to the indicator "value added of logistics" but incorporates additionally the intermediate consumption of the sector and is suitable to benchmark and monitor development per country over time.

- Reliability of service:
  The indicator intends to show an overall reliability of the operation and service performance on company level, including:
  - Variation in transit times: Indicates the reliability of the transportation function;
  - Accuracy of order fulfilment (i.e., error-free orders): Indicates the reliability of complete shipments;
  - Punctuality (on-time provision of logistics services): Assesses the number of cases the logistics service fulfilled on time.

- Quality management
  The indicator intends to evaluate the overall quality management performance of services on company level in terms of:
  - Service visibility / traceability through the supply chain:
    The availability and accuracy of tracking and tracing system of the supply chain internally and for the customer enables monitoring the status of the service.
  - Quality systems:
    The presence of certifications resp. quality assurance systems certifies a company to a higher extend of quality and is therefore more attractive.
  - Information flow:
    The indicator should assess how good the communication is between LSP and customers. It may concern general communication as well as electronic data interchange.
  - Customer satisfaction
    The indicator assesses the percentage of complaints of the logistics service.

- Flexibility
  The indicator intends to evaluate the capacity of flexibility in offering and fulfilling logistics services on company level:
  1. Ability to adapt changes in demand and capacity: How flexible are offered logistics services regarding variation of volumes, capacity, size and special requirements;

2. Ability to adapt changes in time table: When is the last possibility to make changes in fixed activities, e.g. to change a destination or source point of a shipment;
3. Ability to cope with unexpected disruptions: The indicator assesses the general flexibility of logistics services to cope with serious disruptions, e.g. cancellations, strikes etc., or urgent/unexpected deliveries.

- Regularity of services:
  This indicator evaluates the regularity of service performance on company level in terms of:
  - the ability to offer custom made services;
  - on-time service provision.

Costs:

- Logistics costs

"Logistics costs" is a commonly used business key performance indicator, both on national and company level. Typically Logistics costs can be divided into the following cost components:

- transportation;
- warehousing;
- inventory carrying;
- administration;
- all other logistics-related costs.

On national level the benchmark of the level of logistics costs as total annual expenditure on logistics services per country and logistic market segments. It can be used to measure the size and competitiveness of the logistics sector per country.

To benchmark costs structure on company level, it can be assessed per cost components as percentage of total costs and also as percentage of transport performance (tkm).

Environmental sustainability:

- Emissions of air pollutants:
  The indicator intends to evaluate the negative environmental emissions of air pollutants caused by logistics sector.

  Reflecting the performance in the area of environmental sustainability, the emissions of air pollutants of the logistics sector is an important indicator to compare the environmental sustainability of the sector on country or company level. Main pollutants are CO_2, NOx, NMVOCs, PM10, SOx. The emissions of the sector are mainly caused by transport logistics.

- Energy consumption:
  The indicator intends to evaluate the final energy consumption of the logistics sector.

  Reducing final energy consumption and therefore emissions of air pollutants is an important policy objective. This indicator will benchmark the performance of logistics energy consumption both on national and company level.

- Emissions of noise:
  The indicator intends to evaluate the emissions of noise caused by the logistics sector.

  Emissions of noise of the logistics sector are mainly relating to transport logistics. Reducing transport noise both at source and through mitigation measures to ensure

overall exposure levels minimize impacts on health; is an important policy objective. Therefore an indication of noise is an important indicator both at national and company level.

Safety / Security:

- Damages / Losses / Accidents:
  The focus of service providers is to secure the safety and security of products and working staff during transport and handling in terms of:
  1. Avoiding damages (including accidents);
  2. Avoiding losses and thefts;
  3. Avoiding accidents of employees.

- Security of infrastructure and transport facilities:
  National authorities are responsible for providing the infrastructure and transport facilities needed to ensure an acceptable level of physical security of the logistics supply chain as well as guaranteeing the proper functioning of transport infrastructure services under normal conditions as well as in the event of a natural disaster. Therefore, the security of infrastructure and transport in order to protect the supply chain and critical nodes is an important indicator on national level.

Employment development:

- Logistics sector employment:
  This indicator represents the share of employment of the logistics sector. The comparison between countries indicates the importance and benefits of the sector to national economy regarding employment effects.

- Satisfaction of personnel:
  The level of satisfaction of personnel at company level could also be an indicator comparing issues such as the development of personnel competence, the creation of favourable working conditions (e.g., work-life balance, family-friendly employment), the employment of disadvantaged groups (e.g., older people, disabled) on company level.

- Labour productivity:
  Labour productivity is the output generated per hour of work undertaken. Improvements in labour productivity intend to monitor the efficiency of logistics operations per workload.

- Labour skills of the logistics sector:
  This indicator evaluates the qualification and skills of the personnel in the logistics sector or per company. The topic of workforce engagement and personnel relates to the creation of working conditions and environment that enables employees in the logistics sector to improve their efficiency and skills. This includes issues such as the development of personnel competence, the creation of favourable working conditions (e.g., work-life balance, family-friendly employment), the employment of disadvantaged groups (e.g., older people, disabled). Development of personnel competence refers to the increase and harmonisation of logistics competence across Member States through the development of minimum training standards and a Europe-wide logistics qualification and certification scheme.

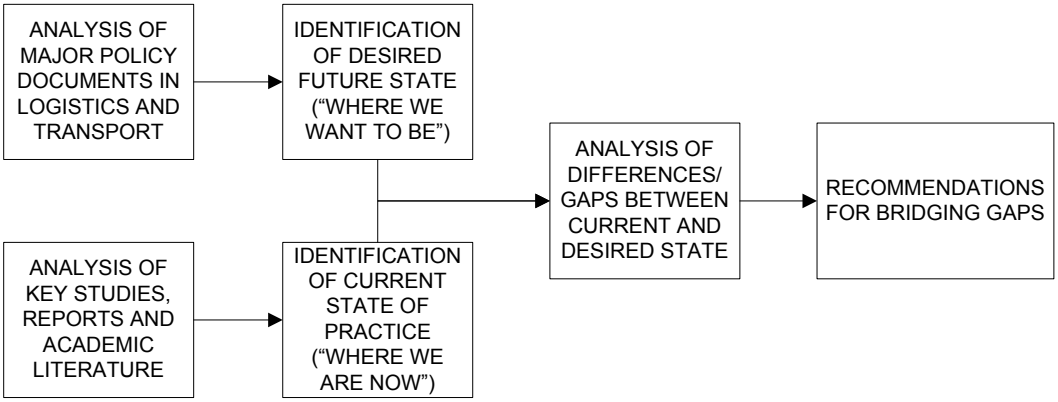
5.6 Gap analysis and recommendations

5.6.1 Framework for analysis

The previous sections reviewed the most important policy documents reflecting European priorities in the field of logistics and transport, as well as key studies investigating/suggesting performance objectives for EU transport and logistics based on EU policy priorities. This review led to the identification of the most important problems / performance issues that the logistics sector currently faces. These problems / performance issues were classified in six major KPAs (efficiency, effectiveness, costs, environmental sustainability, safety/security, employment) for the logistics sector covering policy goals and requirements at EU and national level and performance requirements for logistics service providers.

The above-mentioned analysis of major policy documents and key studies also determines the requirements that logistics performance measurement should fulfil in order to support the attainment of the policy goals. These requirements demonstrate the ideal or "where we want to be" status of logistics performance measurement. On the other hand, the analysis of existing performance measurement approaches at national and company level indicate the current state-of-practice, i.e. the "where we are now" status in logistics performance measurement. The objective of the gap analysis is to determine the differences and identify the gaps between the current state of practice in logistics performance measurement and the desired future state. Based on the findings of the gap analysis, recommendations are provided as to how the identified gaps can be bridged. The approach for performing the gap analysis and developing recommendations is illustrated in Table 5.3.

Table 5.3 Approach for gap analysis and recommendations



5.6.2 Gap analysis

The current and the desired future state in EU logistics performance measurement based on major policy documents are illustrated in the side columns of Table 5.4. The middle column highlights the gap between the current (left side) and desired state (right side).

Table 5.4: Gap analysis of current vs. desired state of logistics performance assessment

CURRENT STATE	EXISTING GAP	DESIRED STATE
Multitude of national logistics performance measurement approaches	Gap in the **geographical disparity** of logistics performance measurement	EU-wide approach to logistics performance measurement
Focus on single or (at best) limited number of performance dimensions	Gap in the **breadth** of performance dimensions encompassed	Consideration of multiple logistics performance dimensions
Multitude of definitions in national and corporate logistics performance measurement systems	Gap in the level of **homogenisation** of logistics performance measurement components	Harmonisation of definitions, metrics and data collection and reporting protocols
Use of primarily subjective data for logistics performance assessment	Gap in the **data mix** for logistics performance assessment	Greater use of objective data for logistics performance assessment
Data unavailability / temporal gaps in the publication of logistics performance data	Gap in the **availability** of logistics performance data	Continuous and timely data availability for supporting policy evaluation
Performance assessment limited to logistical activities of the focal firm	Gap in the **scope** of logistics performance assessment	Consideration of the integrated supply chain in performance assessment at company level

The gap analysis identifies six major gaps in logistics performance assessment: geographical disparity (multitude of national vs. the advantages of the existence of a EU-wide system), scope of performance assessment (focus on focal firm vs. need for supply chain-wide performance assessment), breadth (limited dimensions vs. multiple dimensions), measurement approach/type (mostly subjective data vs. consideration of objective data), homogenisation (many definitions, metrics, measurement protocols vs. harmonisation), availability (temporal gaps in data publication vs. continuous and timely availability).

Not all gaps in logistics performance assessment are applicable to the two levels of analysis (national, company/3PL); in addition, the context of some of the identified gaps differs between the two levels of analysis. In specific:

- Data availability in the company/industrial level may be subject to serious confidentiality issues as well as the unwillingness of companies to disclose data from which it may be easier to distinguish their relative position in the industry; in contrast, in the collection and processing of such data at a more aggregate (e.g., national) level by a national authority this barrier may not be so prominent;
- The gap related to the scope of performance assessment is applicable at industry level and refers to the current focus on intra-organisational logistics performance and the desire for broadening the scope of performance to a multi-organisation / supply chain level. The scope of logistics performance at national/government level is by default focused on supply chain level. As such, it encompasses dimensions such as the policy environment of the country

(trade facilitation, customs and borders management), the infrastructure of supply chain activities, the quality of services offered by logistics service providers, and efficiency across the supply chain.

5.6.3 Recommendations

Recommendation 1: Encourage/promote the development of an EU-wide framework for logistics performance assessment (national and company/3PL level)

The existence and use of a multitude of national logistics performance approaches in Europe has been highlighted in the review presented in last sections. These logistics performance systems obviously reflect national priorities. However, the implementation of EU-wide policies for logistics activities (e.g., Freight Transport Logistics Action Plan) requires monitoring their impact across Europe and within individual EU member states. Moreover, the implementation of such policies affects the organisation, operation and performance of the entire logistics system. It is therefore recommended to encourage the development of an EU-wide framework for national logistics performance assessment that should enable comparison of national logistics performance across the EU and between EU member states and at the same time consider specific national logistics policy priorities.

In addition, the review of performance assessment approaches at company/3PL level has highlighted that there is no specialised performance assessment framework for 3PL service providers. Performance assessment of 3PL service providers is important in the context of outsourcing of logistics activities, as it enables customers to determine service levels in contracts with 3PLs and monitor the performance of 3PLs throughout the contract duration. It is therefore encouraged to develop an EU-wide framework for 3PL performance assessment that should enable customers of 3PLs to set and monitor 3PL service level goals.

The development of an integrated EU-wide logistics performance assessment framework would require an EU-wide harmonisation of objective performance indicators in terms of i) definition, ii) metrics, iii) data collection protocols, iv) reporting. Harmonisation should also be pursued in terms of data requirements (e.g., sample size, sample composition, etc.) for each performance indicator. Logistics costs, as a multi-component performance measure, should especially be harmonised in terms of the categories of costs it comprises.

It is therefore recommended that the European Union undertakes the task of harmonising logistics performance indicators in close consultation with major stakeholders in the European logistics sector. The aim should be to reach for, as broad as possible, a consensus on the i) definition, ii) metrics, iii) data requirements, iv) data collection protocols, v) reporting of the harmonised indicators. It is reasonable that the task of harmonisation should be the responsibility of the European observatory on logistics performance measurement (see Recommendation 2) as a prior action to the development of the EU-wide logistics performance measurement scheme.

More specifically, actions that could be undertaken in this direction include:

- Develop a European observatory on logistics performance assessment that will comprise national logistics stakeholders (e.g., national logistics associations, statistical authorities) from each Member State. This network will develop the EU-wide logistics performance assessment scheme; the stakeholders will be responsible for the collection of logistics performance data at national (member state) level. An example of such a network is the Logistics Performance International Observatory (Rantasila and Ojala, 2012);

- Produce an annual report on the State of European Logistics that will include the logistics performance data collected through the EU-wide logistics performance assessment scheme;
- Review the state-of-the-art in European policy at regular intervals (e.g., every 2 years) in order to identify potential changes in the policy priorities that may impose updates/changes to the performance assessment framework (e.g., re-prioritisation of performance categories / indicators, inclusion / omission of performance categories).

Recommendation 2: Shift the focus from single-criterion (e.g. cost-oriented) performance assessment to multiple-criteria performance assessment

One major conclusion of the review of logistics performance systems is that the main (or in some cases sole) focus of performance is on single performance criteria, such as logistics costs (total and/or per logistics activity) and (less frequently) efficiency and effectiveness. This one-dimensional concept of logistics performance is rather limited in light of policy developments which require a broader view of transport and logistics performance, however comprehensively the cost dimensions may be specified. Performance assessment approaches such as the Triple Bottom Line (3BL) approach, which incorporates the concept of sustainability in policymaking and corporate decision-making and considers the three dimensions of social, environmental and financial performance, may constitute the basis of logistics performance measurement in the future. It is therefore recommended to emphasise the importance of a multi-criteria approach for logistics performance assessment both at national and at company level. It is suggested that at least the following performance dimensions be additionally considered:

- Environmental sustainability;
- Safety and security;
- Employment/Labour.

Logistics performance measurement that incorporates multiple performance dimensions should be complemented with a prioritisation process of these dimensions. This is necessary for two reasons. Firstly, national logistics policy priorities may differ between member states; therefore the relative priorities of each state should be incorporated in the EU-wide performance assessment process. Secondly, performance objectives and priorities may also differ between stakeholder categories in each country and across Europe. A multi-criteria approach to logistics performance measurement should therefore incorporate the assessment of the relative importance of the various KPAs and the respective KPIs at member state and at stakeholder level.

Recommendation 3: Encourage the use of objective data in logistics performance measurement

According to the analysis in Sections 5.3 and 5.4, studies on logistics performance measurement at national or cross-country level most commonly employ a survey-based approach. A review of national-level logistics costs studies (Rantasila and Ojala, 2012) shows that around 30% of the studies employ a survey method, 23% are statistics-based and the remaining 47% employ a case-study or some other approach.

The use of data (indicators and metrics) for which objective measurements (i.e., absolute measurements that do not incorporate subjective perceptions of the data providers) can be collected, should be encouraged, especially in survey-based studies (which are more conducive to subjective assessment). The systematic collection and use of objective data in logistics performance measurement can:

- Produce robust results of linkages / causal relationships between the variables assessed;
- Increase homogeneity and comparability of logistics performance results across countries and facilitate policy evaluation;

- Reduce systematic biases related to survey design, psychological factors and other subjective traits of the respondents.

The analysis has also revealed that at both national and company level, logistics costs are largely assessed using objective indicators/data. The major categories of logistics costs identified and measured are transportation costs, warehousing costs, inventory carrying costs, administration costs and other logistics-related costs. However, in multi-thematic performance assessment studies, which include more performance dimensions besides costs there is a lack of objective indicators for dimensions such as service level, environmental sustainability, efficiency, safety and security. It is therefore suggested to encourage the use of objective indicators for other performance dimensions.

Recommendation 4: Ensure continuity of data availability

The assessment of logistics performance, both at national and company level, is heavily dependent on the availability of statistical data. One issue that surfaced throughout the research was the lack of continuity of data availability, presented in the form of static rather than dynamic (throughout several years) performance assessment studies. Moreover, extant research (BE-LOGIC, 2011) has shown that for a number of important indicators, such as load factors, operating cost, energy intensity and emissions intensity, very little information or no information at all is available at European or even national level. Other issues relate to the level of disaggregation of certain indicators for logistics / freight transport, e.g., BE LOGIC stated that in the case of energy intensity and emissions, the available data was not disaggregated at the level of freight transport (data was available for the entire transport sector but not for specific transport modes or terminals). It is therefore recommended to ensure continuity of data availability for the logistics performance indicators that will be selected to be included in the integrated logistics performance assessment frameworks for national and company level. More specific actions that could be undertaken in this direction include:

- Incorporate in the EU-wide logistics performance assessment framework clear guidelines for collecting and reporting logistics and transport−related performance data. These guidelines should be developed in coordination and consensus with national authorities and organisations involved in logistics performance assessment. They should clarify the KPIs that should be reported by each Member State, the frequency with which they should be collected and the deadlines for reporting them.

Recommendation 5: Ensure continuous update of and timely access to national logistics performance data

Timeliness of statistical data on logistics performance is crucial for the development of policies (at European, national or regional level) and the formulation of business strategies (at company level). However, it is a common occurrence that such statistical data are not available in a timely and uniform manner. For example, there are differences in the starting and ending points of time series of freight transport performance indicators available in Eurostat; data on the same indicator may not be available for all member states; data for the previous year are not available until late in the current year. All these problems may affect negatively the ability of public and private decision-makers to formulate policies and strategies. It is therefore recommended to:

- Develop an electronic repository of statistical data for logistics performance at national and sector (3PL) level that will consolidate the logistics performance indicators included in the EU-wide logistics performance scheme. This repository should be easily accessible (e.g., through Eurostat) and continuously updated;

- Investigate the possibility of real-time availability of non-processed statistical data that are directly submitted by national statistical authorities, prior to the processing, verification and publication of the final processed data.

At industry/3PL level, it is suggested to allow the logistics industry to decide what types of performance data it should monitor and potentially share. A recommendation would be to encourage the industry to undertake benchmarking studies that can provide an overall view about where the sector is in terms of performance.

Recommendation 6: Consideration of supply-chain-wide performance assessment

A significant finding of the literature review for logistics performance assessment at company level is the adoption of a narrow focus of performance assessment. This focus highlights intra-organisational logistics performance and overlooks performance at supply chain level. However, as global competition has shifted from company level to supply chain and even supply network level, the expansion from a logistics performance assessment to a supply chain performance assessment viewpoint is crucial. Third-party (3PL) and fourth party (4PL) logistics service providers (in cooperation with focal firms and upstream and downstream supply chain partners) can play a decisive role in measuring supply chain-wide performance as they can have a more holistic view of the supply chain activities of the focal firms using their services. It is therefore recommended to encourage/promote the consideration of integrated supply chain performance assessment (in parallel to logistics performance assessment at firm level) to the European logistics service provision sector.

More specific actions that could be undertaken in this direction include:

- Training of 3PLs on integrated supply chain performance assessment;
- Dissemination of the importance of the EU-wide logistics performance assessment framework in order to persuade 3PLs to adhere to its requirements.

Annex I: Literature list

Literature list CH2

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Annex II: Overview secondary sources

The following section provides an overview of evaluated secondary data sources identified within the scope of statistical research and analysis.

ACEA (European Automobile Manufacturers Association) - Tax Guide

Description: The ACEA Tax Guide gives an overview of motor vehicle taxation in 31 European countries. Furthermore, there are other major world markets included such as Brazil, China, India, Japan, Korea, Russia and the United States. The report describes in detail the taxes that are levied on the sale, registration, ownership and use of motor vehicles in each country.

Reference: http://www.acea.be/news/article/tax-guide

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

BMWI (Federal Ministry for Economic Affairs and Energy) - The Trend of Energy Markets up to the Year 2030

Description: The reports offers forecasts for the Energy Sector in Germany as well as worldwide. Therefore, available resources, energy consumption, CO^2 emissions and energy prices by world regions were investigated and analyzed. For a better assessment and understanding, different assumptions were made regarding oil prices, technology or demography.

Reference: http://www.bmwi.de/EN/Service/publications.html

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Interviews	Questionnaire	Case Studies	
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

Bureau van Dijk - Company Database AMADEUS

Description: Amadeus is a company database provided by Bureau van Dijk.

Reference: https://amadeus.bvdinfo.com/version-2014117/home.serv?product=amadeusneo

Methodology	Type of Survey	Not clearly indicated			
	Interrogation	Not clearly indicated			
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

CEA (European Insurance and Reinsurance Federation) - The European Motor Insurance Market

Description: This report analyses market trends and developments and explains the way motor insurance premiums are set. It also includes a detailed analysis of personal injury claims in motor third party liability insurance (MTPL), which play an important role in determining MTPL premiums.

Reference: http://www.insuranceeurope.eu/publications/statistics

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

CIA (Central Intelligence Agency) - The World Factbook

Description: The World Factbook is a portal operated by the U.S. Central Intelligence Agency (CIA). It provides information and data on country level. The sources are not stated for all figures. Affin to logistics issues is data on infrastructural conditions for each country.

Reference: https://www.cia.gov/library/publications/the-world-factbook/

Methodology	Type of Survey	Not clearly indicated			
	Interrogation	Not clearly indicated			
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

Cushman & Wakefield - Research

Description: Cushman & Wakefield provides different studies regarding capital and real estate markets on a global as well as on a national basis. Besides local reports for metropolitan areas in Germany and the United States, there are also reports covering other regions worldwide (e.g. APAC). These studies focus on properties for different industry sectors (e.g. logistics).

Reference: http://www.cushmanwakefield.de/de-de/research-and-insight/?f=

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			
	Approach	Qualitative		Quantitative	
	Frequency	Annual, Monthly, Infrequent			
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

Deka Bank - Europäische Logistikmärkte

Description: This publication gives an overview of the logistics markets as well as real estate (leasing) markets in Europe at country level. Besides traffic infrastructure, modal split and other country specific indicators, the report also analyses the rental charge development for logistics properties.

Reference: https://www.dekabank.de/db/de/research/immobilienresearch/index_pub.jsp?CATEGORY_ID=304

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

Deka Bank - Real Estate Research

Description: The Deka Bank releases (besides abovementioned study "Europäische Logistikmärkte") various reports in the field of real estate markets. These are for example country analyses, also regarding national logistics, tourism and retail markets, or prognosis studies concerning property markets in Europe, North America, Latin America and the Asian / Pacific region.

Reference: https://www.dekabank.de/db/de/research/immobilienresearch/index.jsp

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative		Quantitative	
	Frequency	Annual, Monthly, Infrequent			
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

DIW (Deutsches Institut für Wirtschaftsforschung) - Research & Advice

Description: The DIW (Deutsches Institut für Wirtschaftsforschung) publishes discussion papers, interviews and case studies in the field of transport and logistics.

Reference: http://www.diw.de/en/diw_01.c.100295.en/research_advice/research_advice.html

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Interviews	Questionnaire	Case Studies	
	Approach	Qualitative	Quantitative		
	Frequency	Annual, Monthly, Infrequent			
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free	On charge		

ECG (Association of European Vehicle Logistics) - Fuel Prices

Description: ECG is the association of European Vehicle Logistics. For the fuel prices, every week data from other sources like MABUX (Marine Bunker Exchange) are collected, giving an average price in Euro for every EU Member State plus Turkey and Russia.

Reference: http://www.ecgassociation.eu/publicationsreports/fuelprices.aspx

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative	Quantitative		
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free	On charge		

Economy Watch - Economic Statistics

Description: Economy Watch provides a numerous amount of reports and surveys, mostly on charge. Its Economic Statistics portal provides macroeconomic data for countries all over the world. Among others the references used are CIA (CIA Factbook), IMF (International Monetary Fund), OECD and World Bank.

Reference: http://www.economywatch.com/economic-statistics/

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

ESPO (European Sea Ports Organisation) - Statistics

Description: The European Sea Ports Organisation quarterly publishes statistics on total tonnage, liquid bulk, dry bulk, etc., for certain ports, collected from its national member associations.

Reference: http://www.espo.be/index.php?option=com_content&view=article&id=73&Itemid=89

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Interviews	Questionnaire	Case Studies	
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

Fraunhofer SCS - Top 100 in European Transport and Logistics Services

Description: The Top 100 in European Transport and Logistics Services provides data on logistics market sizes and market structures for the European countries (EU28 plus Norway, Switzerland). Its core results are rankings of the largest logistics services providers in Europe and in all of the assessed countries.

Reference: http://www.scs.fraunhofer.de/de/studien/logistikmarkt/top100_13.html

Methodology					
	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Interviews	Questionnaire	Case Studies	
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

Frost & Sullivan - Research

Description: Frost & Sullivan is an international consulting company and provides its clients with disciplined research and best-practice models in different industry sectors (e.g. Automotive & Transportation Research, Business & Financial Services, etc.). Furthermore, F&S offers research services, market insights and newsletters to different topics and countries worldwide.

Reference: http://www.frost.com/prod/servlet/research.pag

Methodology					
	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative		Quantitative	
	Frequency	Annual, Monthly, Infrequent			
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

IEA (International Energy Agency) - Research

Description: The International Energy Agency provides data regarding energy production and consumption. Parts of the data is available for purchase and parts are downloadable for free.

Reference: http://www.iea.org/publications/

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

IRF (International Road Federation) - IRF World Road Statistics (WRS)

Description: The International Road Federation is publisher of the yearly appearing World Road Statistics (WRS). It is available on charge and provides timelines for different indicators regarding road transport in countries all over the world. The recent edition is available for $US 2,950 for non members. Members of IRF are eligible for discount.

Reference: http://www.irfnet.ch/world_road_statistics.php

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

IRU (International Road Transport Union)

Description: The International Road Transport Union is a world road transport organization providing information for its registered members about actual fuel prices, border waiting times and regularly releases factsheets and statistics.

Reference: http://www.iru.org/

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	**Secondary Data**
	Interrogation	Not clearly indicated			
	Approach	Qualitative		**Quantitative**	
	Frequency	Once	Infrequent	Biennial	**Annual**
	Geographical Scope	**World**	EU	International	National
	Geogr. Detail	EU	**National Level**	Regional/Local	
	Availability	**free**		On charge	

ITF (International Transport Forum)

Description: The International Transport Forum acts as an intergovernmental organization within the OECD system, collecting data from its member's ministries. Every three months key indicators for rail, road and inland waterways are published.

Reference: http://www.internationaltransportforum.org/home.html

Methodology	Type of Survey	Census	**Sample Representative**	Sample not Representative	Secondary Data
	Interrogation	Interviews	**Questionnaire**	**Case Studies**	
	Approach	Qualitative		**Quantitative**	
	Frequency	Quarterly			
	Geographical Scope	**World**	EU	International	National
	Geogr. Detail	EU	**National Level**	Regional/Local	
	Availability	**free**		On charge	

Jones Lang LaSalle - Logistikimmobilien Report Deutschland

Description: The "Logistikimmobilien Report Deutschland" provides a detailed overview of the market for logistics properties in Germany. Furthermore, the report describes general trends in logistics and examines the rental and investment market for logistics properties.

Reference: http://www.joneslanglasalle.de/Germany/DE-DE/Pages/ResearchDetails.aspx?ItemID=11407

Methodology					
	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level		Regional/Local
	Availability	free		On charge	

Jones Lang LaSalle - Research Germany

Description: Besides the "Logistikimmobilien Report Deutschland", Jones Lang LaSalle Germany also offers various other market reports and analyses. These are for example Industrial Market Profiles for the most important regions / built-up areas in Germany as well as detailed studies about the market for distribution warehouses in metropolitan areas in Germany.

Reference: http://www.joneslanglasalle.de/Germany/DE-DE/Pages/Research.aspx

Methodology					
	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative		Quantitative	
	Frequency	Annual, Monthly, Infrequent			
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level		Regional/Local
	Availability	free		On charge	

Jones Lang LaSalle - Global Market Research

Description: Jones Lang LaSalle Research offers various reports and market studies regarding capital and real estate markets (office market, logistics properties, retail industry) on a state level as well as on a worldwide basis.

Reference: http://www.jll.com/research

Methodology					
	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative		Quantitative	
	Frequency	Annual, Monthly, Infrequent			
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

KombiConsult

Description: KombiConsult is a company specialized in the field of combined transport. It releases together with the UIC the report on combined transport in Europe.

Reference: http://www.kombiconsult.com/web/Deutsch/Publikationen/

Methodology					
	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Interviews	Questionnaire		Case Studies
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

OECD (Organisation for Economic Co-operation and Development) - Economic Outlook

Description: The OECD Economic Outlook provides an overview on macroeconomic data, such as unit labour costs, GDP growth or fiscal balances. The data refers to the OECD.Stat library, following behind.

Reference: http://www.oecd.org/eco/outlook/

Methodology					
	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level		Regional/Local
	Availability	free		On charge	

OECD.Stat (Organisation for Economic Co-operation and Development)

Description: OECD.Stat is part of the OECD statistical information system. It comprises a data warehouse, where statistical data can be extracted from OECD statistical databases.

Reference: http://stats.oecd.org/

Methodology					
	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Interviews	Questionnaire		Case Studies
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level		Regional/Local
	Availability	free		On charge	

Postbank - Research

Description: Postbank Research provides its clients with research services regarding investment and capital markets at international level. Within these studies, the effects of economic developments (national and international) on stock exchange markets are investigated and analyzed. Moreover, Postbank also offers detailed industry sector and country analyses.

Reference: www.postbank.de/research

Methodology					
	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative		Quantitative	
	Frequency	Annual, Monthly, Infrequent			
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

ProgTrans - World Report

Description: The ProgTrans World Report is a triennially released publication with analyses and forecasts for the development of transport services.

Reference: http://www.progtrans.com/html/reports.html

Methodology					
	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Interviews	Questionnaire		Case Studies
	Approach	Qualitative		Quantitative	
	Frequency	Triennially			
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

Savills - Research (Germany, Europe, Asia-Pacific Region)

Description: Savills provides various real estate market and investment reports for Germany (top six office markets), further European countries as well as for the Asia-Pacific region. Moreover, some studies investigate the financial situation in each country (investment in properties, employment, interest rate, etc.) or focus on individual branches (retail warehouse market).

Reference: http://www.savills.com/research/

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative		Quantitative	
	Frequency	Annual, Quarterly, Monthly, Infrequent			
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

The World Bank - Logistics Performance Indicator

Description: The most appropriate input from the World Banks reports and surveys for the project is the Logistics Performance Indicator (LPI) which is compiled from a sample of nearly 1,000 freight forwarders from all over the world (155 countries). Its key result is a ranking of the nations worldwide regarding their logistics performance which is calculated by 6 subindicators.

Reference: http://siteresources.worldbank.org/TRADE/Resources/239070-1336654966193/LPI_2012_final.pdf

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Interviews	Questionnaire		Case Studies
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level	Regional/Local	
	Availability	free		On charge	

UIC (International Union of Railways)

Description: The International Union of Railways is an organization, representing the interests of railway companies and operators. While the "International Railway Statistics" is only available on charge, the publications on combined transport provide data on market size, transport volume and employees.

Reference: http://www.uic.org/spip.php?article3046

Methodology					
	Type of Survey	Census	**Sample Representative**	Sample not Representative	Secondary Data
	Interrogation	Interviews	**Questionnaire**		**Case Studies**
	Approach	Qualitative		**Quantitative**	
	Frequency	Once	Infrequent	**Biennial**	Annual
	Geographical Scope	**World**	**EU**	International	National
	Geogr. Detail	EU	**National Level**		**Regional/Local**
	Availability	**free**		**On charge**	

UIRR (International Union of Combined Road-Rail Transport Companies)

Description: The UIRR describes in its annual reports key figures and statistics of the combined transport in Europe.

Reference: http://www.uirr.com/de/media-centre/annual-reports/annual-reports.html

Methodology					
	Type of Survey	Census	**Sample Representative**	Sample not Representative	Secondary Data
	Interrogation	Interviews	**Questionnaire**		Case Studies
	Approach	Qualitative		**Quantitative**	
	Frequency	Once	Infrequent	Biennial	**Annual**
	Geographical Scope	World	**EU**	International	National
	Geogr. Detail	EU	**National Level**		Regional/Local
	Availability	**free**		On charge	

UNCTADStat (United Nations Conference on Trade and Development)

Description: UNCTADStat is a part of UNCTAD (United Nations Conference on Trade and Development). It comprises a data warehouse which compiles, validates and processes a wide range of data collected from national and international sources. The database focusses on trade and development indicators on macroeconomic level.

Reference: http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx?sCS_referer=&sCS_ChosenLang=en

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level		Regional/Local
	Availability	free		On charge	

UNECE Statistical Database (United Nations Economic Commission for Europe)

Description: UNECE Statistical Database is a part of UNECE (United Nations Economics Commission for Europe). It provides free access to data structured to facilitate easy retrieval of statistics by users. It is organized by subject or policy areas and data is presented in multidimensional tables.

Reference: http://w3.unece.org/pxweb/

Methodology	Type of Survey	Census	Sample Representative	Sample not Representative	Secondary Data
	Interrogation	Not clearly indicated			s
	Approach	Qualitative		Quantitative	
	Frequency	Once	Infrequent	Biennial	Annual
	Geographical Scope	World	EU	International	National
	Geogr. Detail	EU	National Level		Regional/Local
	Availability	free		On charge	

Annex III: Logistics Market Segments Descriptions from the Top 100 in European Transport and Logistics Services

Taken from Top 100 in European Transport and Logistics Services 2013, p. 59-61.

Segment 1: "Bulk Logistics"

This large segment includes transport and logistics operations related to bulk cargoes, especially from the raw materials and waste disposal industries. Cargoes are considered "bulk", when typical shipments are significantly bigger than a single car- or truckload (i.e. usually more than 25 tonnes). This mainly concerns coal, mineral oil and raw chemicals, agricultural products, ores, iron and steel, construction materials, stone and minerals, typically moving in very large volumes between discrete source and sink locations. Bulk cargo is often in gas, liquid or granular form. Handling and transport require special equipment, which typically involves mechanized loading, unloading and storage procedures. The most favoured means of transport are specialized ocean carriers like tankers and dry bulk vessels, inland barges, pipelines, whole or part trains and in some cases specialized truck fleets (e.g. tipper-trucks).

Segment 2: "General Truckload/Full Carload (TL/FCL) Cargo"

This segment includes the carriage of dry goods that can be carried and stored by standard "dry van" and "curtain side" type over-the-road truck equipment, box-type railcars, standard ISO-containers and standard swap body units. The range of shipment weights is typically ranging from two to three tonnes per shipment up to about 25 tonnes. FTL cargo is moved without intermediate break-bulk or consolidation from "dock-to-dock". A special characteristic of this segment is the relative "openness" of the market for any type of cargo that may be handled with standardized equipment. There are tens of thousands of users and tens of thousands of suppliers of FTL/FCL transportation services in the European market.

Segment 3: "General Less than Truck Load (LTL)/Groupage Networks"

LTL resp. groupage transport refers to the market for individually labelled dry or staple goods from the industrial or consumer goods sectors in consignments weighing between about 30 kg and two to three tonnes, very often being tendered in palletized "unit-load" format.

So, this market segment also includes the so-called "groupage". Different from FTL/FCL, those shipments cannot be economically carried directly from sender to consignee, but require consolidation through networks of regional collection and distribution depots and terminals, sometimes involving intermediate sorting "hubs". General LTL cargo is carried in non-specialized trucks and containers from terminal to terminals, but because of the demands for scheduled nationwide and continent-spanning LTL services, the LTL industry has been experiencing significant concentration towards a limited number of regional, national and European networks.

Segment 4: "Specialized Transportation"

Specialized transportation refers to those objects and demands for transport that require specialized equipment, systems, and handling (therefore cannot be attributed to the general FTL- and LTL- segments outlined above), which are not typically moving in "bulk" volumes and are not integrated into "contract logistics" arrangements. The specialized transportation segment, as it is defined for the purposes of this "Top 100" study includes heavy haulage with cranes, flatbed and gooseneck-trailers, as required especially by the construction and capital goods industries, FTL/FCL transportation by tank containers and silos, and also LTL-type cargo requiring specialized networks of transport- and break-bulk operations.

Examples are the perishable food distribution networks requiring temperature controls and specific systems for the assurance of food hygiene, "hanging garment" networks for manufacturers and importers to the fashion retail outlets, fuel distribution, dedicated networks to the transport of dangerous, sensitive and very valuable items, the movement of households and new furniture, finished vehicle transportation, sheet glass transportation, live-stock animal transport, and the transport of high cube loads using "jumbo" trucks. Specialized transportation aggregates a large variety of sub-market segments in logistics, which usually require enhanced levels of investment into equipment, personnel training and specialization, attention to regulatory and customer specific details.

Segment 5: "CEP – Courier, Express and Parcel Services"

This segment covers primarily on small, time-critical shipments weighing less than approximately 31 kg, insofar as they are not attributed to segment 3 "Less Than Truck Load."

The networks of depots of the parcel and express services have a structure similar to that described in segment 3, but the networks of CEP depots tend to be denser and more highly mechanized than in the LTL segment. Important sub-segments are defined by quality standards and network coverage, such as "standard parcel" vs. "time-definite" express freight, "local", "national" and "international" networks. Due to the high investment needs, fixed cost and geographic coverage typically required for competitive CEP services, in this segment a significant degree of supplier concentration has occurred. The segment also includes "true courier" services – i.e. services where local, domestic and worldwide shipments are individually carried and accompanied by – typically smaller – couriers from door-to-door.

Segment 6: "Contract Logistics"

This important segment describes logistics services provided through individually configured, specialized systems for customers in industrial or consumer goods manufacturing and the wholesale and retail trades ("multi-user systems") or individual companies ("dedicated contract logistics"). The definition of contract logistics requires that complex bundles of several logistical services such as transportation and warehousing, as well as a potentially wide range of value-added services, are provided within the framework of long-term contractual relationships tailored to individual customer's requirements. Large business volumes within the contract logistics segments are provided by the automotive industry's closed material supply systems, the dedicated distribution systems of the high-tech and "fast-moving consumer goods" industries, for spare parts and after-sale services. More recently, "interplant" industrial logistics services are being outsourced more and more in contract logistics arrangements to third-party logistics service providers. The "Top 100" measurements of the contract logistics segment also include the not-yet outsourced in-house logistics operations by industrial and trade organizations.

Contract logistics services are offered both by independent, often local third-party logistics service providers, and by large international logistics organizations, which may operate many contracts and locations.

Segment 7: "General Warehousing and Terminal Operations"

This segment includes the terminal operations that are independently organized and operated as part of the worldwide transportation infrastructure, such as inland ports, sea- and airports, container tank storage farms, large-scale storage facilities for agricultural raw materials.

With this segment the current "Top 100" issues also reports the activities of providers of systems for recyclable packaging materials ("MTV-systems") and standard "common" warehousing services that are not part of contract logistics packages.

Segment 8: "General Ocean Freight"

This segment – in analogy to the FTL/FCL segment restricted widely to land based activities – covers the worldwide water-based outbound transport and forwarding services, including the global overseas services for standardized ISO-containers.

Segment 9: "Air Cargo"

This segment refers to worldwide outbound transport and forwarding services with an emphasis on air cargo, including air cargo carriers, air cargo agencies and air cargo forwarding services.

Annex IV: Assessment of the Economic Value Added of Logistics via Symmetrical Input-Output Matrices

The evaluation of the economic value added can be derived from the symmetrical input-output tables on the national level. These statistics are arranged as matrices that describe the interdependencies of industries. They report flows of goods and services that are produced within national economies.

The following table shows the availability of these matrices as from May 2014. After 2008, a new classification (NACE Rev.2) was introduced. Tables of former years are mostly available in NACE 1 classification and not comparable. The grey-coloured cells of the table indicate the matrices that are analysed in detail in the framework of the evaluation of the economic value added of logistics.

Table A.IV 1 Availability of symmetric input-output tables (SIOT)

	ESA 95 Table	SIOT								
Code	Country	2005	2006	2007 Rev 1	2007 Rev 2	2008 Rev 1	2008 Rev 2	2009	2010	2011
BE	Belgium	x							x	
BG	Bulgaria	2009								
CZ	Czech Republic	x (2)		x				x	x	
DK	Denmark	x	x	x						
DE	Germany	x	x	x			x	x	x	
EE	Estonia	x							x	
IE	Ireland	x							x	
GR	Greece	x					x	x	x	
ES	Spain	x								
FR	France	x	x	x			x	x	x	
IT	Italy	x							x	
CY	Cyprus	2011								
LV	Latvia									
LT	Lithuania	x							x	
LU	Luxembourg	x	x	x						
HU	Hungary	x					x		x	
MT	Malta									
NL	Netherlands	x	x	x			x	x	x	
AT	Austria	x					x	x	x	
PL	Poland	x								
PT	Portugal	x					x			
RO	Romania	x	x				x		x	
SI	Slovenia	x						x	x	
SK	Slovakia	x							x	
FI	Finland	x	x	x			x	x	x	x
SE	Sweden	x					x		x	
UK	United Kingdom	x							x	
HR	Croatia									
MK	FYR Macedonia	x							x	
TR	Turkey									

	ESA 95 Table	SIOT								
Code	Country	2005	2006	2007 Rev 1	2007 Rev 2	2008 Rev 1	2008 Rev 2	2009	2010	2011
NO	Norway	x	x	x			x	x	x	x
x	available		(2) also provided in Nace Rev2							
20xx	year of availability									

Source: Eurostat 2014, edited by Fraunhofer SCS.

For the year 2010, matrices are available for 18 of the European member states in NACE Rev 2 classification. This year is selected for structural comparisons of the value added to sectors by logistics activities. Developments can be shown for the timespan from 2008, resp. 2009 to 2010 for eleven countries (CZ, DE, GR, FR, HU, NL, AT, RO, SI, FI, SE).

The input-output matrices provide a level of detail that is shown in the table below.

Table A.IV 2 Symmetrical input-output matrices – sector overview

Product / NACE2 Codes	Description
CPA_A01	Products of agriculture, hunting and related services
CPA_A02	Products of forestry, logging and related services
CPA_A03	Fish and other fishing products; aquaculture products; support services to fishing
CPA_B	Mining and quarrying
CPA_C10-C12	Food products, beverages and tobacco products
CPA_C13-C15	Textiles, wearing apparel and leather products
CPA_C16	Wood and of products of wood and cork, except furniture; articles of straw and plaiting materials
CPA_C17	Paper and paper products
CPA_C18	Printing and recording services
CPA_C19	Coke and refined petroleum products
CPA_C20	Chemicals and chemical products
CPA_C21	Basic pharmaceutical products and pharmaceutical preparations
CPA_C22	Rubber and plastics products
CPA_C23	Other non-metallic mineral products
CPA_C24	Basic metals
CPA_C25	Fabricated metal products, except machinery and equipment
CPA_C26	Computer, electronic and optical products
CPA_C27	Electrical equipment
CPA_C28	Machinery and equipment n.e.c.
CPA_C29	Motor vehicles, trailers and semi-trailers
CPA_C30	Other transport equipment
CPA_C31_C32	Furniture; other manufactured goods
CPA_C33	Repair and installation services of machinery and equipment
CPA_D35	Electricity, gas, steam and air-conditioning
CPA_E36	Natural water; water treatment and supply services

Product / NACE2 Codes	Description
CPA_E37-E39	Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services
CPA_F	Constructions and construction works
CPA_G45	Wholesale and retail trade and repair services of motor vehicles and motorcycles
CPA_G46	Wholesale trade services, except of motor vehicles and motorcycles
CPA_G47	Retail trade services, except of motor vehicles and motorcycles
CPA_H49	Land transport services and transport services via pipelines
CPA_H50	Water transport services
CPA_H51	Air transport services
CPA_H52	Warehousing and support services for transportation
CPA_H53	Postal and courier services
CPA_I	Accommodation and food services
CPA_J58	Publishing services
CPA_J59_J60	Motion picture, video and television programme production services, sound recording and music publishing; programming and broadcasting services
CPA_J61	Telecommunications services
CPA_J62_J63	Computer programming, consultancy and related services; information services
CPA_K64	Financial services, except insurance and pension funding
CPA_K65	Insurance, reinsurance and pension funding services, except compulsory social security
CPA_K66	Services auxiliary to financial services and insurance services
CPA_L68B	Real estate services (excluding imputed rent)
CPA_L68A	Imputed rents of owner-occupied dwellings
CPA_M69_M70	Legal and accounting services; services of head offices; management consulting services
CPA_M71	Architectural and engineering services; technical testing and analysis services
CPA_M72	Scientific research and development services
CPA_M73	Advertising and market research services
CPA_M74_M75	Other professional, scientific and technical services; veterinary services
CPA_N77	Rental and leasing services
CPA_N78	Employment services
CPA_N79	Travel agency, tour operator and other reservation services and related services
CPA_N80-N82	Security and investigation services; services to buildings and landscape; office administrative, office support and other business support services
CPA_O84	Public administration and defence services; compulsory social security services
CPA_P85	Education services
CPA_Q86	Human health services
CPA_Q87_Q88	Social work services
CPA_R90-R92	Creative, arts and entertainment services; library, archive, museum and other cultural services; gambling and betting services
CPA_R93	Sporting services and amusement and recreation services
CPA_S94	Services furnished by membership organisations
CPA_S95	Repair services of computers and personal and household goods
CPA_S96	Other personal services

Product / NACE2 Codes	Description
CPA_T	Services of households as employers; undifferentiated goods and services produced by households for own use
CPA_U	Services provided by extraterritorial organisations and bodies

Source: National accounts statistics 2014, adapted by Fraunhofer SCS.

The number of sectors adds up to 65. For these 65 sectors, inputs as well as outputs of each are given in monetary values. For example, for the section CPA A01 Products of agriculture, hunting and related services, one can trace from which of the 65 sectors how much inputs result.

The level of detail enables analyses for all of these 65 sectors. The logistics sector is incorporated with the following sectors:

Table A.IV 3 Symmetrical input-output matrices – detail for logistical analyses

Product / NACE 2 Code	Description	Share of turnover of logistics in sector in per cent	Inclusion in symmetrical input output matrices analyses
CPA_H49	Land transport services and transport services via pipelines	68.8	Yes
CPA_H50	Water transport services	84.7	Yes
CPA_H51	Air transport services	7.6	No
CPA_H52	Warehousing and support services for transportation	100.0	Yes
CPA_H53	Postal and courier services	47.1	Yes

Source: Fraunhofer SCS.

The categories that represent the logistics sector best are H49, H50, H52 and H53. Due to the high shares of turnover from pure logistical activities, these are included in further evaluation. See the percentage indication of column four. It shows the logistics share of each category. The share that is missing represents passenger transport activities which shall be excluded from analyses. These categories (H49 to H53) represent only logistics activities carried out by logistics service providers and not activities carried out by the industry. Consequently, the analyses focus on the outsourced logistics activities. Aspects of data availability are dealt with in the section on these aspects.

The sector aggregates and industry branches evaluated are shown in the following list:

Sector aggregates:

- Total national product (Nace2 Sections A-U, Divisions 01-99)
  Primary sector - Agriculture (Nace2 Sections A-B, Divisions 01-09);
- % of total national product
  Secondary sector - Manufacturing (Nace2 Section C, Divisions 10-31);
- 30.5 % of total national product
  Tertiary sector - Services (Nace2 Sections C33-U, Divisions 33-99);
- About 67 % of total national product.

Industry branches (five of the most important industry sectors on EU27 level):

- Industry branch - Constructions and construction works

9.6 % of total national product;

- Industry branch - Food products, beverages and tobacco products
  5.9 % of total national product;
- Industry branch - Motor vehicles, trailers and semi-trailers
  % of total national product;
- Industry branch - Manufacture of chemicals and chemical products
  2.62 % of total national product;
- Industry branch - Machinery and equipment n.e.c.
  2.62 % of total national product.

The respective section shows the results of the analyses that have been carried out.

Annex V: Inventory of the statistical basis – Metadata

Supplementary to this report, a dataset will be provided with logistic indicators as collected by task 1 of this study: Statistical analysis. In this Annex, the following paragraphs describe the indicators, structure of the tables, content and quality. As this is a report, focus lies on those indicators already collected.

Overview of the collected indicators in the dataset:

1. Tonnes (per transport mode);
2. Tonne-kilometres;
3. Tonnes per inhabitant;
4. Number of vehicles;
5. Number of vehicle movements;
6. Number of empty runs;
7. Tonnes per vehicle;
8. Total turnover;
9. Number of logistics service providers;
10. Number of employees 10b Number of employees (LSP);
11. Average turnover per service provider;
12. Average vehicle age;
13. Average vehicle size;
14. Average length of haul;
15. Overall logistic expenses per country;
16. Vehicle and train-tkm;
17. Number of trips per 1,000 vehicle-kilometres;
18. Share of road freight vehicles with EURO 4-6 standard;
19. Owned and hired fleet share (poss. for road);
20. TEN-T lines per country;
21. Modal share of intermodal transport;
22. Share of logistics costs in total product costs;
23. Share of value added of the logistics sector in total value added;
24. Productivity (value added per employee) in the logistics sector;
25. Im- and Export value density per country;
26. Transport performance (tkm) per GDP;
27. a) Fuel prices b) Capital costs c) Warehouse rents d) Road tolls;
28. Average wages;
29. Number of warehouses per country;
30. m² per warehouse;
31. Inventory stock turn rate;
32. Share of inputs from ICT.

Indicator 1 - Tonnes (per transport mode)

Description:

This indicator represents the amount of goods transported per year within the different modes of transport and countries. The indicator is stated in thousands of tonnes for rail, road, sea and inland waterways transport and in tonnes for air transport.

Source:

- Eurostat-Tables:
  - 'avia_gooc' - 'Freight and mail air transport by reporting country';

- 'iww_go_atygo' - 'Transport by type of good (from 2007 onwards with NST2007)';
- 'iww_go_atygo07' - 'Transport by type of good (1982-2007 with NST/R)';
- 'mar_go_aa' - 'Maritime transport - Goods (gross weight) - Annual data - All ports - by direction';
- 'rail_go_typeall' - 'Railway transport - Goods transported, by type of transport';
- 'road_go_ta_tott' - 'Summary of annual road freight transport by type of operation and type of transport'.

Structure of tables:

The MS Excel file contains 5 sheets for all modes of transport. The single sheets are structured as follows:

Rail transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Thousands of tonnes	Total transport	101.829	110.779	115.526	121.579	98.887	107.670	107.587	103.920
		National transport	27.517	30.505	33.220	39.012	34.988	37.442	34.834	31.084
		International transport	48.046	56.042	55.133	54.988	43.932	49.692	52.658	52.206
		International transport - Incoming	29.331	35.918	34.629	35.476	27.470	31.149	32.503	31.955
		International transport - Outgoing	18.715	20.124	20.505	19.511	16.462	18.543	20.155	20.251
		Transit	26.265	24.233	27.172	27.580	19.967	20.536	20.094	20.630
BE - Belgium	Thousands of tonnes	Total transport	-	-	66.248	64.648	45.718	54.476	55.876	-
		National transport	-	-	21.803	23.235	15.484	19.033	18.594	-
		International transport	-	-	42.180	39.303	28.929	34.057	35.887	-
		International transport - Incoming	-	-	17.857	16.362	12.530	15.069	17.689	-
		International transport - Outgoing	-	-	24.322	22.940	16.399	18.987	18.198	-
		Transit	-	-	2.265	2.110	1.304	1.386	1.395	-

Besides the total number, the indicator is differentiated into:

- National transport = Railway transport between two places (a place of loading/embarkation and a place of unloading/disembarkation) located in the same country;
- International transport = Railway transport between a place (of loading/embarkation or of unloading/disembarkation) in one country and a place (of loading/embarkation or of unloading/disembarkation) in another country;
- International transport – Incoming;
- International transport – Outgoing;
- Transit = Railway transport through a country between two places (a place of loading/embarkation and a place of unloading/disembarkation) outside that country.

Road transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Thousands of tonnes	Total - Total transport	288.197	358.843	354.330	369.454	336.691	331.034	344.737	333.963
		Loaded - National transport	248.475	316.104	314.152	332.079	303.055	299.965	313.105	305.377
		Loaded - International transport - Total	39.722	42.739	40.178	37.375	33.637	31.070	31.632	28.586
		Loaded - International - Goods loaded in reporting country	15.471	16.237	16.086	15.641	14.367	12.695	13.314	11.811
		Loaded - International - Goods unloaded in reporting country	15.850	17.372	15.924	14.663	12.798	12.173	12.687	11.279
		Loaded - International - Cross-trade	6.057	6.022	5.092	4.408	3.716	3.495	3.173	2.839
		Loaded - International - Cabotage	2.344	3.108	3.076	2.663	2.755	2.706	2.458	2.657
BE - Belgium	Thousands of tonnes	Total - Total transport	337.913	348.527	352.202	317.637	297.879	296.189	289.203	233.169
		Loaded - National transport	265.086	274.141	279.190	249.624	233.589	237.049	233.721	193.240
		Loaded - International transport - Total	72.826	74.386	73.012	68.013	64.290	59.139	55.482	39.930
		Loaded - International - Goods loaded in reporting country	34.994	36.623	36.541	33.517	31.581	28.729	27.141	19.830
		Loaded - International - Goods unloaded in reporting country	25.284	25.215	24.440	23.062	22.113	20.500	19.792	13.989
		Loaded - International - Cross-trade	6.196	5.481	5.268	4.558	4.091	4.151	3.510	2.753
		Loaded - International - Cabotage	6.352	7.068	6.762	6.876	6.505	5.759	5.039	3.358

Besides the total number, the indicator is differentiated into:

- Loaded - National transport: = Road transport between two places (a place of loading/embarkation and a place of unloading/ disembarkation) located in the

same country irrespective of the country in which the road motor vehicle is registered. It may involve transit through a second country;

- Loaded - International transport - Total = Road transport between a place of loading/embarkation or unloading/disembarkation in the reporting country and a place of loading/embarkation or unloading/disembarkation in another country;
- Loaded - International - Goods loaded in reporting country;
- Loaded - International - Goods unloaded in reporting country;
- Loaded - International - Cross-trade = Road transport performed by a road motor vehicle registered in one country between a place of loading/embarkation in a second country and a place of unloading/disembarkation in a third country;
- Loaded - International - Cabotage = Road transport within a country other than the registration country, performed by a road motor vehicle registered in the reporting country.

Sea transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
BE - Belgium	Thousands of tonnes	Total transport	206.539	218.941	236.320	243.819	203.368	228.228	232.789	-
		Inwards	116.603	125.486	134.138	140.196	111.659	126.882	129.708	-
		Outwards	89.936	93.455	102.183	103.622	91.709	101.346	103.080	-
BG - Bulgaria	Thousands of tonnes	Total transport	24.841	27.513	24.900	26.576	21.893	22.946	25.185	-
		Inwards	14.293	16.250	15.853	16.791	11.797	11.847	13.036	-
		Outwards	10.548	11.263	9.047	9.785	10.096	11.099	12.149	-

Indicator is differentiated into:

- Total transport = Any movement of goods and / or passengers using merchant ships in journeys, which are undertaken wholly or partly by sea;
- Inwards;
- Outwards.

Inland Waterways:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Thousands of tonnes	Total transport	9.336	9.183	12.107	11.209	9.322	11.052	9.943	10.714
		National transport	356	1.137	972	502	329	457	565	1.240
		International transport	7.723	6.254	7.811	7.897	6.527	7.868	7.110	7.063
		International transport - Loaded	1.653	1.441	1.547	2.166	1.581	1.668	1.546	1.624
		International transport - Unloaded	6.070	4.813	6.264	5.731	4.945	6.200	5.564	5.439
		Transit	1.258	1.792	3.323	2.809	2.466	2.728	2.268	2.411
BE - Belgium	Thousands of tonnes	Total transport	160.397	165.855	134.647	130.350	108.243	161.594	172.906	190.288
		National transport	35.409	37.543	38.645	36.772	33.663	46.550	49.808	48.675
		International transport	120.498	123.139	85.144	83.414	67.725	106.820	114.297	129.323
		International transport - Loaded	45.660	48.747	28.842	29.942	23.529	44.243	47.340	52.809
		International transport - Unloaded	74.839	74.392	56.302	53.472	44.196	62.577	66.957	76.515
		Transit	4.490	5.173	10.858	10.164	6.854	8.225	8.800	12.290

Besides the total number, the indicator is differentiated into:

- National transport = Any movement of goods and/or passengers using an Inland Waterways Transport (IWT) vessel between two places (a place of loading/embarkation and a place of unloading/disembarkation) within a national territory irrespective of the country in which the IWT vessel is registered. It may involve transit through a second country, although for this country this transport has to be reported as transit;
- International transport = Inland waterway transport between two places (a place of loading/embarkation and a place of unloading/disembarkation) located in two different countries. It may involve transit through one or more additional countries. For the latter countries this transport has to be reported as transit;
- International transport – Loaded;
- International transport – Unloaded;

- Transit = Inland waterway transport through a country between two places (a place of loading/embarkation and a place of unloading/disembarkation) both located in another country or in other countries provided that the total journey within the country is by inland waterways and that there is no loading/embarkation and unloading/disembarkation operation in that country.

Air transportation:

Country	Indicator	Specification		2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Tons	Total freight and mail on board in tonnes	Total transport	207.818	229.126	228.007	227.264	220.697	257.309	240.567	219.775
			National transport	994	955	838	863	782	695	545	396
			International transport	206.824	228.171	227.169	226.401	219.915	256.614	240.022	219.379
			International transport Intra-EU	62.690	64.715	65.073	63.711	62.710	71.872	75.485	71.757
			International transport Extra-EU	144.134	163.456	162.096	162.690	157.205	184.742	164.537	147.622
		Freight and mail loaded in tonnes	Total transport	84.684	87.231	84.755	80.849	74.361	85.608	96.188	89.592
			National transport	993	967	839	861	807	699	554	384
			International transport	83.691	86.264	83.916	79.988	73.554	84.909	95.634	89.208
			International transport Intra-EU	27.033	26.303	26.581	26.467	24.061	24.453	23.814	22.232
			International transport Extra-EU	56.658	59.961	57.335	53.521	49.493	60.456	71.820	66.976
BE - Belgium	Tons	Total freight and mail on board in tonnes	Total transport	694.405	1.125.458	1.367.620	1.250.310	953.006	1.118.284	1.158.347	1.068.434
			National transport	202	509	658	798	453	767	792	224
			International transport	694.203	1.124.949	1.366.962	1.249.512	952.553	1.117.517	1.157.555	1.068.210
			International transport Intra-EU	268.007	478.754	503.903	355.126	275.277	304.121	304.241	305.555
			International transport Extra-EU	426.196	646.195	863.059	894.386	677.276	813.396	853.314	762.655
		Freight and mail loaded in tonnes	Total transport	352.760	534.644	612.067	540.156	421.756	507.597	537.122	520.377
			National transport	0	73	281	405	302	496	265	175
			International transport	352.760	534.571	611.786	539.751	421.454	507.101	536.857	520.202
			International transport Intra-EU	135.878	252.629	263.376	177.511	142.534	158.345	160.297	165.798
			International transport Extra-EU	216.882	281.942	348.410	362.240	278.920	348.756	376.560	354.404

Besides the total number, the indicator is differentiated into:

- National transport = Air transport on a domestic flight;
- International transport = Air transport on an international flight;
- International transport Intra-EU;
- International transport Extra-EU.

Indicator 2 - Tonne-kilometres

Description:

This indicator represents both the amount of goods transported (weight) as well as the distance of the transport per year. It is differentiated into different modes of transport and countries. The indicator is stated in millions of tonne-kilometres.

Source:

- Eurostat-Tables:
  - 'iww_go_atygo' - 'Transport by type of good (from 2007 onwards with NST2007)';
  - 'iww_go_atygo07' - 'Transport by type of good (1982-2007 with NST/R)';
  - 'rail_go_typeall' - 'Railway transport - Goods transported, by type of transport';
  - 'road_go_ta_tott' - 'Summary of annual road freight transport by type of operation and type of transport'.
- OECD - StatExtracts - Transport - Transport activity - Goods transport - Coastal shipping tonne-km;
- World Bank - Data - Indicators (all) - Infrastructure - Air transport, freight (million tonne-km).

Structure of tables:

The MS Excel file contains 5 sheets for all modes of transport. The single sheets are structured as follows:

Rail transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Millions of Tonne-kilometre	Total transport	18.957	20.980	21.371	21.915	17.767	19.833	20.345	19.499
		National transport	4.494	4.650	5.024	5.909	5.356	5.846	5.542	4.983
		International transport	9.610	11.201	10.158	10.488	8.285	9.571	10.093	9.552
		International transport - Incoming	5.449	6.692	5.889	6.146	4.620	5.502	5.805	5.489
		International transport - Outgoing	4.161	4.509	4.268	4.342	3.665	4.069	4.288	4.063
		Transit	4.853	5.129	6.189	5.517	4.126	4.415	4.710	4.965
BE - Belgium	Millions of Tonne-kilometre	Total transport	-	-	9.258	8.927	6.374	7.476	7.593	-
		National transport	-	-	2.284	2.271	1.713	2.196	2.037	-
		International transport	-	-	6.569	6.263	4.442	5.166	5.333	-
		International transport - Incoming	-	-	2.707	2.522	1.841	2.421	2.495	-
		International transport - Outgoing	-	-	3.863	3.741	2.601	2.745	2.838	-
		Transit	-	-	405	394	219	114	223	-

Besides the total number, the indicator is differentiated into:

- National transport = Railway transport between two places (a place of loading/embarkation and a place of unloading/disembarkation) located in the same country;
- International transport = Railway transport between a place (of loading/embarkation or of unloading/disembarkation) in one country and a place (of loading/embarkation or of unloading/disembarkation) in another country;
- International transport – Incoming;
- International transport – Outgoing;
- Transit = Railway transport through a country between two places (a place of loading/embarkation and a place of unloading/disembarkation) outside that country.

Road transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Millions of Tonne-kilometre	Total - Total transport	37.044	39.187	37.402	34.313	29.075	28.659	28.542	26.089
		Loaded - Total transport	37.044	39.187	37.402	34.313	29.075	28.659	28.542	26.089
		Loaded - National transport	12.514	14.437	14.744	14.581	13.491	13.914	14.475	14.118
		Loaded - International transport - Total	24.530	24.750	22.658	19.732	15.584	14.745	14.067	11.970
		Loaded - International - Goods loaded in reporting country	9.183	9.277	8.908	7.910	6.263	5.861	5.803	4.825
		Loaded - International - Goods unloaded in reporting countn	8.619	8.977	8.264	7.230	5.639	5.372	5.359	4.555
		Loaded - International - Cross-trade	6.155	5.780	4.800	3.950	3.039	2.903	2.408	2.077
		Loaded - International - Cabotage	573	717	686	642	643	609	498	514
BE - Belgium	Millions of Tonne-kilometre	Total - Total transport	43.847	43.017	42.085	38.356	36.174	35.002	33.107	25.008
		Loaded - Total transport	43.847	43.017	42.085	38.356	36.174	35.002	33.107	25.008
		Loaded - National transport	19.283	19.615	19.650	18.207	17.603	17.755	17.750	14.521
		Loaded - International transport - Total	24.565	23.402	22.435	20.149	18.572	17.246	15.358	10.487
		Loaded - International - Goods loaded in reporting country	11.479	11.287	10.935	9.801	9.127	8.399	7.452	5.223
		Loaded - International - Goods unloaded in reporting countn	8.076	7.687	7.155	6.464	5.939	5.519	5.103	3.303
		Loaded - International - Cross-trade	3.413	2.877	2.815	2.339	2.047	1.964	1.704	1.246
		Loaded - International - Cabotage	1.597	1.552	1.529	1.546	1.458	1.363	1.099	715

Besides the total number, the indicator is differentiated into:

- Loaded - National transport: = Road transport between two places (a place of loading/embarkation and a place of unloading/ disembarkation) located in the same country irrespective of the country in which the road motor vehicle is registered. It may involve transit through a second country;
- Loaded - International transport - Total = Road transport between a place of loading/embarkation or unloading/disembarkation in the reporting country and a place of loading/embarkation or unloading/disembarkation in another country;
- Loaded - International - Goods loaded in reporting country;
- Loaded - International - Goods unloaded in reporting country;
- Loaded - International - Cross-trade = Road transport performed by a road motor vehicle registered in one country between a place of loading/embarkation in a second country and a place of unloading/disembarkation in a third country;
- Loaded - International - Cabotage = Road transport within a country other than the registration country, performed by a road motor vehicle registered in the reporting country.

Sea transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
ES - Spain	Millions of Tonne-kilometre	National Transport	48.178	47.383	49.446	45.396	40.040	41.666	42.115	-
FI - Finland	Millions of Tonne-kilometre	National Transport	2.180	2.679	2.892	2.937	2.513	3.621	3.966	-

The numbers are not differentiated into more details.

Inland Waterways:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Millions of Tonne-kilometre	Total transport	1.753	1.837	2.597	2.359	2.003	2.375	2.123	2.191
		National transport	37	137	146	92	62	73	88	101
		International transport	1.275	1.073	1.288	1.284	1.077	1.347	1.241	1.247
		International transport - Loaded	196	171	162	260	199	205	183	213
		International transport - Unloaded	1.079	902	1.125	1.023	878	1.142	1.057	1.034
		Transit	440	627	1.163	983	863	955	794	844
BE - Belgium	Millions of Tonne-kilometre	Total transport	8.566	8.908	9.006	8.746	7.087	9.070	9.251	10.420
		National transport	3.060	3.169	3.406	3.498	2.895	3.829	3.905	4.233
		International transport	4.928	5.069	4.802	4.515	3.634	4.621	4.714	5.461
		International transport - Loaded	1.534	1.619	1.439	1.425	1.221	1.595	1.627	1.905
		International transport - Unloaded	3.393	3.450	3.363	3.090	2.413	3.027	3.087	3.557
		Transit	579	671	798	733	559	620	632	726

Besides the total number, the indicator is differentiated into:

- National transport = Any movement of goods and/or passengers using an Inland Waterways Transport (IWT) vessel between two places (a place of loading/embarkation and a place of unloading/disembarkation) within a national territory irrespective of the country in which the IWT vessel is registered. It may involve transit through a second country, although for this country this transport has to be reported as transit;
- International transport = Inland waterway transport between two places (a place of loading/embarkation and a place of unloading/disembarkation) located in two different countries. It may involve transit through one or more additional countries. For the latter countries this transport has to be reported as transit;
- International transport – Loaded;
- International transport – Unloaded;
- Transit = Inland waterway transport through a country between two places (a place of loading/embarkation and a place of unloading/disembarkation) both located in another country or in other countries provided that the total journey within the country is by inland waterways and that there is no loading/embarkation and unloading/disembarkation operation in that country.

Air transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Millions of Tonne-kilometre	Freight	537	572	454	421	342	358	383	322
BE - Belgium	Millions of Tonne-kilometre	Freight	705	740	755	982	1.427	1.067	1.241	1.368

The numbers are not differentiated into more details.

- Air transport, freight = Air freight is the volume of freight, express, and diplomatic bags carried on each flight stage (operation of an aircraft from take off to its next landing), measured in metric tonnes times kilometers travelled.

Indicator 3 - Tonnes per inhabitant

Description:

This indicator represents the amount of goods transported per year within the different modes of transport and countries related to one inhabitant. It is calculated as a quotient of the above named amount of goods transported and the actual population of the examined country. The indicator is stated in tonnes.

Source:

- Eurostat-Tables:
  - 'avia_gooc' - 'Freight and mail air transport by reporting country';
  - 'demo_pjan' - 'Population on 1 January by age and sex';
  - 'iww_go_atygo' - 'Transport by type of good (from 2007 onwards with NST2007)';
  - 'iww_go_atygo07' - 'Transport by type of good (1982-2007 with NST/R)';
  - 'mar_go_aa' - 'Maritime transport - Goods (gross weight) - Annual data - All ports - by direction';
  - 'rail_go_typeall' - 'Railway transport - Goods transported, by type of transport';
  - 'road_go_ta_tott' - 'Summary of annual road freight transport by type of operation and type of transport'.

Structure of tables:

The MS Excel file contains 5 sheets for all modes of transport. The single sheets are structured as follows:

Rail transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Thousands of tonnes	Total transport	101.829	110.779	115.526	121.579	98.887	107.670	107.587	103.920
		National transport	27.517	30.505	33.220	39.012	34.988	37.442	34.834	31.084
		International transport	48.046	56.042	55.133	54.988	43.932	49.692	52.658	52.206
		International transport - Incoming	29.331	35.918	34.629	35.476	27.470	31.149	32.503	31.955
		International transport - Outgoing	18.715	20.124	20.505	19.511	16.462	18.543	20.155	20.251
		Transit	26.265	24.233	27.172	27.580	19.967	20.536	20.094	20.630
	Number	Inhabitants	8.201.359	8.254.298	8.282.984	8.318.592	8.355.260	8.375.290	8.404.252	8.408.121
	Tons per inhabitant	Total transport per inhabitant	12,42	13,42	13,95	14,62	11,84	12,86	12,80	12,36
		National transport per inhabitant	3,36	3,70	4,01	4,69	4,19	4,47	4,14	3,70
		International transport per inhabitant	5,86	6,79	6,66	6,61	5,26	5,93	6,27	6,21
		International transport - Incoming per inhabitant	3,58	4,35	4,18	4,26	3,29	3,72	3,87	3,80
		International transport - Outgoing per inhabitant	2,28	2,44	2,48	2,35	1,97	2,21	2,40	2,41
		Transit per inhabitant	3,20	2,94	3,28	3,32	2,39	2,45	2,39	2,45

Besides the total number, the indicator is differentiated into:

- National transport = Railway transport between two places (a place of loading/embarkation and a place of unloading/disembarkation) located in the same country;
- International transport = Railway transport between a place (of loading/embarkation or of unloading/disembarkation) in one country and a place (of loading/embarkation or of unloading/disembarkation) in another country;
- International transport – Incoming;
- International transport – Outgoing;
- Transit = Railway transport through a country between two places (a place of loading/embarkation and a place of unloading/disembarkation) outside that country.

Road transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Thousands of tonnes	Total - Total transport	288.197	358.843	354.330	369.454	336.691	331.034	344.737	333.963
		Loaded - Total transport	288.197	358.843	354.330	369.454	336.691	331.034	344.737	333.963
		Loaded - National transport	248.475	316.104	314.152	332.079	303.055	299.965	313.105	305.377
		Loaded - International transport - Total	39.722	42.739	40.178	37.375	33.637	31.070	31.632	28.586
		Loaded - International - Goods loaded in reporting country	15.471	16.237	16.086	15.641	14.367	12.695	13.314	11.811
		Loaded - International - Goods unloaded in reporting country	15.850	17.372	15.924	14.663	12.798	12.173	12.687	11.279
		Loaded - International - Cross-trade	6.057	6.022	5.092	4.408	3.716	3.495	3.173	2.839
		Loaded - International - Cabotage	2.344	3.108	3.076	2.663	2.755	2.706	2.458	2.657
	Number	Inhabitants	8.201.359	8.254.298	8.282.984	8.318.592	8.355.260	8.375.290	8.404.252	8.408.121
	Tons per inhabitant	Total - Total transport per inhabitant	35,14	43,47	42,78	44,41	40,30	39,53	41,02	39,72
		Loaded - Total transport per inhabitant	35,14	43,47	42,78	44,41	40,30	39,53	41,02	39,72
		Loaded - National transport per inhabitant	30,30	38,30	37,93	39,92	36,27	35,82	37,26	36,32
		Loaded - International transport - Total per inhabitant	4,84	5,18	4,85	4,49	4,03	3,71	3,76	3,40
		Loaded - International - Goods loaded in reporting country per inhabitant	1,89	1,97	1,94	1,88	1,72	1,52	1,58	1,40
		Loaded - International - Goods unloaded in reporting country per inhabitant	1,93	2,10	1,92	1,76	1,53	1,45	1,51	1,34
		Loaded - International - Cross-trade per inhabitant	0,74	0,73	0,61	0,53	0,44	0,42	0,38	0,34
		Loaded - International - Cabotage per inhabitant	0,29	0,38	0,37	0,32	0,33	0,32	0,29	0,32

Besides the total number, the indicator is differentiated into:

- Loaded - National transport: = Road transport between two places (a place of loading/embarkation and a place of unloading/ disembarkation) located in the same country irrespective of the country in which the road motor vehicle is registered. It may involve transit through a second country;
- Loaded - International transport - Total = Road transport between a place of loading/embarkation or unloading/disembarkation in the reporting country and a place of loading/embarkation or unloading/disembarkation in another country;
- Loaded - International - Goods loaded in reporting country;
- Loaded - International - Goods unloaded in reporting country;
- Loaded - International - Cross-trade = Road transport performed by a road motor vehicle registered in one country between a place of loading/embarkation in a second country and a place of unloading/disembarkation in a third country;
- Loaded - International - Cabotage = Road transport within a country other than the registration country, performed by a road motor vehicle registered in the reporting country.

Sea transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
BE - Belgium	Thousands of tonnes	Total transport	206.539	218.941	236.320	243.819	203.368	228.228	232.789	0
		Inwards	116.603	125.486	134.138	140.196	111.659	126.882	129.708	0
		Outwards	89.936	93.455	102.183	103.622	91.709	101.346	103.080	0
	Number	Inhabitants	10.445.852	10.511.382	10.584.534	10.666.866	10.753.080	10.839.905	11.000.638	11.094.850
	Tons per inhabitant	Total transport per inhabitant	19,77	20,83	22,33	22,86	18,91	21,05	21,16	0,00
		Inwards per inhabitant	11,16	11,94	12,67	13,14	10,38	11,71	11,79	0,00
		Outwards per inhabitant	8,61	8,89	9,65	9,71	8,53	9,35	9,37	0,00

The indicator is differentiated into:

- Total transport = Any movement of goods and/or passengers using merchant ships on journeys, which are undertaken wholly or partly at sea;
- Inwards;
- Outwards.

Inland Water Ways:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Thousands of tonnes	Total transport	9.336	9.183	12.107	11.209	9.322	11.052	9.943	10.714
		National transport	356	1.137	972	502	329	457	565	1.240
		International transport	7.723	6.254	7.811	7.897	6.527	7.868	7.110	7.063
		International transport - Loaded	1.653	1.441	1.547	2.166	1.581	1.668	1.546	1.624
		International transport - Unloaded	6.070	4.813	6.264	5.731	4.945	6.200	5.564	5.439
		Transit	1.258	1.792	3.323	2.809	2.466	2.728	2.268	2.411
	Number	Inhabitants	8.201.359	8.254.298	8.282.984	8.318.592	8.355.260	8.375.290	8.404.252	8.408.121
	Tons per inhabitant	Total transport per inhabitant	1,14	1,11	1,46	1,35	1,12	1,32	1,18	1,27
		National transport per inhabitant	0,04	0,14	0,12	0,06	0,04	0,05	0,07	0,15
		International transport per inhabitant	0,94	0,76	0,94	0,95	0,78	0,94	0,85	0,84
		International transport - Loaded per inhabitant	0,20	0,17	0,19	0,26	0,19	0,20	0,18	0,19
		International transport - Unloaded per inhabitant	0,74	0,58	0,76	0,69	0,59	0,74	0,66	0,65
		Transit per inhabitant	0,15	0,22	0,40	0,34	0,30	0,33	0,27	0,29

Besides the total number, the indicator is differentiated into:

- National transport = Any movement of goods and/or passengers using an Inland Waterways Transport (IWT) vessel between two places (a place of loading/embarkation and a place of unloading/disembarkation) within a national territory irrespective of the country in which the IWT vessel is registered. It may involve transit through a second country, although for this country this transport has to be reported as transit;
- International transport = Inland waterway transport between two places (a place of loading/embarkation and a place of unloading/disembarkation) located in two different countries. It may involve transit through one or more additional countries. For the latter countries this transport has to be reported as transit;
- International transport – Loaded;
- International transport – Unloaded;
- Transit = Inland waterway transport through a country between two places (a place of loading/embarkation and a place of unloading/disembarkation) both located in another country or in other countries provided that the total journey within the country is by inland waterways and that there is no loading/embarkation and unloading/disembarkation operation in that country.

Air transportation:

Country	Indicator	Specification		2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Tons	Total freight and mail on board in tonnes	Total transport	207.818	229.126	228.007	227.264	220.697	257.309	240.567	219.775
			National transport	994	955	838	863	782	695	545	396
			International transport	206.824	228.171	227.169	226.401	219.915	256.614	240.022	219.379
			International transport Intra-EU	62.690	64.715	65.073	63.711	62.710	71.872	75.485	71.757
			International transport Extra-EU	144.134	163.456	162.096	162.690	157.205	184.742	164.537	147.622
		Freight and mail loaded in tonnes	Total transport	84.684	87.231	84.755	80.849	74.361	85.608	96.188	89.592
			National transport	993	967	839	861	807	699	554	384
			International transport	83.691	86.264	83.916	79.988	73.554	84.909	95.634	89.208
			International transport Intra-EU	27.033	26.303	26.581	26.467	24.061	24.453	23.814	22.232
			International transport Extra-EU	56.658	59.961	57.335	53.521	49.493	60.456	71.820	66.976
	Number	Inhabitants		8.201.359	8.254.298	8.282.984	8.318.592	8.355.260	8.375.290	8.404.252	8.408.121
	Tons per inhabitant	Total freight and mail on board	Total transport per inhabitant	0,025	0,028	0,028	0,027	0,026	0,031	0,029	0,026
			National transport per inhabitant	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
			International transport per inhabitant	0,025	0,028	0,027	0,027	0,026	0,031	0,029	0,026
			International transport Intra-EU per inhabitant	0,008	0,008	0,008	0,008	0,008	0,009	0,009	0,009
			International transport Extra-EU per inhabitant	0,018	0,020	0,020	0,020	0,019	0,022	0,020	0,018
		Freight and mail loaded	Total transport per inhabitant	0,010	0,011	0,010	0,010	0,009	0,010	0,011	0,011
			National transport per inhabitant	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
			International transport per inhabitant	0,010	0,010	0,010	0,010	0,009	0,010	0,011	0,011
			International transport Intra-EU per inhabitant	0,003	0,003	0,003	0,003	0,003	0,003	0,003	0,003
			International transport Extra-EU per inhabitant	0,007	0,007	0,007	0,006	0,006	0,007	0,009	0,008

Besides the total number, the indicator is differentiated into:

- National transport = Air transport on a domestic flight;
- International transport = Air transport on an international flight;
- International transport Intra-EU;
- International transport Extra-EU.

Indicator 4 - Number of vehicles

Description:

This indicator represents the number of vehicles registered at the end of one year within the different modes of transport and countries.

Source:

- Eurostat-Tables:
  - 'avia_eq_arc_typ' - 'Commercial aircraft fleet by type of aircraft';
  - 'iww_eq_loadcap' - 'Number of self-propelled vessels, of dumb and pushed vessels by load capacity';
  - 'rail_eq_loco_n' - 'Number of locomotives, by source of power';
  - 'rail_eq_railc_n' - 'Number of railcars, by source of power';
  - 'rail_eq_wagon_n' - 'Number of wagons, by status of enterprise';
  - 'road_eqs_lornum' - 'Lorries, by load capacity';
  - 'road_eqs_roaene' - 'Road tractors by type of motor energy';
  - 'road_eqs_semitn' - 'Semi-trailers, by load capacity';
  - 'road_eqs_trailn' - 'Trailers, by load capacity'.
- UNCTADstat - Maritime Transport - World merchant fleet.

Structure of tables:

The MS Excel file contains 5 sheets for all modes of transport. The single sheets are structured as follows:

Rail transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Number	locomotives	-	-	1.447	-	-	1.436	1.428	-
		railcars	-	-	590	-	-	645	640	-
		Wagons	-	-	20.787	-	-	21.015	20.684	-
		Covered wagons	-	-	6.131	-	-	8.537	5.716	-
		High sided wagons	-	-	3.576	-	-	3.705	3.494	-
		Flat wagons	-	-	4.069	-	-	4.793	4.918	-
		Wagons for intermodal transport	-	-	-	-	-	3.286	3.134	-
		Other wagons	-	-	7.011	-	-	0	3.422	-
BE - Belgium	Number	locomotives	760	717	698	644	570	-	-	-
		railcars	759	754	749	750	748	-	-	-
		Wagons	17.077	15.544	15.730	15.854	12.821	-	-	-
		Covered wagons	427	191	78	74	84	-	-	-
		High sided wagons	2.328	2.105	1.980	1.940	1.645	-	-	-
		Flat wagons	12.234	11.310	11.990	12.042	10.635	-	-	-
		Wagons for intermodal transport	-	-	-	0	0	-	-	-
		Other wagons	2.088	1.938	1.682	1.798	457	-	-	-

Besides the total number, the indicator is differentiated into:

- Locomotives = Tractive railway vehicle with a power of 110 kW and above at the draw hook equipped with prime mover and motor or with motor only used for hauling railway vehicles;
- Railcars = Tractive railway vehicle with motor constructed for the conveyance of passengers or goods by rail;
- Wagons = Railway vehicle normally intended for the transport of goods;
- Covered wagons = Wagon characterized by its closed construction with a roof and fully enclosed sides, capable of being locked and/or sealed;
- High sided wagons = Wagon with no roof and with rigid sides higher than 60 cm;
- Flat wagons = Wagon without roof or sides, or wagon without roof but with sides not higher than 60 cm, or swing-bolster wagon, of ordinary or special type;
- Wagons for intermodal transport = Wagon specially built or equipped for the transport of intermodal transport units (ITUs) or other goods road vehicles;

- Other wagons.

Road transportation:

Country	Indicator	Specification		2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Number	Lorries	Total	338.888	345.480	353.744	362.990	370.907	379.965	390.704	-
			Less than 1 000 kg	216.209	222.462	228.076	233.899	239.979	246.537	-	-
			From 1 000 to 1 499 kg	57.733	59.215	62.468	66.402	69.073	72.480	-	-
			From 1 500 to 2 999 kg	16.139	15.297	14.715	14.190	13.671	13.167	-	-
			From 3 000 to 4 999 kg	8.163	7.865	7.620	7.297	6.999	6.751	-	-
			From 5 000 to 6 999 kg	6.905	6.640	6.437	6.238	6.022	5.835	-	-
			From 7 000 to 9 999 kg	12.945	12.635	12.378	12.271	12.160	12.153	-	-
			From 10 000 to 14 999 kg	14.280	14.456	14.726	14.966	15.139	15.175	-	-
			15 000 kg or over	6.514	6.910	7.324	7.727	7.864	7.867	-	-
		Semi-trailer	Total	26.564	26.668	27.107	27.615	27.137	27.765	-	-
			Less than 5 000 kg	-	712	710	709	705	705	-	-
			From 5 000 to 9 999 kg	-	288	274	277	228	224	-	-
			From 10 000 to 14 999 kg	-	535	513	504	521	504	-	-
			From 15 000 to 19 999 kg	-	697	668	626	621	605	-	-
			20 000 kg or over	-	24.436	24.942	25.499	25.062	25.727	-	-
		Trailers	Total	541.635	554.200	567.691	582.311	595.299	613.118	679.002	-
			Less than 5 000 kg	473.795	486.479	498.927	512.488	525.825	540.646	-	-
			From 5 000 to 9 999 kg	17.826	17.743	17.669	17.509	17.277	17.903	-	-
			From 10 000 to 14 999 kg	16.049	16.225	16.591	16.954	17.109	18.506	-	-
			15 000 kg or over	33.965	33.753	34.504	35.360	35.088	36.063	-	-
		Road tractors		19.161	18.843	18.901	18.348	17.065	16.823	-	-
		Total		926.248	945.191	967.443	991.264	1.010.408	1.037.671	1.069.706	-

Besides the total number, the indicator is differentiated into the 4 vehicle types:

- Lorries = Rigid road motor vehicle designed, exclusively or primarily, to carry goods;
- Semi-trailer = Goods road vehicle with no front axle designed in such way that part of the vehicle and a substantial part of its loaded weight rests on a road tractor;
- Trailers = Goods road vehicle designed to be hauled by a road motor vehicle. This category excludes agricultural trailers and caravans;
- Road tractors = Road motor vehicle designed, exclusively or primarily, to haul other road vehicles which are not power-driven (mainly semi-trailers). Agricultural tractors are excluded.

Each type of vehicle is differentiated in different classes of load capacity.

Sea transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Number	Total fleet	-	-	-	-	-	-	1	1
		Oil tankers	-	-	-	-	-	-	-	-
		Bulk carriers	-	-	-	-	-	-	-	-
		General cargo	-	-	-	-	-	-	-	-
		Container ships	-	-	-	-	-	-	-	-
		Other types of ships	-	-	-	-	-	-	1	1
BE - Belgium	Number	Total fleet	-	-	-	-	-	-	192	203
		Oil tankers	-	-	-	-	-	-	13	13
		Bulk carriers	-	-	-	-	-	-	19	21
		General cargo	-	-	-	-	-	-	17	18
		Container ships	-	-	-	-	-	-	4	4
		Other types of ships	-	-	-	-	-	-	139	147

The numbers are not differentiated into more details.

Inland Waterways:

Country	Indicator	Specification		2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Number	Self-propelled barge	Total	-	-	-	-	-	-	-	-
			Less than 250 t	-	-	-	-	-	-	-	-
			From 250 to 399 t	-	-	-	-	-	-	-	-
			From 400 to 649 t	-	-	-	-	-	-	-	-
			From 650 to 999 t	-	-	-	-	-	-	-	-
			From 1 000 to 1 499 t	-	-	-	-	-	-	-	-
			From 1 500 to 2 999 t	-	-	-	-	-	-	-	-
			3 000 t or over	-	-	-	-	-	-	-	-
		Dumb and pushed vessel	Total	-	-	-	-	-	-	-	-
			Less than 250 t	-	-	-	-	-	-	-	-
			From 250 to 399 t	-	-	-	-	-	-	-	-
			From 400 to 649 t	-	-	-	-	-	-	-	-
			From 650 to 999 t	-	-	-	-	-	-	-	-
			From 1 000 to 1 499 t	-	-	-	-	-	-	-	-
			From 1 500 to 2 999 t	-	-	-	-	-	-	-	-
			3 000 t or over	-	-	-	-	-	-	-	-
		Total		0	0	0	0	0	0	0	-
BE - Belgium	Number	Self-propelled barge	Total	1.242	1.220	1.177	1.126	1.091	1.065	1.022	-
			Less than 250 t	36	35	35	36	34	33	32	-
			From 250 to 399 t	303	276	244	251	237	222	203	-
			From 400 to 649 t	180	172	160	116	115	102	99	-
			From 650 to 999 t	186	179	166	160	148	146	130	-
			From 1 000 to 1 499 t	287	285	286	283	267	255	244	-
			From 1 500 to 2 999 t	204	214	212	191	190	196	203	-
			3 000 t or over	46	59	74	89	100	111	111	-
		Dumb and pushed vessel	Total	242	246	248	244	244	244	241	-
			Less than 250 t	14	14	19	19	15	13	17	-
			From 250 to 399 t	20	21	19	33	34	37	34	-
			From 400 to 649 t	39	39	41	27	30	27	24	-
			From 650 to 999 t	10	10	10	11	11	11	11	-
			From 1 000 to 1 499 t	29	24	23	23	21	21	23	-
			From 1 500 to 2 999 t	90	88	81	77	78	76	68	-
			3 000 t or over	40	47	55	54	53	59	64	-
		Total		1.484	1.466	1.425	1.370	1.335	1.309	1.263	-

Besides the total number, the indicator is differentiated into the 2 vehicle types:

- Self-propelled barge = any powered inland waterways freight vessel, other than self-propelled tanker barges;
- Dumb and pushed vessel = IWT freight vessel designed to be towed which does not have its own means of mechanical propulsion / IWT freight vessel which is designed to be pushed and does not have its own means of mechanical propulsion.

Air transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Number	Cargo aircraft	1	1	1	1	1	0	0	-
BE - Belgium	Number	Cargo aircraft	20	48	54	55	40	24	28	-

Values are not differentiated into more details.

Indicator 5 - Number of vehicle movements

Description:

This indicator represents the number of journeys of a vehicle per year and includes both loaded and empty runs. So the number does not depend on the weight loaded. It is differentiated in the two modes of transport road and air as well as in countries. The indicator is stated in 1,000 journeys for road and simply the number of departures for air transports.

Source:

- Eurostat-Table:
  - 'road_go_ta_vm' - 'Annual road freight transport vehicle movements, loaded and empty, by reporting country'.
- World Bank - Data - Indicators (all) - Infrastructure - Air transport, registered carrier departures worldwide.

Structure of tables:

The MS Excel file contains 2 sheets for road and air transport. The single sheets are structured as follows:

Road transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	1000 Journeys	Total transport	37.107	46.374	45.645	46.939	43.071	42.120	43.584	42.477
		National transport	33.785	42.799	42.207	43.651	40.119	39.386	40.811	39.981
		International transport	3.322	3.575	3.438	3.288	2.953	2.735	2.773	2.496
BE - Belgium	1000 Journeys	Total transport	25.143	25.739	25.780	19.467	19.117	18.882	18.393	14.606
		National transport	21.165	21.440	21.994	15.998	15.722	15.818	15.653	12.618
		International transport	3.977	4.300	3.786	3.469	3.395	3.064	2.739	1.987

Besides the total number, the indicator is differentiated into:

- National transport = Road transport between two places (a place of loading/embarkation and a place of unloading/ disembarkation) located in the same country irrespective of the country in which the road motor vehicle is registered. It may involve transit through a second country;
- International transport = Road transport between a place of loading/embarkation or unloading/disembarkation in the reporting country and a place of loading/embarkation or unloading/disembarkation in another country.

Air transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Number	Registered carrier departures worldwide	141.968	149.512	151.070	150.738	138.942	176.195	193.587	174.101
BE - Belgium	Number	Registered carrier departures worldwide	151.939	158.016	173.818	179.019	249.997	105.201	108.414	104.227

Values are only stated for total transport and are not differentiated into more details:

- Registered carrier departures worldwide = Domestic takeoffs and takeoffs abroad of air carriers registered in the country.

Indicator 6 - Number of empty runs

Description:

This indicator represents the number of journeys with an empty vehicle per year. It is differentiated in the two modes of transport road and rail as well as in countries. The

indicator is stated in 1,000 empty journeys for road and the number of empty containers and swap bodies for rail transports.

Source:

- Eurostat-Tables:
  - 'rail_go_contnbr' - 'Annual number of empty and loaded intermodal transport units carried on railways';
  - 'road_go_ta_vm' - 'Annual road freight transport vehicle movements, loaded and empty, by reporting country'.

Structure of tables:

The MS Excel file contains 2 sheets for road and rail transport. The single sheets are structured as follows:

Rail transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Number	Total transport	227.606	285.257	302.326	328.368	271.957	323.117	322.341	286.669
		National transport	115.018	155.620	185.749	209.625	158.214	181.918	171.366	155.575
		International transport	71.763	90.006	87.318	95.356	92.440	113.296	111.685	93.581
		International transport - Incoming	32.307	41.437	38.481	35.661	36.610	43.325	43.074	43.679
		International transport - Outgoing	39.456	48.569	48.837	59.695	55.830	69.971	68.611	49.902
		Transit	40.825	39.631	29.259	23.387	21.303	27.903	39.290	37.513
BE - Belgium	Number	Total transport	0	143.799	124.171	130.344	72.424	77.334	75.989	-
		National transport	0	82.588	65.382	57.706	39.714	42.407	41.669	-
		International transport	0	60.953	58.667	72.304	32.597	34.807	34.201	-
		International transport - Incoming	0	23.304	24.813	18.597	7.837	8.368	8.223	-
		International transport - Outgoing	0	37.649	33.854	53.707	24.760	26.439	25.979	-
		Transit	0	258	122	334	113	121	119	-

Besides the total number, the indicator is differentiated into:

- National transport = Railway transport between two places (a place of loading/embarkation and a place of unloading/disembarkation) located in the same country;
- International transport = Railway transport between a place (of loading/embarkation or of unloading/disembarkation) in one country and a place (of loading/embarkation or of unloading/disembarkation) in another country;
- International transport – Incoming;
- International transport – Outgoing;
- Transit = Railway transport through a country between two places (a place of loading/embarkation and a place of unloading/disembarkation) outside that country.

Road transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	1000 Journeys	Total transport	14.842	18.368	18.166	18.687	17.206	16.919	17.520	17.092
		National transport	13.748	17.204	17.028	17.573	16.162	15.959	16.541	16.245
		International transport	1.094	1.164	1.138	1.114	1.043	960	979	847
BG - Bulgaria	1000 Journeys	Total transport	-	15.120	12.999	16.051	13.296	11.437	10.892	11.540
		National transport	-	14.983	12.875	15.865	12.956	11.078	10.549	11.082
		International transport	-	137	124	186	340	359	343	458

Besides the total number, the indicator is differentiated into:

- National transport = Road transport between two places (a place of loading/embarkation and a place of unloading/ disembarkation) located in the same country irrespective of the country in which the road motor vehicle is registered. It may involve transit through a second country;

- International transport = Road transport between a place of loading/embarkation or unloading/disembarkation in the reporting country and a place of loading/embarkation or unloading/disembarkation in another country.

Indicator 7 - Tonnes per vehicle

Description:

This indicator represents the weight of transported goods per vehicle for all transport modes per year. Furthermore it is differentiated in Countries. The indicator is stated in transported tonnes per one vehicle.

Source:

- Eurostat-Tables:
  - 'avia_eq_arc_typ' - 'Commercial aircraft fleet by type of aircraft';
  - 'avia_gooc' - 'Freight and mail air transport by reporting country';
  - 'iww_eq_loadcap' - 'Number of self-propelled vessels, of dumb and pushed vessels by load capacity';
  - 'iww_go_atygo' - 'Transport by type of good (from 2007 onwards with NST2007)';
  - 'iww_go_atygo07' - 'Transport by type of good (1982-2007 with NST/R)';
  - 'mar_go_aa' - 'Maritime transport - Goods (gross weight) - Annual data - All ports - by direction';
  - rail_eq_loco_n' - 'Number of locomotives, by source of power';
  - rail_eq_railc_n - 'Number of railcars, by source of power';
  - rail_eq_wagon_n' - 'Number of wagons, by status of enterprise';
  - 'rail_go_typeall' - 'Railway transport - Goods transported, by type of transport';
  - road_eqs_lornum' - 'Lorries, by load capacity';
  - road_eqs_roaene' - 'Road tractors by type of motor energy';
  - road_eqs_semitn' - 'Semi-trailers, by load capacity';
  - road_eqs_trailn' - 'Trailers, by load capacity';
  - 'road_go_ta_tott' - 'Summary of annual road freight transport by type of operation and type of transport'.
- UNCTADstat - Maritime Transport - World merchant fleet.

Structure of tables:

The MS Excel file contains 5 sheets for all modes of transport. The single sheets are structured as follows:

Rail transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Tons per vehicle (Wagons) - Rail	Total transport	-	-	5.558	-	-	5.123	5.201	-
BE - Belgium	Tons per vehicle (Wagons) - Rail	Total transport	-	-	4.212	4.078	3.566	-	-	-

Values are not differentiated into more details:

- Number of rail vehicles = Sum of wagons per country.

Road transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Tons per vehicle (Lorries and road tractors) - Road	Total transport	805	985	951	969	868	834	-	-
BE - Belgium	Tons per vehicle (Lorries and road tractors) - Road	Total transport	518	520	510	446	411	402	380	-

Values are not differentiated into more details:

- Number of road vehicles = Sum of lorries and road tractors per country;
- Lorries = Rigid road motor vehicle designed, exclusively or primarily,to carry goods;

- Road tractors = Road motor vehicle designed, exclusively or primarily, to haul other road vehicles which are not power-driven (mainly semi-trailers). Agricultural tractors are excluded.

Sea transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Tons per vehicle (Vessels and ships) - Sea	Total transport	no data available						-	-
BE - Belgium	Tons per vehicle (Vessels and ships) - Sea	Total transport							1.212.443	-

Values are not differentiated into more details:

- Number of sea vehicles = Sum of vessels / ships per country.

Inland waterways transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Tons per vehicle (Barges and vessels) - IWW	Total transport	-	-	-	-	-	-	-	-
BE - Belgium	Tons per vehicle (Barges and vessels) - IWW	Total transport	108.084	113.134	94.489	95.146	81.081	123.448	136.901	-

Values are not differentiated into more detail:

- Number of IWW vehicles = Sum of self-propelled barges and dumb and pushed vessels per country.

Air transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Tons per vehicle (Cargo aircrafts) - Air	Total transport	207.818	229.126	228.007	227.264	220.697	-	-	-
BE - Belgium	Tons per vehicle (Cargo aircrafts) - Air	Total transport	34.720	23.447	25.326	22.733	23.825	46.595	41.370	-

Values are not differentiated into more details.

- Number of air vehicles = Sum of cargo aircrafts per country.

Indicator 8 - Total Turnover

Description:

This indicator represents the turnover of logistics services providers for the different countries Turnover hereby is defined as the totals invoiced by the observation unit during the reference period, and this corresponds to market sales of goods or services supplied to third parties. Turnover includes all duties and taxes on the goods or services invoiced by the unit with the exception of the VAT invoiced by the unit vis-à-vis its customer and other similar deductible taxes directly linked to turnover. It also includes all other charges (transport, packaging, etc.) passed on to the customer, even if these charges are listed separately in the invoice. Reduction in prices, rebates and discounts as well as the value of returned packing must be deducted. Income classified as other operating income, financial income and extra-ordinary income in company accounts is excluded from turnover. Operating subsidies received from public authorities or the institutions of the European Union are also excluded.

Source:

- Eurostat-Table:
  - 'sbs_na_1a_se_r2' - 'Annual detailed enterprise statistics for services (NACE Rev. 2 H-N and S95)';
- Fraunhofer SCS Research, Estimations and Calculations.

Structure of tables:

The MS Excel file contains 1 sheet and is structured as follows:

Turnover:

GEO	GEO	NACE_R2	NACE_R2	2005	2006	2007	2008	2009	2010	2011	2012
EU28	European Union (28 countries)	H	Transportation and storage	-	-	-	-	-	-	1.320.000	-
			Sum of Logistics (H492, H494, H495, H502, H504, H512, H521, H522, H532)	-	-	-	-	-	-	899.087	-
EU27	European Union (27 countries)	H	Transportation and storage	-	-	-	1.305.077	1.140.000	1.250.000	1.310.000	-
			Sum of Logistics (H492, H494, H495, H502, H504, H512, H521, H522, H532)	-	-	-	950.948	867.042	916.121	936.270	-
BE	Belgium	H	Transportation and storage	-	-	-	49.026	42.281	46.797	47.292	50.362
			Sum of Logistics (H492, H494, H495, H502, H504, H512, H521, H522, H532)	-	-	-	34.598	30.850	34.319	33.381	34.317

Values are not differentiated into more details - relevant industrial sectors according to NACE_R2 are listed in table.

Indicator 9 - Number of logistics service providers

Description:

This indicator represents the number of logistics services provider for the different modes of transport in each country. In this indicator all companies offering mainly services in the field of transportation and/or warehousing services as well as other logistics related functions are listed.

Source:

- Eurostat-Tables:
  - 'avia_ec_enterp' - 'Number of aviation and airport enterprises';
  - 'iww_ec_ent_n' - 'Number of inland waterway transport enterprises by number of vessels';
  - 'rail_ec_ent' - 'Railway enterprises - by type of enterprise';
  - 'road_ec_entemp' - 'Goods road transport enterprises, by number of employees'.

Structure of tables:

The MS Excel file contains 4 sheets for road, rail, inland water ways and air transportation. The single sheets are structured as follows:

Rail transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Number	Total	24	26	27	21	21	23	-	-
		Railway undertaking	-	-	-	-	-	-	-	-
		Infrastructure manager	-	-	-	-	-	-	-	-
		Integrated company	-	-	-	-	-	-	-	-
BE - Belgium	Number	Total	1	1	1	1	1	-	-	-
		Railway undertaking	-	-	-	-	-	-	-	-
		Infrastructure manager	-	-	-	-	-	-	-	-
		Integrated company	-	-	-	-	-	-	-	-

Besides the total number the service providers are differentiated into the following 3 types of enterprises:

- Railway undertaking;
- Infrastructure manager = Any enterprise or transport operator responsible in particular for establishing and maintaining railway infrastructure, as well as for operating the control and safety systems. An infrastructure manager can delegate to another railway enterprise the following tasks: maintaining railway infrastructure and operating the control and safety system;
- Integrated company = Railway transport operator also being an infrastructure manager.

Road transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Number		6.706	7.147	7.384	7.080	6.824	6.742	-	-
BG - Bulgaria	Number		10.051	7.660	7.097	8.015	8.974	9.072	9.510	-

The numbers are not differentiated into more details.

Inland Waterways:

Country	Indicator	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Number	73	73	75	72	83	82	-	-
BE - Belgium	Number	1.062	1.041	1.079	1.087	-	-	-	-

The numbers are not differentiated into more details.

Air transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
BG - Bulgaria	Number	Aviation enterprises	-	-	6	12	-	15	19	-
		Airport enterprises	-	-	-	-	-	-	-	-
		Total	0	0	6	12	0	15	19	-

Besides the total number the service providers are differentiated into the following 2 types of enterprises:

- Aviation enterprises;
- Airport enterprises.

Indicator 10 - Number of employees

Description:

This indicator represents the number of employees within the logistics sector for different modes of transport and countries. This also covers employees not employed at logistics service providers, but dedicated to tasks related to transportation and/or warehousing activities as well as other logistics related functions.

Source:

- Eurostat-Tables:
  - avia_ec_emp_ent' - 'Employment in aviation and airport enterprises by sex';
  - 'iww_ec_employ' - 'Employment in inland waterways transport enterprises by number of vessels in enterprises';
  - 'rail_ec_emplo_a' - 'Employment in principal railway enterprises, by type of activity';
  - 'road_ec_empl' - 'Employment in goods road transport enterprises'.
- Les comptes des transports 2012, p.72;
- Federal Ministry of Transport, Building and Urban Development - Verkehr in Zahlen 2012/2013.

Structure of tables:

The MS Excel file contains 4 sheets for road, rail, inland waterways and air transportation. The single sheets are structured as follows:

Rail transportation:

Country	ndicato	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Number	Total	15.897	14.830	14.167	13.092	12.779	12.468	-	-
		General administration	-	-	-	-	-	-	-	-
		Railway operations - total	-	-	-	-	-	-	-	-
		Railway operations - operating and traffic	-	-	-	-	-	-	-	-
		Railway operations - traction and rolling stock	-	-	-	-	-	-	-	-
		Railway operations - ways and works	-	-	-	-	-	-	-	-
		Employment in other operations	-	-	-	-	-	-	-	-
BE - Belgium	Number	Total	37.290	37.993	38.331	38.587	38.792	-	-	-
		General administration	-	-	-	-	-	-	-	-
		Railway operations - total	-	-	-	-	-	-	-	-
		Railway operations - operating and traffic	-	-	-	-	-	-	-	-
		Railway operations - traction and rolling stock	-	-	-	-	-	-	-	-
		Railway operations - ways and works	-	-	-	-	-	-	-	-
		Employment in other operations	-	-	-	-	-	-	-	-

Besides the total number, the employees are differentiated into the following 6 types of activities:

- General administration;
- Railway operations – total: Includes all employees related to operational tasks within a railway company (total number of the following types;
- Railway operations - operating and traffic: Station staff (excluding staff operating control and safety systems), train crews (excluding tractive units' crews) and associated central and regional offices. Includes tourism and advertising;
- Railway operations - traction and rolling stock: Tractive units' crews, workshop, inspection staff and associated central and regional offices;
- Railway operations - ways and works;
- Employment in other operations = Passenger and goods road services, shipping services, electric power plants, hotel staff etc.

Road transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Number		57.576	53.910	54.073	54.338	51.782	51.012	-	-
BG - Bulgaria	Number		-	-	-	43.397	44.752	43.800	48.149	-

The numbers are not differentiated into more details.

Inland Waterways transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria			379	434	413	457	470	459	-	-
BG - Bulgaria			-	-	-	1.134	1.095	1.058	979	-

The numbers are not differentiated into more details.

Air transportation:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
BG - Bulgaria	Number	Aviation enterprises	-	-	-	1.659	1.675	1.660	1.735	-
		Airport enterprises	-	-	-	-	-	-	-	-
		Total	0	0	0	1.659	1.675	1.660	1.735	-
CY - Cyprus	Number	Aviation enterprises	2.800	2.800	1.822	1.637	1.568	1.212	1.037	-
		Airport enterprises	-	-	1.186	2.569	-	8.727	7.100	-
		Total	2.800	2.800	3.008	4.206	1.568	9.939	8.137	-

Besides the total number, the employees are differentiated into the following 2 types of enterprises:

- Aviation enterprises;
- Airport enterprises.

Indicator 10b - Number of employees (LSP)

Description:

This indicator represents the total number of employees in the logistics sector according to the NACE Rev. 2 classification. The included classes are H492 to H532. This comprises only staff members directly employed in companies from the transport and logistics sector.

Source:

- Eurostat-Table:
  - 'SBS_na_1a_se_r2' - 'Annual detailed enterprise statistics for services (NACE Rev. 2 H-N and S95).
- Fraunhofer SCS Research, Estimations and Calculations.

Structure of tables:

The MS Excel file contains 1 sheet for all types of transportation. The single sheet is structured as follows:

Employees:

Legend: value estimated from average of existing values in timeline

GEO	GEO	NACE_R2	NACE_R2	2005	2006	2007	2008	2009	2010	2011	2012
BE	Belgium	H	Transportation and storage	-	-	-	186.367	184.162	201.147	202.077	-
			Sum of Logistics	0	0	0	103.446	103.432	143.629	143.803	0
		H492	Freight rail transport	-	-	-	-	-	-	-	-
		H494	Freight transport by road and removal services	-	-	-	54.757	54.757	54.324	55.189	-
		H495	Transport via pipeline	-	-	-	16	14	24	10	-
		H502	Sea and coastal freight water transport	-	-	-	175	175	175	175	-
		H504	Inland freight water transport	-	-	-	240	185	343	356	-
		H512	Freight air transport and space transport	-	-	-	-	-	-	-	-
		H521	Warehousing and storage	-	-	-	8.303	7.843	10.357	14.128	-
		H522	Support activities for transportation	-	-	-	39.955	40.458	78.406	73.945	-
		H532	Other postal and courier activities	-	-	-	-	-	-	-	-
BG	Bulgaria	H	Transportation and storage	-	-	-	148.576	147.171	141.553	142.287	-
			Sum of Logistics	0	0	0	80.103	79.947	77.974	81.447	0
		H492	Freight rail transport	-	-	-	5.621	5.621	5.621	5.621	-
		H494	Freight transport by road and removal services	-	-	-	38.267	39.305	38.337	42.468	-
		H495	Transport via pipeline	-	-	-	0	0	0	0	-
		H502	Sea and coastal freight water transport	-	-	-	-	-	-	-	-
		H504	Inland freight water transport	-	-	-	1.111	1.075	1.034	955	-
		H512	Freight air transport and space transport	-	-	-	521	362	407	416	-
		H521	Warehousing and storage	-	-	-	926	784	920	874	-
		H522	Support activities for transportation	-	-	-	33.657	32.800	31.655	31.113	-
		H532	Other postal and courier activities	-	-	-	-	-	-	-	-

The numbers are not differentiated into more details.

- Employees = Persons who work for an employer and who have a contract of employment and receive compensation in the form of wages, salaries, fees, gratuities, piecework pay or remuneration in kind. The relationship of employer to employee exists when there is an agreement, which may be formal or informal, between an enterprise and a person, normally entered into voluntarily by both parties, whereby the person works for the enterprise in return for remuneration in cash or in kind.

Indicator 11 - Average turnover per service provider

Description:

The indicator average turnover per service provider is calculated by logistics service providers' turnover divided by the number of relevant enterprises in each country. It is stated in Euro.

Source:

- Eurostat-Table:
  - 'sbs_na_1a_se_r2' - 'Annual detailed enterprise statistics for services (NACE Rev. 2 H-N and S95).

Structure of tables:
The MS Excel file contains 1 sheet and is structured as follows:

GEO	GEO(L)	NACE_R2	NACE_R2/TIME	2005	2006	2007	2008	2009	2010	2011	2012
EU28	European Union (28 countries)	H	Transportation and storage	-	-	-	-	-	-	1.155	-
			Sum of Logistics (H492, H494, H495, H502, H504, H512, H521, H522, H532)	-	-	-	-	-	-	3.277	-
EU27	European Union (27 countries)	H	Transportation and storage	-	-	-	1.167	1.024	1.114	1.156	-
			Sum of Logistics (H492, H494, H495, H502, H504, H512, H521, H522, H532)	-	-	-	1.237	1.113	1.164	1.175	-
BE	Belgium	H	Transportation and storage	-	-	-	3.051	2.530	2.550	2.759	-
			Sum of Logistics (H492, H494, H495, H502, H504, H512, H521, H522, H532)	-	-	-	2.957	2.622	2.698	2.885	-

Values are not differentiated into more details - relevant industrial sectors according to NACE_R2 are listed in the table:

- Enterprises = The enterprise is the smallest combination of legal units that is an organizational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources. An enterprise carries out one or more activities at one or more locations. An enterprise may be a sole legal unit.

Indicator 12 - Average vehicle age

Description:
The indicator average vehicle age shows the average age of the vehicles in use in years for different vehicle type (e.g. semi-trailer). It is calculated as the weighted average of different vehicle age classes (e.g. from 2 to 5 years).

Source:

- Eurostat-Tables:
  - 'iww_eq_age' - 'Number of vessels by date of construction';
  - 'road_eqs_lorroa' - 'Lorries and road tractors, by age'.
- Fraunhofer SCS Research, Estimations and Calculations.

Structure of tables:
The MS Excel file contains 2 sheets for road and IWW vehicles. The single sheets are structured as follows:

Average vehicle age: Road

Country	Indicator	Specification		2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Average Vehicle Age	Lorries	Total	6,72	5,95	5,89	5,82	5,93	6,05	-	-
		Road tractors	Total	4,09	3,50	3,66	3,67	3,97	4,33	-	-
		Total	Total	6,58	5,83	5,78	5,72	5,84	5,97	-	-
BE - Belgium	Average Vehicle Age	Lorries	Total	6,29	6,28	6,26	6,24	6,30	6,46	6,58	-
		Road tractors	Total	5,64	5,74	5,73	5,64	5,69	5,99	6,20	-
		Total	Total	6,24	6,24	6,23	6,20	6,26	6,43	6,56	-

Besides the total number, the indicator is differentiated into:

- Lorries = Rigid road motor vehicle designed, exclusively or primarily, to carry goods;
- Road tractors = Road motor vehicle designed, exclusively or primarily, to haul other road vehicles which are not power-driven (mainly semi-trailers).

Average vehicle age: Inland Waterways

Country	Indicator	Specification		2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Average Vehicle Age	Self-propelled barge	Total	-	-	-	-	-	-	-	-
		Dumb and pushed vessel	Total	-	-	-	-	-	-	-	-
		Total	Total	-	-	-	-	-	-	-	-
BE - Belgium	Average Vehicle Age	Self-propelled barge	Total	-	-	42,85	42,86	49,43	50,28	51,06	-
		Dumb and pushed vessel	Total	-	-	23,47	24,52	36,63	37,21	39,31	-
		Total	Total	-	-	39,47	39,60	47,77	48,59	49,55	-

Besides the total number, the indicator is differentiated into:

- Self-propelled barge = Any powered inland waterways freight vessel, other than self-propelled tanker barges. Towed barges, pushed barges and pushed-towed barges which have an auxiliary engine only must be regarded as towed barges, pushed barges or pushed-towed barges as the case may be. The fact that a self-propelled barge can be used for towing does not change its nature;
- Dumb and pushed vessel = IWT freight vessel designed to be towed which does not have its own means of mechanical propulsion / IWT freight vessel which is designed to be pushed and does not have its own means of mechanical propulsion.

Indicator 13 - Average vehicle size

Description:

The indicator average vehicle size shows the average size of load capacity in kg / tonnes per vehicle type (e.g. semi-trailer). It is calculated as the weighted average of different vehicle load capacity classes (e.g. 3,000 kg to 5,000 kg) per vehicle type.

Source:

- Eurostat-Tables:
  - 'iww_eq_loadcap' - 'Number of self-propelled vessels, of dumb and pushed vessels by load capacity';
  - 'road_eqs_lornum' - 'Lorries, by load capacity';
  - 'road_eqs_semitn' - 'Semi-trailers, by load capacity';
  - 'road_eqs_trailn' - 'Trailers, by load capacity'.

Structure of tables:

The MS Excel file contains 2 sheets for road and IWW vehicles. The single sheets are structured as follows:

Average vehicle size: road

Country	Indicator	Specification		2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	avg. payload in kg	Lorries	Total	2.036	2.016	2.002	1.987	1.961	1.927	-	-
		Semi-trailers	Total	-	21.931	21.972	22.002	22.010	22.044	-	-
		Trailers	Total	3.870	3.836	3.829	3.822	3.787	3.801	-	-
BE - Belgium	avg. payload in kg	Lorries	Total	-	-	-	-	-	-	-	-
		Semi-trailers	Total	-	-	-	-	-	-	-	-
		Trailers	Total	-	-	-	-	-	-	-	-

The indicator is differentiated into:

- Lorries = Rigid road motor vehicle designed, exclusively or primarily, to carry goods;
- Semi-trailer = Goods road vehicle with no front axle designed in such way that part of the vehicle and a substantial part of its loaded weight rests on a road tractor;
- Trailers = Goods road vehicle designed to be hauled by a road motor vehicle. This category excludes agricultural trailers and caravans.

Average vehicle size: IWW

Country	Indicator	Specification		2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	avg. payload in tons	Self-propelled barge	Total	-	-	-	-	-	-	-	-
		Dumb and pushed vessel	Total	-	-	-	-	-	-	-	-
BE - Belgium	avg. payload in tons	Self-propelled barge	Total	1.091	1.154	1.221	1.261	1.308	1.367	1.406	-
		Dumb and pushed vessel	Total	1.803	1.868	1.896	1.866	1.869	1.930	1.965	-

The indicator is differentiated into:

- Self-propelled barge = Any powered inland waterways freight vessel, other than self-propelled tanker barges;
- Dumb and pushed vessel = IWT freight vessel designed to be towed which does not have its own means of mechanical propulsion / IWT freight vessel which is designed to be pushed and does not have its own means of mechanical propulsion.

Indicator 14 - Average length of haul

Description:

The indicator average length of haul is calculated by tonne-kilometres divided by tonnes of total freight transport per mode. It is stated in kilometers.

Source:

- Eurostat-Tables:
  - 'iww_go_atygo' - 'Transport by type of good (from 2007 onwards with NST2007)';
  - 'iww_go_atygo07' - 'Transport by type of good (1982-2007 with NST/R)';
  - 'rail_go_typeall' - 'Railway transport - Goods transported, by type of transport';
  - 'road_go_ta_tott' - 'Summary of annual road freight transport by type of operation and type of transport'.
- Fraunhofer SCS Research, Estimations and Calculations.

Structure of tables:

The MS Excel file contains 3 sheets for road, rail and inland waterways. The single sheets are structured as follows:

Average length of haul: Rail

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Average length of haul	Total transport	186	189	185	180	180	184	189	188
		National transport	163	152	151	151	153	156	159	160
		International transport	200	200	184	191	189	193	192	183
		International transport - Incoming	186	186	170	173	168	177	179	172
		International transport - Outgoing	222	224	208	223	223	219	213	201
		Transit	185	212	228	200	207	215	234	241
BE - Belgium	Average length of haul	Total transport	-	-	140	138	139	137	136	-
		National transport	-	-	105	98	111	115	110	-
		International transport	-	-	156	159	154	152	149	-
		International transport - Incoming	-	-	152	154	147	161	141	-
		International transport - Outgoing	-	-	159	163	159	145	156	-
		Transit	-	-	179	187	168	82	160	-

Besides the total number, the indicator is differentiated into:

- National transport = Railway transport between two places (a place of loading/embarkation and a place of unloading/disembarkation) located in the same country;
- International transport = Railway transport between a place (of loading/embarkation or of unloading/disembarkation) in one country and a place (of loading/embarkation or of unloading/disembarkation) in another country;

- International transport – Incoming;
- International transport – Outgoing;
- Transit = Railway transport through a country between two places (a place of loading/embarkation and a place of unloading/disembarkation) outside that country.

Average length of haul: Road

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Average length of haul	Total - Total transport	129	109	106	93	86	87	83	78
		Loaded - Total transport	129	109	106	93	86	87	83	78
		Loaded - National transport	50	46	47	44	45	46	46	46
		Loaded - International transport - Total	618	579	564	528	463	475	445	419
		Loaded - International - Goods loaded in reporting country	594	571	554	506	436	462	436	409
		Loaded - International - Goods unloaded in reporting country	544	517	519	493	441	441	422	404
		Loaded - International - Cross-trade	1.016	960	943	896	818	831	759	732
		Loaded - International - Cabotage	244	231	223	241	233	225	203	193
BE - Belgium	Average length of haul	Total - Total transport	130	123	119	121	121	118	114	107
		Loaded - Total transport	130	123	119	121	121	118	114	107
		Loaded - National transport	73	72	70	73	75	75	76	75
		Loaded - International transport - Total	337	315	307	296	289	292	277	263
		Loaded - International - Goods loaded in reporting country	328	308	299	292	289	292	275	263
		Loaded - International - Goods unloaded in reporting country	319	305	293	280	269	269	258	236
		Loaded - International - Cross-trade	551	525	534	513	500	473	485	453
		Loaded - International - Cabotage	251	220	226	225	224	237	218	213

Besides the total number, the indicator is differentiated into:

- Loaded - Total transport;
- Loaded - National transport = Road transport between two places (a place of loading/embarkation and a place of unloading/ disembarkation) located in the same country irrespective of the country in which the road motor vehicle is registered. It may involve transit through a second country;
- Loaded - International transport – Total = Road transport between a place of loading/embarkation or unloading/disembarkation in the reporting country and a place of loading/embarkation or unloading/disembarkation in another country;
- Loaded - International - Goods loaded in reporting country;
- Loaded - International - Goods unloaded in reporting country;
- Loaded - International - Cross-trade = Road transport performed by a road motor vehicle registered in one country between a place of loading/ embarkation in a second country and a place of unloading/disembarkation in a third country;
- Loaded - International - Cabotage = Road transport within a country other than the registration country, performed by a road motor vehicle registered in the reporting country.

Average length of haul: Inland Waterways

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Average length of haul	Total transport	188	200	215	210	215	215	214	204
		National transport	104	120	150	183	188	160	156	81
		International transport	165	172	165	163	165	171	175	177
		International transport - Loaded	119	119	105	120	126	123	118	131
		International transport - Unloaded	178	187	180	179	178	184	190	190
		Transit	350	350	350	350	350	350	350	350
BE - Belgium	Average length of haul	Total transport	53	54	67	67	65	56	54	55
		National transport	86	84	88	95	86	82	78	87
		International transport	41	41	56	54	54	43	41	42
		International transport - Loaded	34	33	50	48	52	36	34	36
		International transport - Unloaded	45	46	60	58	55	48	46	46
		Transit	129	130	73	72	82	75	72	59

Besides the total number, the indicator is differentiated into:

- National transport = Any movement of goods and/or passengers using an Inland Waterways Transport (IWT) vessel between two places (a place of loading/embarkation and a place of unloading/disembarkation) within a national territory irrespective of the country in which the IWT vessel is registered. It may involve transit through a second country, although for this country this transport has to be reported as transit;
- International transport = Inland waterway transport between two places (a place of loading/embarkation and a place of unloading/ disembarkation) located in two different countries. It may involve transit through one or more additional countries. For the latter countries this transport has to be reported as transit;
- International transport – Loaded;
- International transport – Unloaded;
- Transit = Inland waterway transport through a country between two places (a place of loading/embarkation and a place of unloading/disembarkation) both located in another country or in other countries provided that the total journey within the country is by inland waterways and that there is no loading/embarkation and unloading/ disembarkation operation in that country.

Indicator 15 - Overall logistics expenses per country

Description:

This indicator represents the overall logistics expenses per country and is differentiated into several sub-categories like transportation, warehousing, order procession administration & planning as well as inventory holding costs. The indicator is stated in billions of Euro.

Source:

- Fraunhofer SCS Research, Estimations and calculations - Top 100 reports:
  - Distribution derived from Davis: Establish Davis - Logistics Cost and Service 2012. Presentation on the Annual Conference of the Council of Supply Chain Management Professionals (CSCMP) Annual Conference, varying venues, 2013).

Structure of tables:

The MS Excel file contains 1 sheet that is structured as follows:

Logistics expenses:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Logistics Expenses	Total logistics expenses	-	-	16,9	17,1	18,7	18,2	21,5	18,8
		Transportation	-	-	7,5	7,7	8,0	7,6	9,0	8,3
		Warehousing	-	-	4,2	4,3	4,7	4,7	5,6	4,5
		Order Processing	-	-	0,8	0,9	1,1	1,1	1,3	1,1
		Administration and Planning	-	-	0,8	0,9	0,7	0,7	0,9	0,8
		Inventory Holding	-	-	3,5	3,4	4,1	4,0	4,7	4,1
BE - Belgium	Logistics Expenses	Total logistics expenses	-	-	31,9	29,6	27,5	30,4	33,8	29,7
		Transportation	-	-	14,2	13,3	11,8	12,8	14,2	13,1
		Warehousing	-	-	7,9	7,4	6,9	7,9	8,8	7,1
		Order Processing	-	-	1,6	1,5	1,7	1,8	2,0	1,8
		Administration and Planning	-	-	1,6	1,5	1,1	1,2	1,4	1,2
		Inventory Holding	-	-	6,7	5,9	6,1	6,7	7,4	6,5

Besides the total logistic expenses, the indicator is not differentiated into more details.

Indicator 16 - Vehicle and train-tkm

Description:

This indicator represents the overall tonne-kilometres per vehicle and year for all modes of transport. It is calculated by transport mode's tonne-kilometres divided by number of vehicles. It is stated in tonne-kilometres.

Source:

- Eurostat-Tables:
  - 'avia_eq_arc_typ' - 'Commercial aircraft fleet by type of aircraft';
  - 'iww_eq_loadcap' - 'Number of self-propelled vessels, of dumb and pushed vessels by load capacity';
  - 'iww_go_atygo' - 'Transport by type of good (from 2007 onwards with NST2007)';
  - 'iww_go_atygo07' - 'Transport by type of good (1982-2007 with NST/R)';
  - 'rail_eq_loco_n' - 'Number of locomotives, by source of power';
  - 'rail_eq_railc_n - 'Number of railcars, by source of power';
  - 'rail_eq_wagon_n' - 'Number of wagons, by status of enterprise';
  - 'rail_go_typeall' - 'Railway transport - Goods transported, by type of transport';
  - 'road_eqs_lornum' - 'Lorries, by load capacity';
  - 'road_eqs_roaene' - 'Road tractors by type of motor energy';
  - 'road_eqs_semitn' - 'Semi-trailers, by load capacity';
  - 'road_eqs_trailn' - 'Trailers, by load capacity';
  - 'road_go_ta_tott' - 'Summary of annual road freight transport by type of operation and type of transport'.
- OECD - StatExtracts - Transport - Transport activity - Goods transport - Coastal shipping tonne-km;
- UNCTADstat - Maritime Transport - World merchant fleet;
- World Bank - Data - Indicators (all) - Infrastructure - Air transport, freight (million tonne-km).

Structure of tables:

The MS Excel file contains 5 sheets that are structured as follows:

Vehicle-tkm: Rail

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Vehicle tonne-kilometres - Rail	Total transport	-	-	1.028.094	-	-	943.754	983.611	-
BE - Belgium	Vehicle tonne-kilometres - Rail	Total transport	-	-	588.557	563.076	497.153	-	-	-

The numbers are not differentiated into more details:

- Rail vehicles = Sum of wagons per country.

Vehicle-tkm: Road

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Vehicle tonne-kilometres - Road	Total transport	103.461	107.561	100.369	89.981	74.941	72.227	-	-
BE - Belgium	Vehicle tonne-kilometres - Road	Total transport	67.241	64.165	60.927	53.879	49.960	47.460	43.492	-

The numbers are not differentiated into more details:

- Road vehicles = Sum of lorries and road tractors per country;
- Lorries = Rigid road motor vehicle designed, exclusively or primarily, to carry goods;
- Road tractors = Road motor vehicle designed, exclusively or primarily, to haul other road vehicles which are not power-driven (mainly semi-trailers). Agricultural tractors are excluded.

Vehicle-tkm: Sea

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Vehicle tonne-kilometres - Sea	Total transport	no data available						-	-
BE - Belgium	Vehicle tonne-kilometres - Sea	Total transport							-	-

- Sea vehicles = Sum of vessels / ships per country.

Vehicle-tkm: Inland Waterways

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Vehicle tonne-kilometres - Inland waterways	Total transport	-	-	-	-	-	-	-	-
BE - Belgium	Vehicle tonne-kilometres - Inland waterways	Total transport	5.772.237	6.076.398	6.320.000	6.383.942	5.308.614	6.928.953	7.324.624	-

- Inland waterways vehicles = Sum of self-propelled barges and dumb and pushed vessels per country.

Vehicle-tkm: Air

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Vehicle tonne-kilometres - Air	Total transport	537.472.000	571.977.000	453.759.000	420.794.000	341.511.000	-	-	-
BE - Belgium	Vehicle tonne-kilometres - Air	Total transport	35.256.500	15.424.708	13.985.056	17.848.764	35.687.475	44.472.958	44.331.893	-

- Air vehicles = Sum of cargo aircrafts per country.

Indicator 17 - Number of trips per 1,000 vehicle-kilometres

Description:

This indicator represents the number of trips per 1,000 vehicle-kilometres. It is calculated by total number of trips divided by 1,000 vehicle-kilometres. It is stated in trips per 1,000 vehicle-kilometres.

Source:

- Eurostat-Table:
  - 'road_go_ta_vm' - 'Annual road freight transport vehicle movements, loaded and empty, by reporting country'.

Structure of tables:

The MS Excel file contains 1 sheet that is structured as follows:

Road-trips per 1,000 vehicle-kilometres

		2005	2005	2005	2006	2006	2006
Country	Indicator	Total	Loaded	Empty	Total	Loaded	Empty
AT - Austria	Number of trips per 1,000 vehicle-kilometres	11,8	9,7	17,5	13,7	11,4	19,5
BE - Belgium	Number of trips per 1,000 vehicle-kilometres	7,5	7,5	-	7,5	7,5	-

Besides the total numbers, the indicator states the number of loaded and unloaded trips per 1,000 vehicle-kilometres as well.

Indicator 18 - Share of road freight vehicles with EURO 4-6 standard

Description:

This indicator represents the share of road freight vehicles with Euro 4-6 standard. It is stated as the share of new registrations with EURO standards in total light commercial vehicles registrations. Besides the MS Excel file, there are several other sources concerning European Vehicle Statistics.

Source:

- ICCT European vehicle market statistics – Pocketbooks.

Structure of tables:
The MS Excel file contains 1 sheet that is structured as follows:

Country	Indicator	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Total registrations					23.946	29.055	33.507	32.698
	Euro 4								
	Euro 5					3%	5%	65%	93%
	Euro 6								
BE - Belgium	Total registrations					48.415	54.841	63.485	56.049
	Euro 4								
	Euro 5					3%	1%	64%	56%
	Euro 6								

Besides the total registrations, the indicator is differentiated into EURO 4, 5 and 6 standards.

Indicator 19 - Owned and hired fleet share (poss. for road)

Description:
This indicator represents the total amount of owned and hired fleet for road transports, differentiated by number of vehicles and by transported goods. It is stated in number of vehicles respectively 1,000 tonnes and million tonne-kilometres.

Source:
- Eurostat-Tables:
  - 'road_eqs_lrstn' - 'Lorries, road tractors, semi-trailers and trailers, by kind of transport (number)';
  - 'road_go_ta_tg' - 'Annual road freight transport, by type of goods and type of transport (1 000 t, Mio Tkm), from 2008 onwards';
  - 'road_go_ta7tg' - 'Annual road freight transport, by type of goods and type of transport (1 000 t, Mio Tkm), until 2007'.

Structure of tables:
The MS Excel file contains 6 sheets that are structured as follows:

Number of vehicles: Lorries

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Owned and hired fleet share - Number of vehicles (Lorries)	Total	338.888	345.480	353.744	362.990	370.907	379.965	-	-
		Own account	311.915	-	-	-	-	-	-	-
		Hire or reward	26.973	-	-	-	-	-	-	-
BE - Belgium	Owned and hired fleet share - Number of vehicles (Lorries)	Total	604.437	623.250	642.687	662.780	676.644	690.837	714.370	-
		Own account	-	-	-	-	-	-	-	-
		Hire or reward	-	-	-	-	-	-	-	-

Besides the total number of vehicles, the indicator is differentiated into:
- Lorries = Rigid road motor vehicle designed, exclusively or primarily, to carry goods;
- Own account = Transport which is not for hire or reward. Such transport is the movement by an enterprise of its own cargo without any financial transaction;
- Hire or reward = Carriage, for remuneration, of persons or goods on behalf of third parties.

Number of vehicles: Road tractors

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Owned and hired fleet share - Number of vehicles (Road tractors)	Total	19.161	18.843	18.901	18.348	17.065	16.823	-	-
		Own account	4.282	-	-	-	-	-	-	-
		Hire or reward	14.879	-	-	-	-	-	-	-
BE - Belgium	Owned and hired fleet share - Number of vehicles (Road tractors)	Total	47.646	47.164	48.060	49.109	47.418	46.673	46.844	-
		Own account	-	-	-	-	-	-	-	-
		Hire or reward	-	-	-	-	-	-	-	-

Besides the total number of vehicles, the indicator is differentiated into:

- Road tractors = Road motor vehicle designed, exclusively or primarily, to haul other road vehicles which are not power-driven (manly semi-trailers). Agricultural tractors are excluded;
- Own account = Transport which is not for hire or reward. Such transport is the movement by an enterprise of its own cargo without any financial transaction;
- Hire or reward = Carriage, for remuneration, of persons or goods on behalf of third parties.

Number of vehicles: Trailers

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Owned and hired fleet share - Number of vehicles (Trailers)	Total	541.635	554.200	567.691	582.311	595.299	613.118	-	-
		Own account	509.644	-	-	-	-	-	-	-
		Hire or reward	31.991	-	-	-	-	-	-	-
BE - Belgium	Owned and hired fleet share - Number of vehicles (Trailers)	Total	-	-	-	-	-	-	-	-
		Own account	-	-	-	-	-	-	-	-
		Hire or reward	-	-	-	-	-	-	-	-

Besides the total number of vehicles, the indicator is differentiated into:

- Trailers = Goods road vehicle designed to be hauled by a road motor vehicle. This category excludes agricultural trailers and caravans;
- Own account = Transport which is not for hire or reward. Such transport is the movement by an enterprise of its own cargo without any financial transaction;
- Hire or reward = Carriage, for remuneration, of persons or goods on behalf of third parties.

Number of vehicles: Semi-trailers

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Owned and hired fleet share - Number of vehicles (Semi-trailers)	Total	26.564	26.668	27.107	27.615	27.137	27.765	-	-
		Own account	-	-	-	-	-	-	-	-
		Hire or reward	-	-	-	-	-	-	-	-
BE - Belgium	Owned and hired fleet share - Number of vehicles (Semi-trailers)	Total	-	-	-	-	-	-	-	-
		Own account	-	-	-	-	-	-	-	-
		Hire or reward	-	-	-	-	-	-	-	-

Besides the total number of vehicles, the indicator is differentiated into:

- Semi-trailers = Goods road vehicle with no front axle designed in such way that part of the vehicle and a substantial part of its loaded weight rests on a road tractor;
- Own account = Transport which is not for hire or reward. Such transport is the movement by an enterprise of its own cargo without any financial transaction;
- Hire or reward = Carriage, for remuneration, of persons or goods on behalf of third parties.

Transported goods: 1,000 tonnes

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Owned and hired fleet share - Total transported goods in thousand tonnes	Total	288.200	358.850	354.338	369.460	336.698	331.042	344.747	333.971
		Own account	119.316	148.427	147.227	156.328	142.750	145.622	149.400	144.788
		Hire or reward	168.884	210.423	207.111	213.132	193.948	185.420	195.347	189.183
BE - Belgium	Owned and hired fleet share - Total transported goods in thousand tonnes	Total	337.913	348.527	352.202	317.637	297.879	296.189	289.203	233.170
		Own account	106.095	104.295	108.236	71.139	81.248	81.316	81.768	87.444
		Hire or reward	231.817	244.232	243.966	246.498	216.630	214.873	207.436	145.726

Besides the total number of vehicles, the indicator is differentiated into:

- Own account = Transport which is not for hire or reward. Such transport is the movement by an enterprise of its own cargo without any financial transaction;

- Hire or reward = Carriage, for remuneration, of persons or goods on behalf of third parties.

Transported goods: million tonne-kilometres

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Owned and hired fleet share - Total transported goods in million tkm	Total	35.304	37.455	35.726	33.510	28.385	27.928	27.852	25.511
		Own account	6.468	6.936	7.419	7.159	6.454	6.820	6.916	6.648
		Hire or reward	28.836	30.519	28.307	26.351	21.931	21.108	20.935	18.863
BE - Belgium	Owned and hired fleet share - Total transported goods in million tkm	Total	48.394	47.868	46.815	42.751	40.519	39.404	37.484	28.395
		Own account	9.698	9.691	8.664	6.932	8.691	7.887	8.490	8.006
		Hire or reward	38.696	38.177	38.151	35.818	31.828	31.517	28.994	20.388

Besides the total number of vehicles, the indicator is differentiated into:

- Own account = Transport which is not for hire or reward. Such transport is the movement by an enterprise of its own cargo without any financial transaction;
- Hire or reward = Carriage, for remuneration, of persons or goods on behalf of third parties.

Indicator 20 - TEN-T lines per country

Description:

The indicator represents the number of Ten-T lines crossing a country and its various passages of different transport modes. The Ten-T project was initiated by the EU in order to manage upcoming transport issues and harmonizing European transport market. It consists inter alia of 9 corridors that need special attention and are important for European or international transport. Core ports and airports that are significant for national or international transports are defined, too.

Source:

- Fraunhofer SCS Evaluation via http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/main.jsp.

Structure of tables:

The MS Excel file contains 1 sheet that is structured as follows:

GEO		no. of corridors	nominations	no. ports core	no. airports core	overall			specific segments		
						road tracks	rail tracks	IWW tracks	road	rail	IWW
BE	Belgium	3	(2) North Sea-Baltic Corridor	10	2	5	11	8	1	2	0
			(6) Rhine-Alpine Corridor						1	2	0
			(8) North Sea-Mediterranean Corridor						3	7	8
BG	Bulgaria	2	(4) Orient/East-Med Corridor	3	1	3	4	1	3	4	0
			(9) Rhine-Danube Corridor						0	0	1

Besides the total number of corridors crossing one country and their specific nominations, the total amount of core ports and airports is given. Furthermore individual road, rail and IWW segments per corridor are listed.

Indicator 21 - Modal share of intermodal transport

Description:

This indicator represents the modal share of intermodal transport for the transport modes road, rail and IWW. It is stated in total and intermodal tonnes (in thousand).

Source:

Fraunhofer SCS Research and Calculations based on statistical data from Eurostat and the fundamental assumption that every combined freight tonnage transported by rail and IWW is transported twice by road freight vehicles (pre-carriage and onward

carriage). The intermodal tonnes for railway transports are extracted directly from the stated Eurostat table. The intermodal tonnage for IWW is the whole tonnage of container transport via inland waterways:

- Eurostat-Tables:
  - 'iww_go_actygo' - 'Container transport by type of good (from 2007 onwards with NST2007)';
  - 'iww_go_atygo' - 'Transport by type of good (from 2007 onwards with NST2007)';
  - 'iww_go_atygo07' - 'Transport by type of good (1982-2007 with NST/R)';
  - 'rail_go_contwgt' - 'Annual railway transport of goods in intermodal transport units (1 000 t, million tkm)';
  - 'rail_go_typeall' - 'Railway transport - Goods transported, by type of transport';
  - 'road_go_ta_tott' - 'Summary of annual road freight transport by type of operation and type of transport'.

Structure of tables:
The MS Excel file contains 1 sheet that is structured as follows:

Modal share – intermodal:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Thousands of tonnes	Total tons - Rail	-	-	115.526	121.579	98.887	107.670	107.587	103.920
		Intermodal tons - Rail	-	-	24.520	27.465	24.760	30.924	31.135	27.086
		Total tons - IWW	-	-	12.107	11.209	9.322	11.052	9.943	10.714
		Intermodal tons - IWW	-	-	12	14	15	5	5	7
		Total tons - Road	-	-	354.330	369.454	336.691	331.034	344.737	333.963
		Intermodal tons - Road	-	-	49.064	54.958	49.550	61.858	62.280	54.186
		Total tons - combined	-	-	481.963	502.242	444.900	449.756	462.267	448.597
		Intermodal tons - combined	-	-	73.596	82.437	74.325	92.787	93.420	81.279
BE - Belgium	Thousands of tonnes	Total tons - Rail	-	-	66.248	64.648	45.718	54.476	55.876	-
		Intermodal tons - Rail	-	-	17.987	17.991	15.166	16.194	15.912	-
		Total tons - IWW	-	-	134.647	130.350	108.243	161.594	172.906	190.288
		Intermodal tons - IWW	-	-	26.844	24.075	21.089	22.390	23.196	34.189
		Total tons - Road	-	-	352.202	317.637	297.879	296.189	289.203	-
		Intermodal tons - Road	-	-	89.662	84.132	72.510	77.168	78.216	-
		Total tons - combined	-	-	553.097	512.635	451.840	512.259	517.985	-
		Intermodal tons - combined	-	-	134.493	126.198	108.765	115.752	117.324	-

Besides the total amount of tonnes per transport mode, intermodal tonnes are described as well.

Indicator 23 - Share of logistics costs on total product costs

Description:
This indicator represents the share of logistics cost on total product costs.

Please use indicator 25 tables as proxy. There the value added of logistics is calculated as proportion from the total macroeconomic product and several sub-segments (primary, secondary, tertiary sector) and industry sectors (construction, food, motor vehicles, chemicals, machinery). On macroeconomic level the information on logistics costs as share of total product costs is not directly available, unless surveyed directly. Therefore figures are derived from the national account systems symmetrical input output matrices that are available on NACE Rev 2 classification. From a present day perspective the elaborate approach via the national account systems best serves this purpose (on macroeconomic level) due to similar leading questions of Indicators 23 and 25.

Indicator 25 - Share of value added of the logistics sector in total value added

Description:

The indicator represents the value added by logistics sector related to primary, secondary and tertiary sector. It is stated in percent. It describes the inputs in sectors or branches coming from logistics activities measured by NACE Rev. 2 divisions 49, 50, 52 and 53. Division 51 (Air transport) is left out due to passenger transportation focus.

Source:

- Fraunhofer SCS Research, Estimations and Calculations based on symmetrical input output matrices for EU member states;
- Eurostat-Table:
  - 'sbs_na_1a_se_r2' - 'Annual detailed enterprise statistics for services (NACE Rev. 2 H-N and S95)'.

Structure of tables:

The MS Excel file contains 1 sheet that is structured as follows:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Value added by logistics sector	Total national product (Nace2 Sections A-U, Divisions 01-99)	-	-	-	5,44%	5,47%	5,45%	-	-
		Primary sector - Agriculture (Nace2 Sections A-B, Divisions 01-09)	-	-	-	3,54%	2,99%	2,86%	-	-
		Secondary sector - Manufacturing (Nace2 Section C, Divisions 10-33)	-	-	-	4,26%	4,62%	4,41%	-	-
		Tertiary sector - Services (Nace2 Sections D-U, Divisions 35-99)	-	-	-	6,15%	5,95%	6,04%	-	-
		Industry branch - Constructions and construction works	-	-	-	1,59%	1,48%	1,43%	-	-
		Industry branch - Food products, beverages and tobacco products	-	-	-	5,83%	5,86%	5,97%	-	-
		Industry branch - Motor vehicles, trailers and semi-trailers	-	-	-	1,09%	1,32%	1,26%	-	-
		Industry branch - Manufacture of chemicals and chemical products	-	-	-	5,11%	6,09%	4,81%	-	-
		Industry branch - Machinery and equipment n.e.c.	-	-	-	2,73%	2,95%	3,00%	-	-

Besides the total national product, the indicator is differentiated into:

- Value added by logistics sector = Inputs in sectors or branches coming from logistics activities measured by NACE Rev 2 Divisions 49, 50, 52, 53. Division 51 Air transport left out due to Passenger transportation focus;
- Primary Sector - Agriculture (Nace2 Sections A-B, Divisions 01-09);
- Secondary sector - Manufacturing (Nace2 Section C, Divisions 10-33);
- Tertiary sector - Services (Nace2 Sections D-U, Divisions 35-99);
- Industry branch - Constructions and construction works;
- Industry branch - Food products, beverages and tobacco products;
- Industry branch - Motor vehicles, trailers and semi-trailers;
- Industry branch - Manufacture of chemicals and chemical products;
- Industry branch - Machinery and equipment n.e.c.

Indicator 26 - Productivity (value added per employee) in the logistics sector

Description:

The indicator represents the productivity of logistics sector based on the value added per person employed. The value for transportation and storage is extracted from Eurostat and stated in 1,000 Euro. The value for logistics is the weighted average of the sectors representing logistics (as explained below) and also stated in 1,000 Euro.

Person employed is defined as are persons aged 15 and over (16 and over in ES and UK, 15 to 74 in DK, EE, HU, LV, SE and FI and 16-74 in IS and NO) who, during the reference week, worked at least one hour for pay, profit or family gain, or were not at work but had a job or business from which they were temporarily absent. Productivity is described as the output produced from each unit of input, for example, the number of cars assembled by one worker in a year. In statistical analysis, productivity may refer to capital productivity, labour productivity, resource productivity (of which energy productivity is a specific case), depending on the input considered.

Source:

- Eurostat-Table:
  - 'sbs_na_1a_se_r2' - 'Annual detailed enterprise statistics for services (NACE Rev. 2 H-N and S95)'.
- Fraunhofer SCS Research, Estimations and Calculations.

Structure of tables:

The MS Excel file contains 1 sheet that is structured as follows:

	Logistics represents:	H492	Freight rail transport
		H494	Freight transport by road and removal services
		H495	Transport via pipeline
		H502	Sea and coastal freight water transport
		H504	Inland freight water transport
		H512	Freight air transport and space transport
		H521	Warehousing and storage
		H522	Support activities for transportation
		H532	Other postal and courier activities

GEO	GEO	NACE_R2	NACE_R2	2005	2006	2007	2008	2009	2010	2011	2012
BE	Belgium	H	Transportation and storage	-	-	-	71	66	72	70	-
			Logistics	-	-	-	80	79	73	72	-
BG	Bulgaria	H	Transportation and storage	-	-	-	9	8	10	10	-
			Logistics	-	-	-	11	10	11	12	-

The indicator is differentiated into:

- Transportation and storage;
- Logistics.

Indicator 27 - Im- and Export value density

Description:

The indicator represents the value density of imports and exports per year for all EU countries. Furthermore, the import / export tonnage as well as import / export values are accounted. The value density is calculated as the ratio of value in million Euros and quantity in million tonnes and is stated in EUR / tonne.

Source:

- Eurostat-Table:
  - 'DS_016890' - 'EU28 trade since 1988 by CN8'.
- Fraunhofer SCS Research, Estimations and Calculation.

Structure of tables:

The MS Excel file contains 1 sheet that is structured as follows:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Total Imports	Value in Mio. Euros	102.345	109.280	118.962	125.301	102.569	119.943	137.513	138.942
	Total Imports	Quantity in Mio. tons	83	88	92	89	81	89	93	92
	Total Imports	Value density in € / ton	1.234	1.235	1.294	1.404	1.266	1.348	1.474	1.502
BE - Belgium	Total Imports	Value in Mio. Euros	256.169	280.053	300.298	317.043	254.367	295.072	335.447	341.787
	Total Imports	Quantity in Mio. tons	279	255	256	264	230	247	255	252
	Total Imports	Value density in € / ton	917	1.098	1.172	1.203	1.104	1.194	1.318	1.358

The numbers are not differentiated into more details.

Indicator 28 - Transport performance (tkms) per GDP (Transport intensity)

Description:

The indicator represents the transport performance per country and per year. Transport performance is calculated as the ratio of tonne-kilometres in inland freight and the gross domestic product in Euro. The quotient is stated in tonne-kilometres per Euro of GDP.

Source:

- Eurostat-Tables:
  - 'iww_go_atygo' - 'Transport by type of good (from 2007 onwards with NST2007)';
  - 'iww_go_atygo07' - 'Transport by type of good (1982-2007 with NST/R)';
  - 'nama_gdp_c' - 'GDP and main components - Current prices';
  - 'rail_go_typeall' - 'Railway transport - Goods transport, by type of transport';
  - 'road_go_ta_tott' - 'Summary of annual road freight transport by type of operation and type of transport'.
- OECD - StatExtracts - Transport activity - Goods transport - Total inland freight in million tonne-km;
- World Bank - Data - Indicators (all) - Infrastructure - Air transport, freight (million tonne-km).

Structure of tables:

The MS Excel file contains 1 sheet that is structured as follows:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Transport intensity (tkm per GDP)	Total transport	0,2636	0,2712	0,2503	0,2338	0,2033	0,2029	0,1946	-
BE - Belgium	Transport intensity (tkm per GDP)	Total transport	0,2047	0,1949	0,1809	0,1646	0,1499	0,1479	0,1386	-

The numbers are not differentiated into more details.

Indicator 29 - a) Fuel prices b) capital costs c) warehouse rents d) road tolls

Description:

These indicators represent the development of different cost factors in the logistics and transportation sector.

Fuel prices:

The indicator represents the consumer prices of petroleum products net / inclusive of duties and taxes and is stated in average weekly prices in EUR per 1,000 litres. The prices communicated by the Member States are the prices most frequently charged, based on a weighted average. Comparisons between prices and price trends in different countries shall be carefully made. They are of limited validity because of differences in product quality, in marketing practices, in market structures, and to the extent that standard categories are representative of the total sales of a given product.

Capital costs:
The indicator shows the nominal short and long term interest rates per year and per country of the European Union. The national data is weighted with the current GDP in ECU / EUR. The short term interest rates are 3-month interbank rates, the long term are 10-year benchmark government bond yields. The indicator is stated in percent.

Warehouse rents:
The indicator represents the average yearly rents for modern warehouse space and is stated in EUR per m². The figures have been calculated by the average of all available values from one country's most representative regions in the different reports. While comparisons between the different countries are feasible, the timelines of the countries should be considered with caution. Due to different data availabilities the number of underlying figures for one country can differ from year to year, which can induce non-market driven rent variations in certain countries.

Road tolls:
The indicator represents road tolls and vignette prices for each European Union member state plus Norway and Switzerland. The values refer to a 40t truck with 4 axles and EURO IV standard. Road tolls are stated in EUR per km, vignette prices in EUR per year.

Source:
- European Commission: Oil Bulletin Prices History;
- European Commission: Economy Finance Series;
- Fraunhofer SCS Research based on multiple market reports from real estate brokers and consultancies (e.g. Jones Lang LaSalle, Cushman & Wakefield, CBRE, DEKA Bank, etc.);
- Ereg association: Road Pricing.

Structure of tables:
The MS Excel file contains 6 sheets. The single sheets are structured as follows:

Fuel prices:
- without duties and taxes

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Diesel price	Average of weekly prices; € / 1000 l	474	506	501	651	425	534	671	738
BE - Belgium	Diesel price	Average of weekly prices; € / 1000 l	470	515	519	680	435	563	712	783

- with duties and taxes

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Diesel price	Average of weekly prices; € / 1000 l	948	1.009	1.034	1.245	974	1.104	1.329	1.410
BE - Belgium	Diesel price	Average of weekly prices; € / 1000 l	992	1.022	1.028	1.208	950	1.143	1.375	1.465

The numbers are not differentiated into more detail.

Capital costs:
- short term interest rates

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Short term Interest rates	3-month interbank rates; %	2,2	3,1	4,3	4,6	1,2	0,8	1,4	0,6
BE - Belgium	Short term Interest rates	3-month interbank rates; %	2,2	3,1	4,3	4,6	1,2	0,8	1,4	0,6

- long term interest rates

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Long term Interest rates	10-year benchmark government bond yields; %	3,4	3,8	4,3	4,4	3,9	3,2	3,3	2,4
BE - Belgium	Long term Interest rates	10-year benchmark government bond yields; %	3,4	3,8	4,3	4,4	3,9	3,5	4,2	3,0

Warehouse rents:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	warehose rents	average of reported rents; € / m² / year	54	68	66	63	74	86	71	62
BE - Belgium	warehose rents	average of reported rents; € / m² / year	49	56	72	54	52	45	45	45

Road tolls:

- tolls

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	road tolls per km	€/km for a 40t truck, 4 axles, EURO IV				0,33	0,33	0,32	0,32	0,35
BE - Belgium	road tolls per km	€/km for a 40t truck, 4 axles, EURO IV				n/a	n/a	n/a	n/a	n/a

Vignette

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	vignette prices per year	€ for a 40t truck, 4 axles, EURO IV				n/a	n/a	n/a	n/a	n/a
BE - Belgium	vignette prices per year	€ for a 40t truck, 4 axles, EURO IV				1.250	1.250	1.250	1.250	1.250

Values are not differentiated into more details.

Indicator 30 - Average wages

Description:

The indicator represents the average wages in the transportation and logistics sector per year and per European country. It is stated in Euro. The value for transportation is directly extracted from Eurostat. The value for logistics is the weighted average of the sectors representing logistics (as explained in the table below).

Source:

- Eurostat-Table:
  - 'sbs_na_1a_se_r2' - 'Annual detailed enterprise statistics for services (NACE Rev. 2 H-N and S95).

Structure of tables:

The MS Excel file contains 1 sheet that is structured as follows:

	Logistics represents average of:	H492	Freight rail transport
		H494	Freight transport by road and removal services
		H495	Transport via pipeline
		H502	Sea and coastal freight water transport
		H504	Inland freight water transport
		H512	Freight air transport and space transport
		H521	Warehousing and storage
		H522	Support activities for transportation
		H532	Other postal and courier activities

GEO	GEO(L)	NACE_R2	NACE_R2	2005	2006	2007	2008	2009	2010	2011	2012
BE	Belgium	H	Transportation and storage	-	-	-	37.207	37.318	40.076	37.228	-
			Logistics	-	-	-	39.926	40.040	42.836	38.621	-
BG	Bulgaria	H	Transportation and storage	-	-	-	3.842	4.051	4.261	4.542	-
			Logistics	-	-	-	4.136	4.273	4.364	4.558	-

The indicator is differentiated into:

- Employees = Persons who work for an employer and who have a contract of employment and receive compensation in the form of wages, salaries, fees, gratuities, piecework pay or remuneration in kind. The relationship of employer to employee exists when there is an agreement, which may be formal or informal, between an enterprise and a person, normally entered into voluntarily by both parties, whereby the person works for the enterprise in return for remuneration in cash or in kind.

Indicator 31 - Number of warehouses per country

Description:

No data available! There is no feasible way to gather this seemingly simply figure. The biggest problem is the lack of a generally accepted definition for the term "warehouse". Most real estate brokers and consultancies consider building larger than 5000m² with the purpose of storing and transhipment of goods as "warehouses", but there is no consistent approach for recording this type of buildings. If there are occasional numbers for a countries warehouses, they only consider those driven by transport companies and not the ones used by industry or commerce itself. The most valid source would be the "building permit and completion statistics" collected by Eurostat, but the indicator "Non-residential buildings, except office buildings" is not further broken down. As this indicator would contain all warehouses but all commercial buildings, shops, hospitals, schools, etc. as well, it cannot be used as a rough estimation. Despite building permits and completions are surveyed on a more specific level in each member state, the collection turned out to be very complex. In Germany, for example, detailed data is aquired on a communal level and aggregated to federal states. Only further aggregated indicators (Warehouses together with retail buildings) are reported to the national level. The gathering for countrywide detailed data would be possible but produces significant time-efforts. Even with these data, there will be a complete coverage only from 1995 on, which is too less to indicate the complete stock of warehouse buildings.

Indicator 32 - m² per warehouse

Description:

The indicator represents the average size of warehouses per country. The figures are calculated by considering all records bigger than 1000m² in the warehouse database conducted by Fraunhofer SCS. This database contains more than 6.600 records for warehouses with these criteria. As described at Indicator No. 31, there is no feasible way to gather complete and valid information about the number or extent of one particular country's warehouses. With the research of Fraunhofer SCS about new warehouse settlements in certain countries, there is at least a sufficient sample for the calculation of average warehouse sizes. Data is acquired by a continuous scanning for press releases, specialist medias and regular queries at project developers.

Source:

- Fraunhofer SCS: Logistikimmobilien - Markt und Standorte 2013.

Structure of tables:

The MS Excel file contains 1 sheet that is structured as follows:

Country	Indicator	Specification	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	average size of warehouses	logistics space in m²								11.253
BE - Belgium	average size of warehouses	logistics space in m²								22.099
BG - Bulgaria	average size of warehouses	logistics space in m²								
CY - Cyprus	average size of warehouses	logistics space in m²								
CZ - Czech Republic	average size of warehouses	logistics space in m²								
DE - Germany	average size of warehouses	logistics space in m²								15.337
DK - Denmark	average size of warehouses	logistics space in m²								
EE - Estonia	average size of warehouses	logistics space in m²								
EL - Greece	average size of warehouses	logistics space in m²								
ES - Spain	average size of warehouses	logistics space in m²								
FI - Finland	average size of warehouses	logistics space in m²								
FR - France	average size of warehouses	logistics space in m²								
HR - Croatia	average size of warehouses	logistics space in m²								
HU - Hungary	average size of warehouses	logistics space in m²								
IE - Ireland	average size of warehouses	logistics space in m²								
IT - Italy	average size of warehouses	logistics space in m²								
LT - Lithuania	average size of warehouses	logistics space in m²								
LU - Luxembourg	average size of warehouses	logistics space in m²								
LV - Latvia	average size of warehouses	logistics space in m²								
MT - Malta	average size of warehouses	logistics space in m²								
NL - Netherlands	average size of warehouses	logistics space in m²								20.606
PL - Poland	average size of warehouses	logistics space in m²								
PT - Portugal	average size of warehouses	logistics space in m²								
RO - Romania	average size of warehouses	logistics space in m²								
SE - Sweden	average size of warehouses	logistics space in m²								
SI - Slovenia	average size of warehouses	logistics space in m²								
SK - Slovakia	average size of warehouses	logistics space in m²								
UK - United Kingdom	average size of warehouses	logistics space in m²								
EU28	average size of warehouses	logistics space in m²								
CH - Switzerland	average size of warehouses	logistics space in m²								9.912

The numbers are not differentiated into more details.

Indicator 33 - Inventory stock turn rate

Description:

The indicator represents the inventory stock turnover of companies which operate in specific NACE codes (as explained below). Only companies with an operating revenue of one million EUR (in 2012) and above were considered. For example, a value of 20 means that turnover per year is 20 times the average inventory.

Source:

- Fraunhofer SCS Calculations based on Amadeus Company Database extraction from April 2014.

Structure of tables:

The MS Excel file contains 1 sheet and is structured as follows:

Country	Indicator	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Inventory stock turnover	29,36	31,11	25,10	27,03	28,16	28,40	28,09	29,80
BE - Belgium	Inventory stock turnover	32,01	33,37	32,86	33,97	32,67	33,11	35,15	33,80

Values are not differentiated into more details - relevant industrial sectors according to NACE Rev. 2 are listed in the table:

- 01 - Crop and animal production, hunting and related service activities;
- 02 - Forestry and logging;
- 03 - Fishing and aquaculture;
- 05 - Mining of coal and lignite;
- 06 - Extraction of crude petroleum and natural gas;
- 07 - Mining of metal ores;

- 08 - Other mining and quarrying;
- 09 - Mining support service activities;
- 10 - Manufacture of food products;
- 11 - Manufacture of beverages;
- 12 - Manufacture of tobacco products;
- 13 - Manufacture of textiles;
- 14 - Manufacture of wearing apparel;
- 15 - Manufacture of leather and related products;
- 16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials;
- 17 - Manufacture of paper and paper products;
- 18 - Printing and reproduction of recorded media;
- 19 - Manufacture of coke and refined petroleum products;
- 20 - Manufacture of chemicals and chemical products;
- 21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations;
- 22 - Manufacture of rubber and plastic products;
- 23 - Manufacture of other non-metallic mineral products;
- 24 - Manufacture of basic metals;
- 25 - Manufacture of fabricated metal products, except machinery and equipment;
- 26 - Manufacture of computer, electronic and optical products;
- 27 - Manufacture of electrical equipment;
- 28 - Manufacture of machinery and equipment nec;
- 29 - Manufacture of motor vehicles, trailers and semi-trailers;
- 30 - Manufacture of other transport equipment;
- 31 - Manufacture of furniture;
- 32- Other manufacturing;
- 45 - Wholesale and retail trade and repair of motor vehicles and motorcycles;
- 46 - Wholesale trade, except of motor vehicles and motorcycles;
- 47 - Retail trade, except of motor vehicles and motorcycles.

Indicator 36 - Share of inputs from ICT

Description:

This indicator represents the share of inputs from ICT (Information and Communication Technologies) divisions as share of sector H Transportation and Storage including comparable values calculated from symmetrical input output matrices where available in NACE Rev. 2 classification. The indicator is stated in percent.

ICT: J61 Telecommunications
J62 Computer programming, consultancy and related activities
J63 Information service activities

H: H49 Land transport and transport via pipeline
H50 Water transport
H51 Air transport
H52 Warehousing and support activities for transportation
H53 Postal and courier activities

Source:

- Eurostat-Tables:
  - Symmetrical Input Output Tables per country and EU27 aggregate.
- Fraunhofer SCS Research, Estimations and Calculations.

Structure of tables:
The MS Excel file contains 1 sheet that is structured as follows:

Country	Indicator	2005	2006	2007	2008	2009	2010	2011	2012
AT - Austria	Share of inputs from ICT in Transportation and Storage	-	-	-	1,08%	1,18%	1,51%	-	-
BE - Belgium	Share of inputs from ICT in Transportation and Storage	-	-	-	-	-	1,61%	-	-

Values are not differentiated into more detail.

Content & Quality

In the following section, the different indicators as well as the utilized sources, mostly queries from Eurostat, are evaluated. In table A it is represented which statistical sources are used for each indicator. Furthermore, it is shown which surveys, as far as they are provided by Eurostat, are based on a legal act gathered by the common questionnaire on a voluntary basis (to differentiate please pay attention to the information in the grey box in the table below). Table B represents the countries per indicator, for which **no information** were available at all. The last table C shows how often country-specific data are available for the most recent year in utilized queries from Eurostat.

Table A

Nb	Indicator	Source & Type of data collection (only if Eurostat query)																																											
		common questionnaire	*common questionnaire*	*common questionnaire*	*legal act*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*legal act*	*legal act*	*legal act*	*legal act*	*legal act*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*legal act*	*legal act*	*legal act*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*legal act / common questionnaire **	*legal act / common questionnaire **	*legal act / common questionnaire **	*legal act / common questionnaire **	*n.a.*	*legal act / common questionnaire ** (see left): distinct classification is not possible; data on infrastr., transp., equipm., enterpr., econ. perform., employm., traffic, pass., goods, accid. are based on comm. quest.; data on carriage of goods using heavy vehicles on legal act								
		avia_ec_enterp	avia_ec_emp_ent	avia_eq_arc_typ	avia_gooc	demo_pjan	iww_ec_employ	iww_ec_ent_n	iww_eq_age	iww_eq_loadcap	iww_go_actygo	iww_go_atygo	iww_go_atygo07	mar_go_aa	nama_gdp_c	rail_ec_emplo_a	rail_ec_ent	rail_eq_loco_n	rail_eq_railc_n	rail_eq_wagon_n	rail_go_contnbr	rail_go_contwgt	rail_go_typeall	road_ec_empl	road_ec_entemp	road_eqs_lornum	road_eqs_lorroa	road_eqs_lrstn	road_eqs_roaene	road_eqs_semitn	road_eqs_traln	road_go_ta_tg	road_go_ta_tott	road_go_ta_vm	road_go_ta7tg	sbs_na_1a_se_r2	Fraunhofer SCS Research	BvD (Amadeus Database)	Ereg association	EU Commission	Eurostat (other)	ICCT	OECD	UNCTADstat	World Bank
1	Tons (per transport mode)				●							●	●	●									●										●												
2	Tonne-kilometres											●	●										●										●										●		●
3	Tons per inhabitant				●	●						●	●	●									●										●												
4	Number of vehicles			●						●								●	●	●						●			●	●	●													●	
5	Number of vehicle movements																																	●											●
6	Number of empty runs																				●													●											
7	Tons per vehicle			●	●					●		●	●	●				●	●	●			●			●			●	●	●		●											●	
8	Total turnover																																			●									
9	Number of logistics service providers	●						●									●								●																				
10	Number of employees		●				●									●								●																					
10b	Number of employees (LSP)																																			●									
11	Average turnover per service provider																																			●									
12	Average vehicle age								●																		●																		
13	Average vehicle size									●																●				●	●														
14	Average length of haul											●	●										●										●				●								
15	Overall logistic expenses per country																																				●								

Continuation of Table A

Nb	Indicator	Source & Type of data collection (only if Eurostat query)																																											
		common questionnaire	common questionnaire	common questionnaire	legal act	common questionnaire	common questionnaire	common questionnaire	common questionnaire	common questionnaire	legal act	legal act	legal act	legal act	legal act	common questionnaire	common questionnaire	common questionnaire	common questionnaire	common questionnaire	legal act	legal act	legal act	common questionnaire	common questionnaire	common questionnaire	common questionnaire	common questionnaire	common questionnaire	common questionnaire	common questionnaire	legal act / common questionnaire *	legal act / common questionnaire *	legal act / common questionnaire *	legal act / common questionnaire *	n.a.	*legal act / common questionnaire ** (see left): distinct classification is not possible; data on infrastr., transp., equipm., enterpr., econ. perform., employm., traffic, pass., goods, accid. are based on comm. quest.; data on carriage of goods using heavy vehicles on legal act								
		avia_ec_enterp	avia_ec_emp_ent	avia_eq_arc_typ	avia_gooc	demo_pjan	iww_ec_employ	iww_ec_ent_n	iww_eq_age	iww_eq_loadcap	iww_go_actygo	iww_go_atygo	iww_go_atygo07	mar_go_aa	nama_gdp_c	rail_ec_emplo_a	rail_ec_ent	rail_eq_loco_n	rail_eq_railc_n	rail_eq_wagon_n	rail_go_contnbr	rail_go_contwgt	rail_go_typeall	road_ec_empl	road_ec_entemp	road_eqs_lornum	road_eqs_lorroa	road_eqs_lrstn	road_eqs_roaene	road_eqs_semitn	road_eqs_trailn	road_go_ta_tg	road_go_ta_tott	road_go_ta_vm	road_go_ta7tg	sbs_na_1a_se_r2	Fraunhofer SCS Research	BvD (Amadeus Database)	Ereg association	EU Commission	Eurostat (other)	ICCT	OECD	UNCTADstat	World Bank
16	Vehicle / train-tkm			●						●		●	●					●	●	●			●			●			●	●	●		●										●	●	●
17	Number of trips per 1,000 vehicle-kilometre																																	●											
18	Share of road freight vehicles with Euro 4-6 standard																																									●			
19	Owned and hired fleet share (poss. for road)																											●				●			●										
20	TEN-T lines per country																																				●								
21	Modal share of intermodal transport										●	●	●									●	●										●												
25	Share of value added of the logistics sector in total value added																																			●	●								
26	Productivity (value added per employee) in the logistics sector																																			●	●								
27	Im-/Export value density per country																																				●				●				
28	Transport performance (tonne-kilometres) per GDP (Transport intensity)											●	●		●								●										●										●		●
29	Fuel prices / capital costs / warehouse rents / road tolls																																				●		●	●					
30	Average wages																																			●									
32	m² per warehouse																																				●								
33	Inventory stock turn rate																																				●	●							
36	Share of inputs from ICT																																				●				●				
22	Size of transport units	Indicator not evaluated / examined due to missing data availability and/or due to low relevance for researech purposes																																											
23	Share of logistics costs on total product costs																																												
24	Share of turnover of the logistics sector in total turnover																																												
31	Number of warehouses per country																																												
34	Handling factor																																												
35	Logistics efficiency (utilization of vehicles and transshipment facilities)																																												

Table A gives an overview about the 36 indicators (respectively 30 indicators since six were not processed) examined and the different sources used to derive them. The majority of these sources are queries from Eurostat, the statistical database of the European Commission. Furthermore, sources like the company database Amadeus, UNCTADstat, OECD stats and numerous others were used to find necessary and auxiliary information. A few results are simply extracted from one or more queries offered in Eurostat database. Since the required data were included in these queries, no further calculations were necessary (this applies to indicators 1, 2, 4, 5, 6, 9, 17, 19). A major part of the indicators is based upon more than one query and has been determined by complex and detailed calculations and aggregations of different statistical values. This could have been combinations / settlements of two or more statistical surveys and sources or other ways to reach the best possible determination of searched values. Whenever possible, existing gaps in time series in single countries were tried to be closed by using estimates, extrapolations or other proven approaches from Fraunhofer SCS research activities. For some indicators, it was due to lacking information / data solely possible to compile incomplete data sets for certain years and / or certain countries (e.g. Indicator 32 - m² per warehouse). The indicators 22-24, 31, 34 and 35 could not be completed / processed due to missing basic data and / or due to low relevance for the agreed research purposes.

Table B

Nb	Indicator	Data missing for following countries (only listed if values are missing for all considered years) [maximum number of countries: EU28 + CH, NO]	
1	Tons (per transport mode)	**Rail**: CY, MT **Sea**: AT, CZ, HU, LU, SK, CH **Air**: no countries missing	**Road**: MT **IWW**: EE, CH, NO **no relevance for IWW**: CY, DK, EL, ES, IE, LV, MT, PT, SE, SI
2	Tonne-kilometres	**Rail**: CY, MT **Sea**: AT, BE, BG, CY, CZ, DE, DK, EE, EL, FR, HU, LT, LU, LV, NL, PL PT, RO, SI, SK, CH **Air**: SE, NO	**Road**: MT **IWW**: EE, CH, NO **no relevance for IWW**: CY, DK, EL, ES, IE, LV, MT, PT, SE, SI
3	Tons per inhabitant	**Rail**: MT **Sea**: AT, CZ, HU, LU, SK, CH **Air**: no countries missing	**Road**: MT **IWW**: EE, CH, NO **no relevance for IWW**: CY, DK, EL, ES, IE, LV, MT, PT, SE, SI
4	Number of vehicles	**Rail**: CY, IE, MT, UK, CH, NO **Sea**: CZ, HU **Air**: no countries missing	**Road**: EL, IE **IWW**: AT, IT, LU, NL, NO **no relevance for IWW**: CY, DK, EL, ES, IE, LV, MT, PT, SE, SI
5	Number of vehicle movements	**Air**: SE, NO	**Road**: MT
6	Number of empty runs	**Rail**: CY, MT	**Road**: BE, IT MT, RO
7	Tons per vehicle	**Rail**: CY, IE, MT, NL, UK, CH, NO **Sea**: AT, CZ, HU, LU, SI, CH **Air**: CY, HR, MT, RO, SK, NO	**Road**: EL, IE, MT **IWW**: AT, EE, IT, LU, NL, CH, NO **no relevance for IWW**: CY, DK, EL, ES, IE, LV, MT, PT, SE, SI
8	Total turnover	**Turnover**: MT	
9	Number of logistics service providers	**Rail**: CY, DK, IE, IT, MT **Air**: AT, BE, DK, ES, FR, LU, MT, NL, PL, RO, UK, CH, NO	**Road**: BE, DK, EL, HR, IE, LU, NL, PT, UK, CH **IWW**: EE, LU, NL, CH, NO **no relevance for IWW**: CY, DK, EL, ES, IE, LV, MT, PT, SE, SI
10	Number of employees	**Rail**: CY, DK, IE, LU, MT, NL, **Air**: AT, BE, DK, EL, ES, FI, HU, LU, MT, NL, PL, RO, UK, CH, NO	**Road**: BE, CZ, DK, EL, HR, IE, LU, NL, PT, UK, CH **IWW**: BE, EE, FR, LU, NL, UK, CH, NO **no relevance for IWW**: CY, DK, EL, ES, IE, LV, MT, PT, SE, SI
10b	Number of employees (LSP)	**Employees**: MT, CH	
11	Average turnover per service provider	**Turnover per enterprise**: MT	
12	Average vehicle age	**Road**: BG, EL	**IWW**: AT, DE, IT, LU, NL, RO, UK, CH, NO **no relevance for IWW**: CY, DK, EL, ES, IE, LV, MT, PT, SE, SI
13	Average vehicle size	**Road**: BE, BG, DK, EL, IE, SK, UK	**IWW**: AT, CZ, DE, IT, LU, NL, RO, CH, NO **no relevance for IWW**: CY, DK, EL, ES, IE, LV, MT, PT, SE, SI
14	Average length of haul	**Rail**: CY, MT	**Road**: MT **IWW**: EE, CH, NO **no relevance for IWW**: CY, DK, EL, ES, IE, LV, MT, PT, SE, SI
15	Overall logistic expenses per country	**Logistics expenses**: no countries missing	
16	Vehicle / train-tkm	**Rail**: CY, IE, MT, NL, PT, UK, CH, NO **Sea**: AT, BE, BG, CY, CZ, DE, DK, EE, EL, FR, HU, IT, LT, LU, LV, MT, NL, PL, PT, RO, SI, SK, UK, CH **Air**: CY, HR, MT, RO, SE, SK, NO	**Road**: EL, IE, MT **IWW**: AT, EE, IT, LU, NL, CH, NO **no relevance for IWW**: CY, DK, EL, ES, IE, LV, MT, PT, SE, SI
17	Number of trips per 1,000 vehicle-kilometre	**Road trips**: no countries missing	
18	Share of road freight vehicles with Euro 4-6 standard	**Share**: BG, CY, CZ, EE, HR HU, LT, LV, MT, PL, RO, SI, SK, CH, NO	
19	Owned and hired fleet share (poss. for road)	**Lorries**: BE, BG, DE, EE, EL, ES, HR, HU, IT, LT, LU, LV, NL, PT, RO, SI, SK, UK, CH, **Trailers**: BE, BG, DE, DK, EE, EL, ES, HR, HU, IE, IT, LT, LU, LV, MT, NL, PT, RO, SE, SI, SK, UK, CH **Transported goods in tons**: no countries missing	**Road tractors**: BE, BG, DE, DK, EE, EL, ES, HR, HU, IE, IT, LT, LU, LV, MT, NL, PT, RO, SI, SK, UK, CH **Semi-trailers**: AT, BE, BG, DE, DK, EE, EL, ES, HR, HU, IE, IT, LT, LU, LV, MT, NL, PT, RO, SE, SI, SK, UK, CH **Transported goods in tkm**: no countries missing
20	TEN-T lines per country	**TEN-T corridor data**: no countries missing	
21	Modal share of intermodal transport	**Modal share**: CY, LU, MT	

Continuation of Table B

Nb	Indicator	Data missing for following countries (only listed if values are missing for all considered years) [maximum number of countries: EU28 + CH, NO]	
25	Share of value added of the logistics sector in total value added	**Added value**: BG, CY, DK, ES, HR, LU, LV MT, PL, CH	
26	Productivity (value added per employee) in the logistics sector	**Productivity per person employed**: MT	
27	Im-/Export value density per country	**Imports**: CH, NO	**Exports**: CH, NO
28	Transport performance (tonne-kilometres) per GDP (Transport intensity)	**Transport intensity**: no countries missing	
29	Fuel prices / capital costs / warehouse rents / road tolls	**Fuel prices**: HR, CH, NO **Warehouse rents**: CY, MT, SI, CH, NO	**Capital costs**: LU (short term only missing) **Tolls and vignettes**: CY, EE, EL, IE, LV, MT, NO
30	Average wages	**Average wages**: MT	
32	m² per warehouse	**m² per warehouse**: data only available for AT, BE, DE, NL, CH	
33	Inventory stock turn rate	**Inventory stock turnover**: no countries missing	
36	Share of inputs from ICT	**ICT share**: BG, CY, DK, ES, HR, LU, LV, MT, PL, CH	
22	Size of transport units	Indicator not evaluated / examined due to missing data availability and/or due to low relevance for researech purposes	
23	Share of logistics costs on total product		
24	Share of turnover of the logistics sector in total turnover		
31	Number of warehouses per country		
34	Handling factor		
35	Logistics efficiency (utilization of vehicles and transshipment facilities)		

Table B offers a detailed overview about the countries missing per indicator. If a single indicator contains more than one examined criteria (e.g. indicator contains the criteria / excel sheets Rail, Road, Sea, Inland Waterways, and Air), the information regarding missing countries is given for each criteria. It is important to know that only these countries are listed, for which no values were available at all (not even for one single year in the time frame considered). With regard to evaluations concerning inland waterways transportation, it has to be taken into account that several countries do not have inland waterways at all and therefore statistical analyses are not possible for this mode of transport. This concerns, in particular, Cyprus, Denmark, Greece, Spain, Ireland, Latvia, Malta, Portugal, Sweden, and Slovenia. For various indicators, like 'Inventory stock turn rate', 'Transport performance', 'TEN-T lines per country', 'Number of trips per 1,000 vehicle-kilometres', and 'Overall logistics expenses per country', it was possible to deliver complete and exhaustive data sets for at least one year (complete means that there is a value for each country in one certain year). Nearly the same goes for the indicators 'Average wages', 'Productivity', 'Average length of haul', 'Average turnover per service provider', 'Total turnover', and 'Number of empty runs'. Here only the values for Malta and / or Cyprus are missing. The remaining indicators show different characteristics with regard to unavailable country or annual data and therefore cannot be categorized any further.

Table C

Country	Values available for most recent year																																	Frequency
	common questionnaire	*common questionnaire*	*common questionnaire*	*legal act*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*legal act*	*legal act*	*legal act*	*legal act*	*legal act*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*legal act*	*legal act*	*legal act*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*common questionnaire*	*legal act / common questionnaire* *	*legal act / common questionnaire* *	*legal act / common questionnaire* *	*legal act / common questionnaire* *	*n.a.*	
	avia_ec_enterp	avia_ec_emp_ent	avia_eq_arc_typ	avia_gooc	demo_pjan	iww_ec_employ	iww_ec_ent_n	iww_eq_age	iww_eq_loadcap	iww_go_actygo	iww_go_atygo	iww_go_atygo07	mar_go_aa	nama_gdp_c	rail_ec_emplo_a	rail_ec_ent	rail_eq_loco_n	rail_eq_railc_n	rail_eq_wagon_n	rail_go_contnbr	rail_go_contwgt	rail_go_typeall	road_ec_empl	road_ec_entemp	road_eqs_lornum	road_eqs_lorroa	road_eqs_lrstn	road_eqs_roaene	road_eqs_semitn	road_eqs_trailn	road_go_ta_tg	road_go_ta_tott	road_go_ta_vm	road_go_ta7tg	sbs_na_1a_se_r2	
AT - Austria			●	●	●					●	●	●		●			●	●	●	●	●	●									●	●	●	●	●	18
BE - Belgium			●	●	●			●	●		●	●	●	●											●	●		●			●	●	●	●	●	17
BG - Bulgaria	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	34
CY - Cyprus	●	●	●	●	●								●	●											●	●	●	●	●		●	●	●	●	●	17
CZ - Czech Republic	●		●	●	●				●		●	●		●			●	●	●	●	●	●					●				●	●	●	●	●	20
DE - Germany			●	●	●				●	●	●	●	●	●		●				●	●	●			●	●	●	●	●	●	●	●	●	●	●	24
DK - Denmark			●	●	●								●	●											●			●	●	●	●	●	●	●	●	14
EE - Estonia	●	●	●	●	●			●	●				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	29
EL - Greece			●	●	●								●	●								●									●	●	●	●		10
ES - Spain			●	●	●								●	●	●	●	●	●	●	●	●				●	●	●	●	●	●	●	●	●	●	●	24
FI - Finland			●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	31
FR - France			●	●	●		●	●	●	●	●	●	●	●							●	●									●	●	●	●	●	18
HR - Croatia	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●		●	32
HU - Hungary			●	●	●					●	●	●		●						●	●				●			●			●	●	●	●	●	16
IE - Ireland			●	●	●								●	●						●	●	●									●	●	●	●	●	13
IT - Italy			●	●	●							●	●	●	●		●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	24
LT - Lithuania	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	33
LU - Luxembourg			●	●	●						●	●		●																	●	●	●	●	●	11
LV - Latvia	●	●	●	●	●								●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	28
MT - Malta			●	●	●								●	●																						5
NL - Netherlands			●	●	●					●	●	●	●	●						●	●	●			●	●		●	●	●	●	●	●	●	●	21
PL - Poland			●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	32
PT - Portugal	●	●	●	●	●								●	●	●	●					●				●	●	●	●			●	●	●	●	●	19
RO - Romania			●	●	●					●	●	●	●	●			●	●	●	●	●	●					●				●	●	●	●	●	20
SE - Sweden	●	●	●	●	●								●	●			●	●	●	●	●	●									●	●	●	●	●	18
SI - Slovenia	●	●	●	●	●								●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	28
SK - Slovakia			●	●	●						●	●		●						●		●			●		●	●	●		●	●	●	●	●	17
UK - United Kingdom			●	●	●		●		●		●	●	●	●						●	●	●												●	●	14
CH - Switzerland			●	●	●				●					●		●									●	●	●	●	●	●	●	●		●	●	16
NO - Norway			●	●	●								●	●	●	●							●	●	●	●	●	●	●	●	●	●	●	●	●	20

This table shows the frequency of data availability per considered country for the most recent year in each Eurostat statistics. This means, how often country specific data are available in utilized queries from the European Commission. The countries showing the highest frequency and thus the best data availability are Bulgaria (34), Estonia (29), Finland (31), Croatia (32), Lithuania (33), Latvia (28), and Poland (32). The poorest data availability regarding the most recent year per query can be found for Denmark (14), Greece (10), Ireland (13), Luxembourg (11), Malta (5), and the United Kingdom (14). A low frequency can be an indicator for an insufficient and / or delayed data supply within the scope of data capture and analysis conducted by the European Commission and the national statistical authorities. Except the Baltic States, these above countries differ strongly regarding their location in Europe, their population or their economic development. Therefore no ultimate reason can be found declaring why single countries show a high respectively low presence of current statistical information.

Annex VI: Problems of Data Availability

The most vivid problem is the lack of data from a general perspective. Learnings of the process went through:

Market structures, economic value added and logistics performance assessment:

- Not every analysis that might be of interest is possible to be carried out with the available data. The most urgent issue in assessing the logistical sector is the complexity and interlinkage of logistics to many economic sectors. The available data for meaningful market structure assessment of companies - their employees, turnover and activities - reaches high coverage. But the fact that a share of logistics activities are carried out by industry itself cannot directly be assessed by the data collected. A simple extrapolation of logistics activities carried out by the industry seems hardly feasible;
- Eurostat turns out to be the most useful source of comparable and comprehensive and consistent data for the evaluation of logistics on a national, multinational level and European-wide level;
- Eurostat data and evaluations drawn from the data in most of the cases is considered to be of high validity;
- The expectation that other sources could extensively help to add data and fill minor gaps in Eurostat outputs turned out to be erroneous;
- Other sources were mainly used, when data was available for all of the countries that are addressed in the study;
- Perception-based data is considered to be of minor usefulness for analyses in the scope of the market structure (this applies for qualitative studies, particularly on trends, but also other market aspects);
- Retrievable data did not allow for a clear differentiation between the logistics subsectors "transportation", "freight transport logistics" and "logistics";
- The data used for the economic value added assessment is considered to be the best available to analyse value added by logistics at the moment. As pointed out in the methodological descriptions, the assessment does not cover the logistics sector as a whole, but the outsourced logistics services sector. Statistical data that disaggregates logistics activities carried out by firms in industry sectors themselves are currently unknown;
- Selective empirical work can help answer questions of value added or transportation costs of firms or industries for small units of an economy. Taking into account as an example from the analysis in the respective chapter (Annex IV: Assessment of the Economic Value Added of Logistics via Symmetrical Input-Output Matrices) that an economy can be divided into 65 sectors, the magnitude of empirical research is excessive. Taking into account additionally that 65 sector aggregates did not enable for an assessment of logistics services completely independent from passenger transport, an even finer breakdown of industry sectors seems appropriate for meaningful analysis;
- Unfortunately, due to classification change from NACE 1 to NACE Rev. 2 in 2008, former years input output matrices are not comparable on the relevant level of detail for the value added analysis;
- The compiled diagrams with data for four logistics services subsectors, numerous countries and several years allows very complex investigation. As the influences, that effect structures and the absolute amount of value added in each Member State and each year are numerous, not every structural characteristic, peculiarity and every developments initial root and multi-layered effects could be traced within the scope of the carried out analyses.

Cost structure assessment:

While some important cost factors such as logistics-related labour costs and diesel prices harmonised across Europe and are regularly available, there is still pent-up demand for the other, cost structure concerning data:

- Data on diesel price developments are available in high levels of detail and always up to date for all Member States. A comparably good date source doesn't yet exist in the other, logistics-relevant fossil (kerosene) and non-fossil (bio-diesel) fuel department;
- The lack of harmonisation of European toll systems makes an aggregated and harmonised assessment of kilometre-based toll costs extremely expensive. The train path-dependent systems are in particular difficult to assess because of the respectively different pricing and billing systems. Summable averages based on the expected transport distances per street for each country would be very helpful in this case;
- Virtually no centrally held data material concerning warehouse spaces and associated rents exists today. Statements regarding this subject are currently possible only via elaborate micro-research. A centralised data management at country level, as it is common for office and retail properties, could help here, at least in the medium term;
- Also, only rough statements can be made throughout Europe regarding taxes and insurance costs. The cost proportion of this issue is, however, comparatively small, which is why the focus should be first directed toward the other problems mentioned.

Annex VII: Stakeholder consultation

Workshop 4th of July 2014 - summary

In order to validate the findings of study and identify relevant policy actions and options for future EU logistics policy, Ecorys organised a workshop with several stakeholders. The table below provides an overview of the participants of the workshop.

Table A.VII. 1 workshop participants

Company or organisation	Function
Nordic Logistics Association	CEO
FTA	EU Affairs Manager
Finnish Transport and Logistics SKAL	Director, Permanent Representative to the European Union
CER	Policy Adviser
DP DHL	Senior Public Policy Manager
Clecat	Director General
Dow Europe GmbH	Sen. SC Consultant
Alliance for European Logistics - Secretariat	Consultant
Nordic Logistics Association	Executive Assistant
EU Intermodal Association	Secretary General
TLN (Transport Logistics Netherlands)	Manager European Affairs
Hutchison Europe	Senior EU Affairs Manager
IRU	Head of Social Affairs
ACEA	Director Transport Policy
eim aisbl	executive director
ECG - The Association of European Vehicle Logistics	EU Affairs Adviser
UNIFE	Technical Affairs Manager
EIM - European Rail Infrastructure Managers	European Affairs Officer
Alliance for European Logistics Secretariat	Consultant
European Federation of Inland Ports (EFIP)	Director
ECSA	Acting director
bgl	Brussels office
Lopez Leza Consultores	Founder Partner
LT Perm Rep	Transport Attaché
Eurotran	Junior Consultant
CCNR	secretary-general
UIRR	Strategy & Communication Advisor
Bulgarian Permanent represenation to the EU	Councellor

Company or organisation	Function
Permanent Representation of Latvia to EU	Land Transport Counsellor
Ecorys	Consultant
Ecorys	Consultant
Ecorys	Senior Partner
Permanent Representation of the Federal Republic of Germany to the EU	Transport Attaché
Permanent Representation of Belgium to the European Union - Mobility and Transport	Transport Attaché
European Commission DG Move	

At the start of the workshop, Ecorys presented the preliminary results of the study. Next, the logistics strategies which can be expected as a reaction from the industry, based on the found trends, were presented. The stakeholders agreed on these strategies, though one addition could be made regarding packaging optimization.

Indicators for logistics

In order to measure the size, impact and performance of the European logistics sector, a list of KPI's was defined. These were divided into Main Key Performance Area (KPA) and Good Practice for related Key Performance Indicators (KPI). Limited reaction was noted on the KPI's themselves. However, questions were raised on the feasibility and necessity for the EC to collect this company specific data. It was explained that currently, comparability between differently collected data is limited, and performance is often locally defined (by geography for example). Therefore, it is of essence to know what performance indicators are monitored and used in business as well.

The question was raised if it would not be more efficient to set up a bottleneck exercise. In 2007, such an industry driven paper was made. The EC answered that such exercises are not in the scope of the study. The indicators are defined in order to measure the impact of the policy options later.

Furthermore, recommendations for logistics performance measurement were presented and little comments were made by the stakeholders on these recommendations.

Problem definition

The stakeholders recognized the current and future problems that were defined and could not think of any other problems. More specific, the stakeholders commented that solving some of the problems, might lead to enhancing some other problems. An example is the implementation of SECA areas, where externalities are priced, but the modal shift might occur towards more polluting modes on land.

Policy objectives

The policy objectives are received well. According to the stakeholders, the objectives are not revolutionary, since they overlap with the ones defined in the 2007 FTLAP. The only difference is that the situation for the logistics sector is now more challenging. Over the past years, price pressure increased, while at the same time the costs increased significantly as well.

The different objectives were discussed separately.

Objective 1: Stimulating innovation and faster adaptation of new technologies, especially within SME

The stakeholders commented that innovations are not always steered by SMEs. For example, the European truck manufactures ask for an extensive number of years for implementing regulation 95/53EC. Furthermore, it was asked to include SME involvement under H2020, and less explicitly under the policy options defined in this study. The SME involvement should be promoted by the MS governments. And the EU level should try to make the procedures less complicated and more transparent. The focus should be more on the actual policy plans, like NAIADIS, instead of reinventing the wheel e.g. making a new FTLAP follow up communication. The stakeholders also suggested canalising money from the NFS to support the future EU logistics policy, like the Danish national funding scheme. Common learning actions of the former Marco Polo funding scheme were effective in realising the objectives. Therefore this measure can be re-included in the future NFS.

Objective 2: Improving utilization of resources

In order to improve the link between modes, the stakeholders suggested focusing actions on multi modal IT services. Promotion of the existing services should be better. In case of an EU wide system, it is not clear which stakeholder is best at running the system. Furthermore it is not clear whether this should be a private initiative, or an initiative of the EC. According to the stakeholders, sharing data is a high priority and concrete action is necessary. This might be something for Eurostat. It is questionable if the data is comparable with European MS, when this task will be assigned to Eurostat.

Objective 3:.Improve interoperability and supply chain coordination

No specific comments made.

Objective 4: Reducing red-tape

Stakeholders asked to limit and harmonise regulation, since it is of great importance to work in a stable legislative and administrative setting. In essence it is preferred to have a stable climate rather than a climate where red tape is changed (even when being reduced).

Objective 5: Improving environmental behaviour, speeding up use of alternative solutions

The stakeholders are positive about the will of the EC to harmonise the legislation. The stakeholders even think the EC should act more strongly in harmonising systems, since Member States often limit the transparency and interoperability of European initiatives like ETSS and SESAR. Enforcement of regulation might be more in place with the EC as well, since harmonisation of enforcement is enhanced in that way.

The stakeholders considered 'swiftly green' a good toolbox for changing behaviour.

AEO's started up very smoothly, but now the effect is limited. It is felt that the AEO status should result in more effects on the ground. The stakeholders think E-CMR can have a major impact on the cooperation between logistics stakeholders, but the sector now sees a strong opposition of certain MS to fully implement this change.

Now, national single windows are almost all over Europe being put in place. Still, these have a national focus. It is time now to integrate national organised SW into more European SW.

92/1606 directive is existing and targets the objectives discussed under this heading.

The political choice for alternative fuels is left too much to the MS. It should be steered much stronger by the European level. Access to alternative fuel stations should be supported (financially).

Awareness campaigns might have a higher impact at the European level, as the EU has funds to reach the European citizen in convincing them the importance of the EU logistics sector. Best practices and innovations could be highlighted in prime time. However, this does not fully reach the end users. Therefore it was proposed to cooperate from the EU level with all 28 national logistics/transport associations to gain full support from the transport sector in setting up EUR/national awareness campaigns. An example is given with the awareness campaigns set up by NGO's based on European funding.

It might be an idea to make the sector more concrete to the general public. The BBC for example made a documentary on the maritime transport chain. The OECD makes good infotaining videos.

Objective 6: Reducing negative externalities

The externalities are lowered regularly at the expense of the industry, while there is no compensation for the costs faced by the industry. An example is the policy for reducing emissions of transport over water. As a result of the reduced emissions, the health costs will decrease. Although this is a benefit the society, there are no benefits for the ship owners who need to invest massively in order to reduce their emissions, e.g. there is no financial contribution.

Objective 7: Improving the attractiveness and education of logistics professions

The stakeholders find it challenging to find good candidates for the jobs in the logistics sectors. The sector has a poor image, which makes it hard to reach the competent people. The general perception is that the sector only needs blue collar workers, doing jobs as in the past era, while sophisticated transport services are in need of the competent high profiles.

It is of high importance to change the image of the sector and to educate the young people for the (future) high skilled jobs in the logistics sector. In order to achieve this, the education between universities and other institutes in Europe should be streamlined. For example, the institutions that offer logistics training can create more awareness on the job opportunities after graduating from their school.

The driver training directive is perceived as a good step for integrating and streamlining the education needs for logistics staff.

Others

When reflecting the importance of logistics at the European level by appointing a European Director for logistics in the 2014-2020 period, stakeholders stated that the actions and policy goals should be streamlined between different public entities. The sector is now confronted with different actions of different European decision makers, which are not always in line with one another.

Stakeholder Questionnaire

This paragraph presents the final results of the online questionnaire, organised within the framework of LOT 1 Fact-finding studies in support of the development of an EU strategy for freight transport logistics.

The questionnaire was structured in 5 parts with in total 27 to 33 individual questions, depending on the answers given. The respondents had often the freedom to add and specify additional answers, not prelisted by the consortium:

- In the first part of the survey the respondents were asked to give more information on the type of company or organisation they work for, and which modes they often use or have knowledge of;
- Second, an assessment of current problems in the European freight transport and logistics sector was asked;
- Third, the respondent was asked to evaluate the past FTLAP (Freight Transport Logistics Action Plan) and suggest follow up actions;
- Fourth, some questions were clustered on logistics performance measurement;
- Fifth and last, the respondents were asked to indicate trends for Europe's logistic sector for the next 15 years;
- The questionnaire ended with some open questions.

The structure of the questionnaire will be followed in this Annex.

Overview

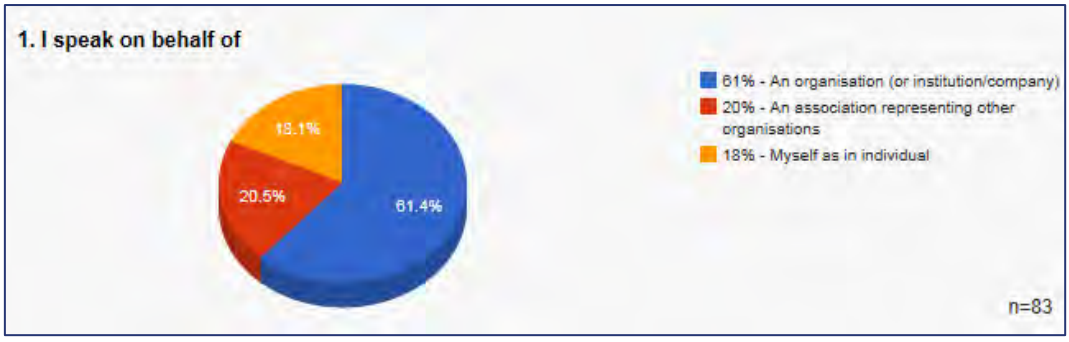
The table below gives a snapshot of the questionnaire's timing, results and success. The online questionnaire was live during 57 days. The questionnaire was online between 12 December 2013 and 6 February 2014.The total of answered questionnaires was 83, of which 52 respondents answered all questions. The rest answered partially.

Table A.VII. 2 Overview of questionnaire

Status:	Closed	Partially answered:	31 (37,3%)
Start:	12-12-2013	Fully answered:	52 (62,7%)
Enddate:	06-02-2014	Total answered:	83
Live:	57 days	The questionnaire was in	
Questions in total:	33	English.	

Results part 1: Respondent information

The first part asked more information on the profile of the respondents. Question 1 asked more on the profile of the organisation the respondent works for. In total, 61% of the respondents replied in name of an organisation (an institution or a company). One out of 5 replied in name of an association and 18% replied as an individual.



2. Can you please identify which organisation (institution/company) or association you represent or work for?
(It was allowed to choose more than one answer)

The majority of respondents works for a transport operator. Freight forwarding companies were represented as well, just as the Logistics Service Providers. 19% of the responses came from terminal operators and consultancy organisations.

Table A.VII. 3 Answers question 2

Answer	Total	% of answers	%
1 Transport Operator	29		35 %
2 Freight Forwarder	22		27 %
3 Logistic Service Provider	25		30 %
4 Shipper	12		14 %
5 IT Partner	7		8 %
6 Terminal Operator	16		19 %
7 Standardisation organisation	4		5 %
8 Public Authority / Customs Authority	1		1 %
9 Public Authority / Border control Authority / Safety & security	2		2 %
10 Public Authority / Mode specific Infrastructure manager	3		4 %
11 Public Authority / Political decision maker	6		7 %
12 Research/Consultancy	16		19 %
13 Private Individual	4		5 %
14 Association/other, please specify	21		25 %

3. What is the size of your organisation?
(It was allowed to choose more than one answer)

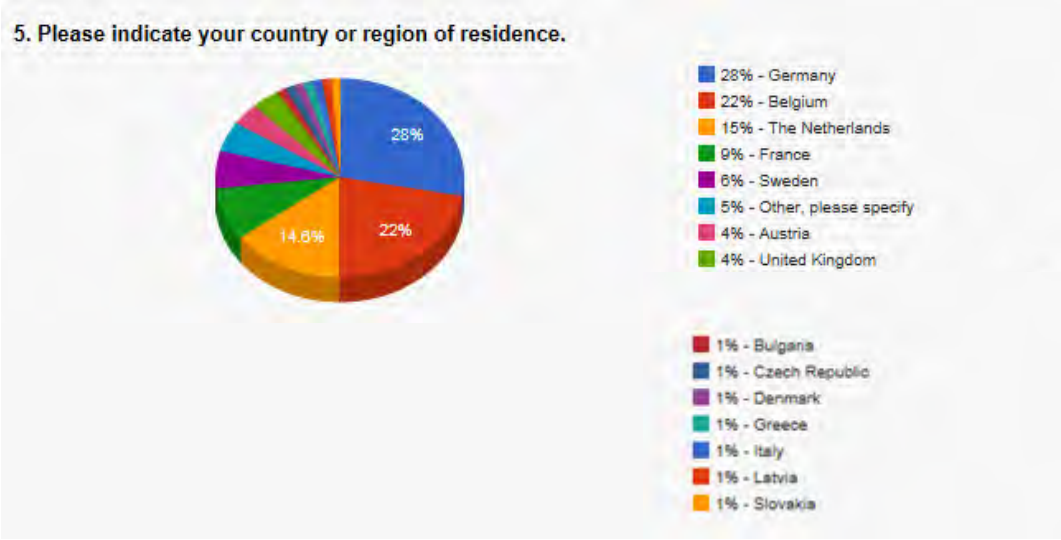
Question 3 asked the respondent more information on the size of the organisation he or she works for. Almost half of the respondents work for a multi-national organisation. One out of 5 works for an SME. A minority of respondents works for an organisation active in only one country.

Table A.VII. 4 Answers question 3

Answer	Total	% of answers	%
1 SME	20		24 %
2 Corporation active in one European Member State	11		13 %
3 Multi-national	37		45 %
4 Local Authority	5		6 %
5 National Authority	12		15 %

Answer	Total	% of answers	%
6 European Authority	5		6 %

In **question 4** the names of the organisations could be shared. These will not be made publically available due to confidentiality concerns.



Question 5 asked to indicate the country of residence. The respondents mainly originate from Germany, Belgium and the Netherlands. Less numerous answers were received from France and Sweden.

6. Which mode(s) of transport does your organisation address?
(It was allowed to choose more than one answer)

Over 70% of the respondents use road transport services. Combined transport is used by over 60% of the respondents. Rail transport services are used by over half of the respondents. Short sea, deep sea and inland shipping are equally important with 45% of the respondents indicating they use one of these modes. Air transport is used by less than a third of the respondents.

Table A.VII. 5 Answers question 6

Answer	Total	% of answers	%
1 Water / Deep sea	37		45 %
2 Water / Short sea	37		45 %
3 Water / Inland waterways	38		46 %
4 Air	31		38 %
5 Rail	45		55 %
6 Road	60		73 %
7 Combined transport	48		59 %
8 Not applicable	6		7 %
9 Other, please specify	8		10 %

Results Part 2: Current problems in the European freight transport and logistics sector
In part 2, current problems within the sector were evaluated. It was asked to score specific problems (like congestion and energy costs for example) on relevance for the sector. Second, external trends were given which the respondent was asked to score on importance and trend.

7. The table below scores the relevance of problems that affect the competitiveness of the European logistics sector.
(It was allowed to choose more than one answer)

Table A.VII. 6 Answers question 7

Subquestions	#	% of answers
Increased congestion	68	4 3 25 50 13 4
Shortage of qualified logistics personnel	68	9 10 24 26 19 12
The level of training of logistics staff declines	68	6 22 22 22 7 21
Differing labour markets and labour legislation between Member States	68	6 21 15 28 22 8
Lack of well interconnected European transport infrastructure	68	4 22 50 18 3
Lack of intermodal transport infrastructure	68	10 13 53 19 3
Intermodal transport concepts are not competitive compared to unimodal road transport	68	6 15 29 28 16 6
Increasing energy costs	68	4 24 31 37 3
Increasing taxation	68	3 9 26 32 24 6
Lack of logistics warehousing	68	13 35 28 10 4 9
Difficult access to capital	68	3 19 38 18 7 15
Regulatory / administrative procedures	68	3 6 19 38 25 9

Question 7 highlights the main problems for the competitiveness of the European logistics sector. The question was answered by 68 respondents. The main problems for the competitiveness are regulatory and administrative procedures. Increased congestion is one of the second-ranked main problems besides increasing energy costs, increasing taxation and differing labour markets. A lack of well interconnected European transport infrastructure and a lack of intermodal infrastructure are less but still significant.

Shortage of qualified logistics staff and the level of training of this staff is less important. Difficult access to capital and a lack of warehousing are not significantly threatening the competitiveness of the sector.

Respondents could add other problems. The list was extended with: Fragmentation in the transport market, the cost of last mile logistics, the lack of harmonized and unified interpretations of EU regulations/directives and its enforcement, VAT procedures for EU-trade, lack of interoperability of the infrastructure, a lack of priority and knowledge related to logistics efficiency solutions, a lack of cooperation and multimodal transport, a lack of organisational innovation, environmental impacts, safety impacts, fragmentation in the transport market and the fact that not all European Member stated allow the use of road trains (LZV's).

8. What is the impact of the current freight transport and logistics sector in Europe on the following problems?
(It was allowed to choose more than one answer)

Question 8 asked the respondents to score the impact of the current freight transport and logistics sector (in Europe) on infrastructure damage, congestion, accidents and emissions. The question was answered by 30 respondents. According to these, the main problems caused by the freight transport and logistics sector are related to emissions. Almost equally important are the effects on congestion. Infrastructure damage is ranked third. Accidents are less highly ranked.

Table A.VII. 7 Answers question 8

Subquestions	#	% of answers
Infrastructure damage	30	3 13 33 40
Congestion problems	30	3 13 27 47 7 3
Accidents	30	23 43 20 3
Emissions	30	20 20 40 20

Results Part 3: Impacts of FTLAP and need for follow-up
Europe's Freight Transport Logistics Action Plan (FTLAP), is one of a series of policy initiatives jointly launched by the European Commission to improve the efficiency and sustainability of freight transport in Europe. It presented a number of short- to medium-term actions to help Europe address challenges and ensure a competitive and sustainable freight transport system in Europe. The main objective was to help industry to move towards a more efficient use of freight transport, mitigating the factors that are driving up prices in the logistics industry and jeopardising the sustainability of its practices.

The FTLAP defined six domains:

1. e-Freight and ITS;
2. Sustainable Quality and Efficiency;
3. Simplification of transport chains;
4. Vehicle dimensions and loading standards;
5. Urban freight logistics;
6. Green freight corridors.

These six domains comprised a total of 34 different actions. The following questions focus on the six different domains that are indicated above. The respondents were asked to evaluate:

- the impact of each action domain on the efficiency, competitiveness and sustainability of Europe's freight transport and logistics sector;
- the need for a follow up of these six areas of action. The question was asked so respondents could indicate if the private sector, the Member States or the European policy level should be taking the initiative for a follow-up action.

1.1Initiatives related to e-Freight and ITS

Information and communication technologies (ICT) can facilitate transport and logistic services. By the development of e-freight and intelligent transport systems (ITS) the logistical chain can become more efficient. Specific actions formulated in the FTLAP focused, e.g. on the integration of electronic fee collection systems, development of a roadmap for the implementation of e-freight and identified areas where standardisation, e.g. collision avoidance systems, is needed.

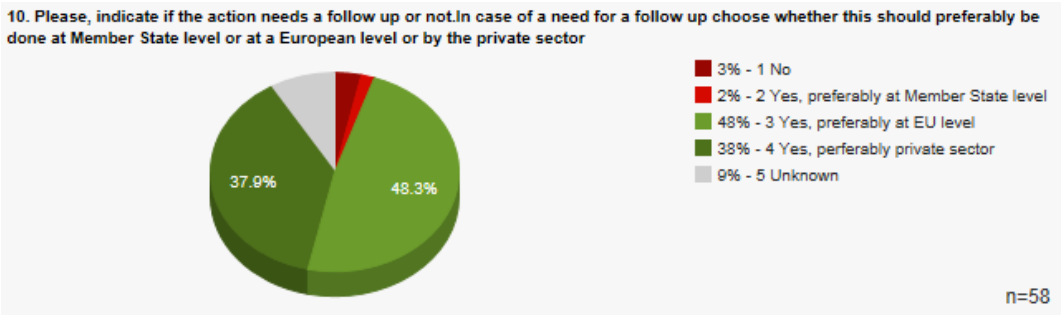
9. Please indicate the impact of e-Freight and ITS on efficiency, competitiveness and sustainability of Europe's freight transport and logistics sector.
(It was allowed to choose more than one answer)

Question 9 asked the respondents to score the impact of e-Freight and ITS on Europe's transport efficiency, the sector's competitiveness and the sector's sustainability. The question was answered by 58 respondents. The most important potential effect of e-Freight and ITS is an increase in transport efficiency. The effect on competitiveness is scored second. The effect on sustainability is scored lower, but still significant.

Table A.VII. 8 Answers question 9

Subquestions	#	% of answers
Impact on Europe's transport efficiency	58	3 26 48 16 7
Impact on Europe's transport sector's competitiveness	58	10 22 45 12 10
Impact on Europe's transport sustainability	58	14 26 40 12 7

Follow-up question 10 questioned if the e-Freight and ITS actions of the actual FTLAP need to be continued. It was asked as well to indicate, if so, the policy level where these follow-up actions need to be developed. Only 3% wants no follow-up for the FTLAP's e-Freight and ITS actions. Only 2% wants a follow-up at Member State level. 38% wants to see actions by the private sector and almost half of the respondents wants a follow up on the European level.



11. Given your answer, what type of action or policy should according to you be undertaken?
Follow-up question 11 gave the respondents the opportunity to add policy actions and to detail more there reasoning behind their answer. The answers were extensive and will be summarised.

The main issues brought up by the respondents are structured in the word cloud below.

The suggestions from respondents focused on or the private sector's role in developing e-Freight and ITS or the role the governments (often the European Union) should take up in developing actions. The private sector is seen as the main actor in further developing the wider use of these solutions. It is the private sector's core as innovative technological innovations can increase quality while decreasing costs. It was however stated that the private sector alone cannot develop these tools. A role for the government is seen in supporting developments, promoting the use of the technologies and most importantly harmonise the developments (by steering or regulating). The force of the private sector could lead to differing standards as these could change market powers. It is in the interest of all that open communication and compatibility is put forward by the government. Only so, the real potential of these technologies can be unlocked. The government and private sector should take up their individual role, moreover should follow the demand and expectations of the European consumers. A concrete example was given. E-commerce for example is booming business, however questions are asked about the sustainability issues involved in shipping parcels with narrow time windows. The technological developments should inform the consumers on the impact of their decisions and expectations on rout km's and emissions. Sharing this data should be made possible by the governments as these can make open standards compulsory. The actual sharing of the data is nevertheless a role of the private sector.

Often, the respondents mentioned a best practice from the rail sector. The harmonised CIM/SMGS consignment note for multi modal and rail carriage of freight between Europe and Eastern Europe allows smoother transhipment and rail freight transport. It proves that standardisation of communication between freight transport partners is lowering costs and increasing efficiency (for example customs procedures).

A follow-up to the action is unmistakably asked. New developments should be backed by the governments. These can support new initiatives via research funding, PPS, partnerships, joint undertakings and financing through calls. On the other hand, governments could be promoting actual developments to unlock potential. Now, many new developments are underused while having large a potential to lower emissions, congestion and costs. The actions in the follow-up should be made concreter.

Concerns were added on data sharing and the impact on security and commercial relationships. Standardisation, addressing fragmentation and increasing compatibility between actors were mentioned as objectives the governments strive for, however governments must avoid to stimulate monopolies of technology service providers.

1.2Initiatives related to Sustainable Quality and Efficiency.

This action domain of the FTLAP focused on removing bottlenecks identified by stakeholders. Specific actions related to the need of skilled personnel by introducing minimum qualifications and training requirements, improving the performance by developing generic indicators to measure and record the performance, to promote best practises and improve the information base of policy makers.

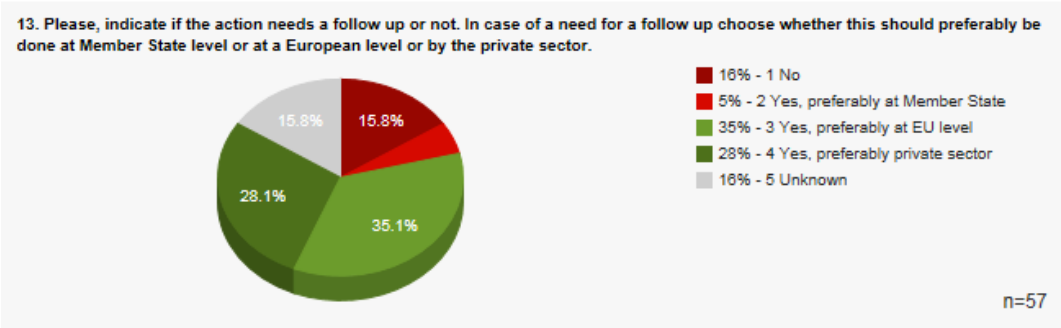
12. Please indicate the impact of Sustainable Quality and Efficiency actions on efficiency, competitiveness and sustainability of Europe's freight transport and logistics sector.

Question 12 asked the respondents to score the impact of the FTLAP's Sustainable Quality and Efficiency actions on Europe's transport efficiency, the sector's competitiveness and the sector's sustainability. The question was answered by 57 respondents. The most important potential effect of Sustainable Quality and Efficiency actions is an increase in transport efficiency. The effect on sustainability is scored second. The effect on competitiveness is scored third, but still significant.

Table A.VII. 9 Answers question 12

Subquestions	#	% of answers
Impact on Europe's transport efficiency	57	0 5 12 42 18 14
Impact on Europe's transport competitiveness	57	0 4 21 33 18 18
Impact on Europe's transport sustainability	57	0 5 16 39 18 14

Follow-up question 13 questioned if the actions of the actual FTLAP need to be continued. Only 16% wants no follow-up for the Sustainable Quality and Efficiency actions. Only 5% wants a follow-up at Member State level. 26% wants to see actions by the private sector and than one third of the respondents (35%) want a follow up on the European policy level.



14. Given you answer, what type of action or policy should according to you be undertaken?

Follow-up question 14 gave the respondents the opportunity to add policy actions and to detail more there reasoning behind their answer. The answers were extensive and will be summarised. The main issues brought up by the respondents are structured in the word cloud below.

The respondents focused on three issues: labour market, education and cooperation between private and public sector on sustainability. Regarding the labour market the issue of differing national education and qualifications was added. Transport and logistics companies need qualified staff with wide transport knowledge (for example on multi-modal transport) in order to increase its performance. The specialized trainings are not enough harmonised between Member States. As such, qualified staff is often not mobile between Member States. Harmonisation of qualifications and certification can be a role the governments should take up. How private companies hire, recruit and train on the job should stay a role of the private sector. The example of FIATA was given. The world-wide freight forwarding organisation has a permanent training system with harmonised minimum qualifications and training requirements. Mutual recognition of standards like these between organisations, private-public and between Member States could increase cross-acceptance of trained staff. Furthermore, a

minimum training for enforcement authorities might be required. The EU level could take up more the role of sharing and promoting best practices.

The labour market in the Union is as well differing in terms of social and fiscal legislation. To ensure fair competition, a harmonisation should be stimulated. A European Qualification Framework (EQF) should be developed in order to harmonise profiles on skills, knowledge and competencies.

Regarding education, it was stated that the EU should help the sector to increase the image of European freight transport companies. In many Member States, a less good reputation is noticed. As such the sector loses good qualified staff to other more attractive sectors. The transport sector's image is often unbalanced and young people have a wrong idea of the services. Therefore private sector, the government and educational institutions should work together in rectifying these wrong impressions.

Regarding the sustainability aspects of freight transport, it is several times stated that the CEN standards of the European Union (EN 16258) are a major breakthrough. Now, this standard should be given a chance by the sector. The standard should become the basis of a good understanding between private sector internally and between the sector and the governments. It is asked that the future developments, undoubtedly following this initiative, could be developed more internationally, and it is asked to base new initiatives, CO_2 calculations and sharing of this information specifically, on the already existing initiatives. The Union should more and more harmonise the CO_2 calculations and should discourage Member States to individually add National (conflicting or diverging) policies. Divergent National standards do not work in a world of worldwide organised supply chains. The EU level could here as well take up the role of sharing and promoting best practices.

1.3Initiatives related to simplification of transport chains

The aim of this action was to facilitate the interaction between businesses and administrations. Examples of specific actions proposed in the FTLAP were the establishment of a single transport document for all carriage of goods in Europe, improvement of security requirements for port access and simplifying the possibilities for short sea shipping.

15. Please indicate the impact of simplification of transport chain actions on efficiency, competitiveness and sustainability of Europe's freight transport and logistics sector

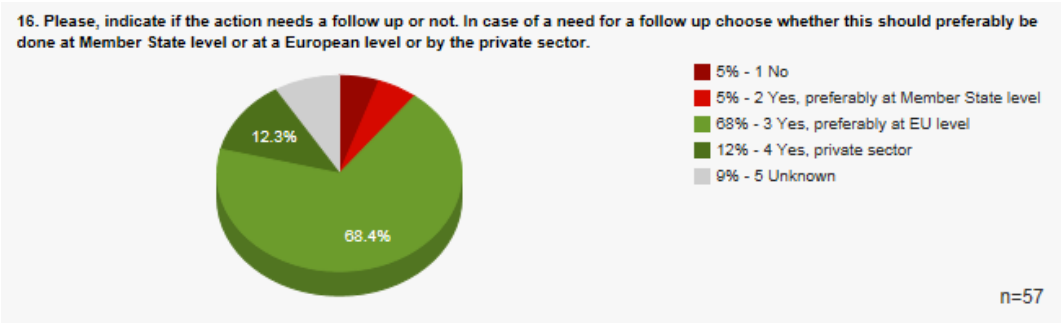
Question 15 asked the respondents to score the impact of the FTLAP's simplification of transport chain actions on Europe's transport efficiency, the sector's competitiveness and the sector's sustainability. The question was answered by 57 respondents. The most important potential effect of simplification of transport chain actions is an increase in transport efficiency. The effect on competitiveness is scored second. The effect on sustainability is scored third, but still significant.

Table A.VII. 10 Answers question 15

Subquestions	#	% of answers
Impact on Europe's transport efficiency	57	4 19 46 21 11
Impact on Europe's transport competitiveness	57	4 21 37 28 11
Impact on Europe's transport sustainability	57	4 7 28 37 12 12

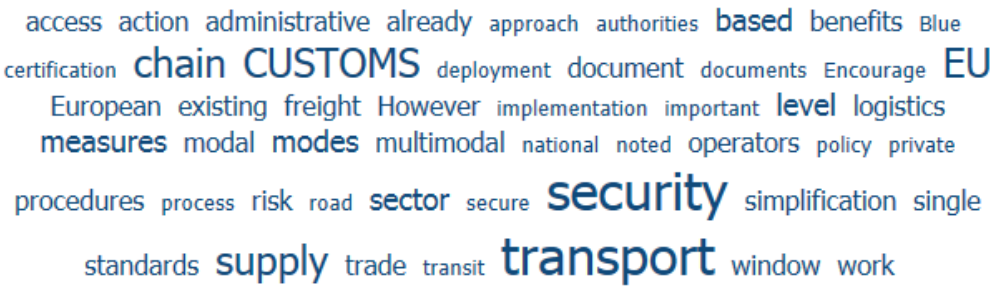
Follow-up question 16 questioned if the simplification of transport chain actions of the actual FTLAP need to be continued. Only 5% wants no follow-up for the actions. As well 5% wants a follow-up at Member State level. Only 12% wants to see actions by

the private sector and an impressive 68% of the respondents want a follow up on the European policy level.



17. Given your answer, what type of action should according to you be undertaken?

Follow-up question 17 gave the respondents the opportunity to add policy actions and to detail more there reasoning behind their answer. The answers were extensive and will be summarised. The main issues brought up by the respondents are structured in the word cloud below.



Simplification of transport chains is an ongoing process. A respondent stated that parties involved in today's transport chains are looking for efficient and transparent transport and information flow and that action plans are in place. However, the simplification and harmonization of customs procedures, removing contradictory or inconsistent requirements for customs and security, can only and should be facilitated via EU level action.

Specifically, the EU should work closely with the industry to secure appropriate implementing measures of a new Union Customs Code to secure without delay: 1. centralized clearance 2. electronic data processing (eCustoms) and 3. single-window for all administrative controls 4. substantial trade simplifications.

Furthermore, cutting red tape should be the top priority in terms of future policy actions for the logistics sector. The Directorate-General responsible for customs and taxation policies (DGTAXUD) should work closely with the industry and the Member States to secure appropriate implementing measures of the Union Customs Code. To conclude, the European Union could investigate whether it can facilitate or stimulate further private or national (regional, local) level action, but essentially the markets should take this forward.

1.4 Initiatives related to vehicle dimensions and loading standards

This FTLAP action was formulated in order to harmonise the standards of load units (e.g. containers). The standardisation of load units is key to the development of intermodality avoiding that companies need to frequently adjusted or even change their equipment to handle different cargo. Examples of specific actions are introducing

an optimal European intermodal load unit and examine the compatibility of load units in different modes.

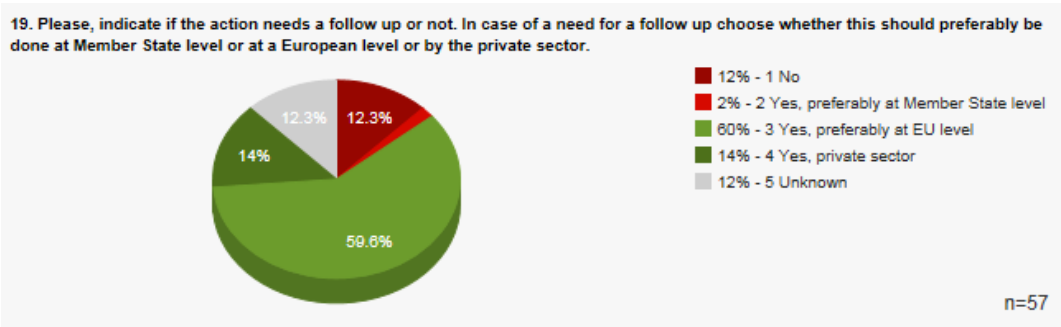
18. Please indicate the impact of vehicle dimensions and loading standards on efficiency, competitiveness and sustainability of Europe's freight transport and logistics sector.

Question 18 asked the respondents to score the impact of the FTLAP's vehicle dimensions and loading standards actions on Europe's transport efficiency, the sector's competitiveness and the sector's sustainability. The question was answered by 57 respondents. The most important potential effect of simplification of transport chain actions is an increase in transport efficiency. The effect on sustainability is scored second but less significant. The effect on competitiveness is scored third.

Table A.VII. 11 Answers question 18

Subquestions	#	% of answers
Impact on Europe's transport efficiency	57	4 4 12 39 30 12
Impact on Europe's transport competitiveness	57	4 4 25 28 28 14
Impact on Europe's transport sustainability	57	4 25 28 30 12

Follow-up question 19 questioned if the actions of the actual FTLAP need to be continued. 12% wants no follow-up for the actions. Only 2% wants a follow-up at Member State level. Only 14% wants to see actions by the private sector and an interesting 60% of the respondents wants to see a follow up on the European policy level.



20. Given your answer, what type of action should according to you be undertaken?

Follow-up question 20 gave the respondents the opportunity to add policy actions and to detail more there reasoning behind their answer. The answers were extensive and will be summarised. The main issues brought up by the respondents are structured in the word cloud below.

Several comments were made on vehicle standards and weights. First, it was stated that intermodality should be supported by the European Union by defining standards for weights and dimensions. Coordinated EU action is asked specifically to support developments like the 45FT containers. Directive 95/53 is seen as a milestone in finally achieving a market position for the 45FT container. Secondly, organisations stated that road vehicle dimension changes should be based on a clear impact assessment as it is expected that a change in these standards could result in a major change in competitiveness with regards to multi-modal and rail transport. However, others gave their view on cross border road transport barriers. For example, two neighbouring Member States allow individually 44 tonne vehicles on their network, still

it is legally not possible to load more than 40 tonnes when the truck crosses the border. Third, it would be an option for policy makers to allow different lengths and dimensions for road vehicles in the case of more aero dynamical vehicle designs. Now weight and dimension legislation hinders these vehicle developments to become standard, as the loading capacity is lowered or as the Member States do not allow the vehicles on their network.

The cross border transport of longer road vehicles is mentioned often as a good example; but as well as a development the Union should take action on. Longer and heavier vehicles could work negatively on multi-modal transports.

1.5Initiatives related to urban freight logistics

Transport related problems, including congestion and noise, are caused by economic activity and traffic in urban environments. Freight transport is a large contributor to these problems. In order to reduce the problems specific actions were formulated to improve the efficiency of transport in cities by organising the deliveries and pick-ups in a more coherent way. Also the distribution of goods between production centres and customers inside urban areas should become more efficient and clean.

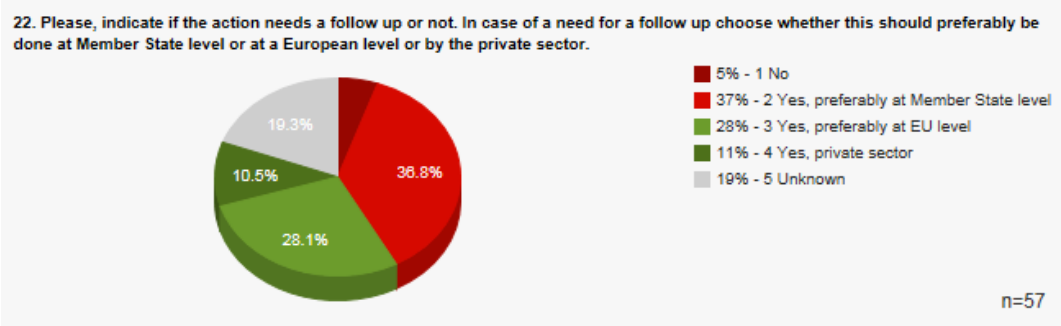
21. Please indicate the impact of urban freight logistics on efficiency, competitiveness and sustainability of Europe's freight transport and logistics sector.

Question 21 asked the respondents to score the impact of the FTLAP's urban freight logistics actions on Europe's transport efficiency, the sector's competitiveness and the sector's sustainability. The question was answered by 57 respondents. The most important potential effect of this action is an increase in transport sustainability. The effect on efficiency is scored second but less significant. The effect on Europe's competitiveness is scored third and less important.

Table A.VII. 12 Answers question 21

Subquestions	#	% of answers
Impact on Europe's transport efficiency	57	4 11 47 21 13
Impact on Europe's transport competitiveness	57	14 25 25 18 18
Impact on Europe's transport sustainability	57	9 53 21 13

Follow-up question 21 questioned if the urban freight logistics actions of the actual FTLAP need to be continued. 5% wants no follow-up for the actions. Only 11% wants a follow-up by the private sector. Only 38% wants to see actions by the European level and an interesting 37% of the respondents wants to see a follow up at a Member State level. This is a significant different outcome to the foregoing four clusters of actions.



23. Given your answer, what type of action should according to you be undertaken?

Follow-up question 23 gave the respondents the opportunity to add policy actions and to detail more there reasoning behind their answer. The answers were extensive and will be summarised. The main issues brought up by the respondents are structured in the word cloud below.

Sustainable urban mobility is actually higher on the agenda of Member States. Initiatives are taken to change urban freight transport. Often, a regulatory way is chosen. The Member States and individual cities do not harmonise rules enough. There is no unique solution for better organising urban logistics and mobility, but coordination of initiatives seems to be of high importance. In that respect, the Member States level is appointed as the best policy level for taking actions. This is in contrast to the former 4 action clusters discussed above. The EU level should however set up a coordinated framework (for example on which rules and action restrictions are allowed on a local level), promote and share best practices and should stimulate initiatives with soft measures. Initiatives like CIVITAS have proven good results. Also the Urban Mobility Package of 2013 is mentioned specifically as a good policy framework for taking future actions regarding this issue. As such, the urban freight transport issue is not prioritized to be included in the follow-up of the FTLAP. Actions could be limited to for example disseminating, supporting innovations, develop tax incentives for sustainable transport concepts, support LNG and other alternative fuel developments and to stimulate contacts between local policy makers and the sector (eg. Paris and London).

1.6Initiatives related to green freight corridors

Transport, an intensive activity, has a negative impact on the environment and human habitat. Despite the negative impact the intensity of transport also opens possibilities for the introduction of innovative solutions aiming to improve the energy-efficiency and the environmental sustainability. In the FTLAP specific actions were formulated such as the development of a freight-oriented rail network, implementation NAIADES for inland waterway transport and reinforce green corridors in TEN-T.

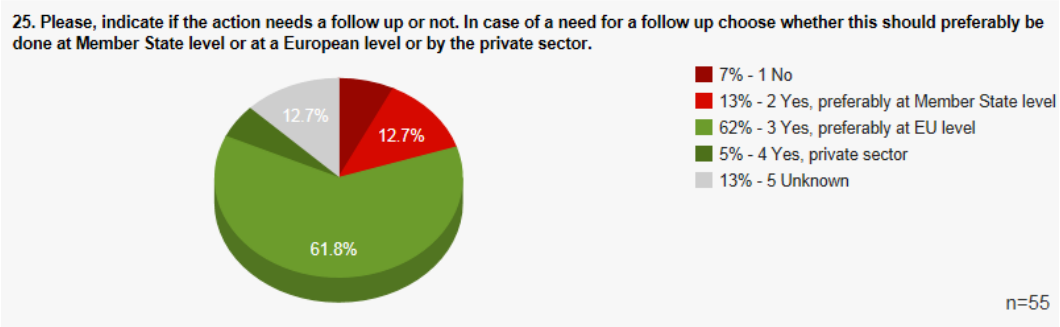
24. Please indicate the impact of green freight corridors on efficiency, competitiveness and sustainability of Europe's freight transport and logistics sector.

Question 24 asked the respondents to score the impact of the FTLAP's green freight corridors actions on Europe's transport efficiency, the sector's competitiveness and the sector's sustainability. The question was answered by 56 respondents. The most important potential effect of this action is an increase in transport sustainability. The effect on efficiency is scored second but less significant. The effect on Europe's competitiveness is scored third and less important.

Table A.VII. 13 Answers question 24

Subquestions	#	% of answers
Impact on Europe's transport efficiency	56	7 4 23 48 7 11
Impact on Europe's transport competitiveness	56	7 9 34 27 11 13
Impact on Europe's transport sustainability	56	7 7 18 46 11 11

Follow-up question 25 questioned if the actions of the actual FTLAP need to be continued. 7% wants no follow-up for the actions. Only 5% wants a follow-up by the private sector. Only 13% wants to see actions by the Member State level and 62% of the respondents wants to see a follow up at a European level.



26. Given your answer, what type of action should according to you be undertaken?

Follow-up question 26 gave the respondents the opportunity to add policy actions and to detail more there reasoning behind their answer. The answers were extensive and will be summarised. The main issues brought up by the respondents are structured in the word cloud below.

Several respondents valued existing programmes, such as rail freight corridors, motorways of the sea, and NAIADES I and II, and advised that these should be continued and monitored by the European Commission in order to strengthen the intermodal capacities of the EU. In the development of cross-border rail networks, due attention should be given to freight transport as well as passenger transport, as freight is often overlooked especially in the development of high speed rail. The Green Corridor Concept is however - in contrast to its original target - not promoting

sustainable transport. And as the rail freight corridors are now in practice the green corridors seem to be an obsolete concept.

The freight-corridors are supported. Respondents are looking forward to these to become operational and successful (with the possibility for authorized applicants). Apart from these initiatives the path to increased sustainable freight transport rests largely with the ability of industry to optimise its transport and logistics requirements in line with the wider supply chain needs. For that, legal, technical and operational barriers need to be removed and incentives for speedier development, investment and implementation of more sustainable technology and measures may sometimes be required.

It was advised specifically to make public funding for infrastructure (including that of rail freight infrastructure) subject to a sound cost-benefit analysis based on the three pillars guaranteeing sustainability namely economic, social and environmental conditions. Second, it was advised to change the Marco Polo Programme into a tool to reduce fuel consumption and CO2 emissions and make it mode neutral in order to allow all transport modes to benefit from it on a non-discriminatory basis. Third, the modernization and integration of the air traffic management systems for all modes and with GALILEO are pivotal as well to help a more efficient and sustainable use of transport infrastructures. In particular the Single European Sky should now become a reality.

The **e-Freight and ITS developments** were evaluated well. These actions are perceived to have resulted in an impact on the efficiency, competitiveness and sustainability of the sector. 38% of the respondents wants to see a follow-up, however by the private sector and less by the governments. The **sustainability and efficiency actions** were evaluated equally good as the former cluster. Here 1 out of 3 wants to see a follow –up at the European level and ¼ wants the private sector to take initiatives. The **simplification and transport chain actions** were evaluated as being in majority beneficial regarding efficiency and competitiveness increase. An impressive 68% of the respondents wants to see a follow-up action by the European level. Only 12% wants a continuation by the private sector. Actions regarding **vehicle dimensions and standards** are perceived to have resulted mainly in an increase in efficiency. Almost 60% wants to see a continuation at the European level. Only 14% wants a continuation by the private sector. The **urban freight transport initiatives** mainly resulted in sustainability increases and 1/3 wants a continuation at the European level. Slightly less than 1/3 wants to see actions be taken by the private sector. The actions on the **green freight corridors** were evaluated to mainly result in an effect on the efficiency and sustainability of the sector. An impressive 62% wants to see a continuation at the European level. Only 13% wants a continuation on the Member State level.

To conclude, the FTLAP was evaluated as resulting in a significant increase in the sector's efficiency and sustainability. An effect was seen as well on the competitiveness, but to a lesser extent. The actions were evaluated differently as regards to the need for follow up actions. It is advised that the e-Freight and ITS developments, should be developed mainly by the private sector. The sustainability and efficiency actions, simplification and transport chain actions & vehicle dimensions and standards should be developed at the European level. The urban freight transport initiatives should be developed at two levels: 1/3 wants a continuation at the European level and slightly less than 1/3 wants to see actions be taken by the private sector.

Results Part 4: Logistics performance measurement

Different stakeholders and players in the logistics sector have different aims for the measurement of logistics performance. Logistic performance measurement would be

e.g. to evaluate the efficiency and sustainability of logistics systems, optimize supply chains, monitor the achievement of logistics policies and explore possible improvements. Therefore a review and analysis is given on existing methods used to assess the performance of logistics at national, sectorial, and company level.

27. Which are the main relevant performance areas to be monitored and measured? Please indicate the relevance of different fields of perspective according the level of performance measurement.

Question 27 asked the respondents to score the main performance indicators which need to be monitored and measured. The question was answered by 54 respondents. The table below shows that performance indicators related to frequency of services, environmental intensity and congestion levels are scored as being less important.

Table A.VII. 14 Answers question 27

Subquestions	#	% of answers
Effectiveness	54	4 15 57 15 9
Efficiency	54	4 9 46 33 7
Customer satisfaction	54	4 4 13 31 41 7
Frequency of service	54	11 30 43 7 7
Flexibility of service	54	4 24 46 17 7
Reliability of service	54	4 6 37 44 9
Environmental intensity	54	7 28 41 17 7
Energy intensity	54	4 20 43 24 7
Operating cost	54	17 41 33 7
Congestion level	54	4 33 31 15 15

Other indicators are scored as more or less important. The most significant ones are related tot the flexibility of services, operating costs, reliability, efficiency, effectiveness and customer satisfaction.

28. Please indicate the relevance of methods used to assess the performance of logistics in your company or sector.

Question 28 asked the respondents to score the relevance of methods to assess performance within a logistics company. The question was answered by 52 respondents. The table below shows that key performance indicators (KPI) and decision support system tools are scored as being important.

Others, balanced scorecards and statistical process control, are scored as less important. Only half of the respondents scored these as being (highly) relevant.

Table A.VII. 15 Answers question 28

Subquestions	#	% of answers
Key Performance Indicators (KPI)	52	4 13 38 27 15
Balanced Scorecards	52	4 10 29 25 4 23
Statistical Process Control	52	4 12 27 19 8 31
Decision Support System Tools	52	4 6 13 44 4 29

29. Which are the three main relevant performance indicators to measure and evaluate the performance of logistic activities in your company or sector? Please specify

32 of the respondents specified indicators themselves via question 29. The issues bought up by these respondents are linked with (in order of frequency): costs, customers, service, reliability, satisfaction, emissions, flexibility and CO_2.

Results Part 5: Trends in the European freight transport and logistics sector

In part 5 the respondents were asked to react on trends which they observe in the period up to 2030. The respondents were given a long list of trends which they could score on relevance. First, internal factors (within the transport sector) are scored. These are followed by a scoring appraisal of external societal trends.

30. Please estimate the likely development of the importance of several logistic strategies in the coming 15 years (up to 2030).

Question 30 was answered by 58 respondents. Green indicates a strong increase is expected. Red means the respondents expects a strong decrease of importance towards 2030. Highly relevant trends up to 2030 are the consolidation trend, the intermodality of freight transport, ICT technology and the integration of supply chains.

Less relevant, but still significantly important, are the trends related to relocation of production to another continent than the EU, shift of production to countries close to the EU, centralisation, flexible supply bases, agility and adaptability, outsourcing and staff retention. A less significant trend is related to relocation of production to the EU.

Table A.VII. 16 Answers question 30

Subquestions	#	% of answers
Centralisation: Concentration of operations in a single location / logistical node; bridging of suppliers	58	12 16 45 10
Consolidation: Consolidation of transports between companies / logistic service provider (collaboration, bundling)	58	9 47 36
Relocation of production: Shift of production to the EU	58	3 22 31 26 3
Relocation of production: Shift of production to a country nearby EU	58	5 24 45 10
Relocation of production: Shift of production to an other continent than the EU	58	16 21 38 16
Intermodality: A transport system whereby at least two different modes are used in an integrated manner in order to complete a door-to-door transport sequence	58	3 12 48 31
Reverse logistic: Integration of recycling, reuse, remanufacturing etc. in the production process	58	55 36
Flexible supply base: Enlargement / diversification of supply sources	58	12 52 19
Agility / adaptability: Adaptability of global supply chains with respect to unexpected or rapid shifts in supply and demand	58	10 48 29
ICT-Technology: Investments in information and communication technology	58	7 28 59
E-Commerce / E-procurement: Electronic supply and demand of goods and services	58	7 38 48
Postponement: Finish a customer-requested product at the latest possible point of the supply chain; postpone the delivery of finished products to the final distribution centre.	58	5 14 34 10
Outsourcing: Outsourcing of production related processes to logistic service providers or transport operations to subcontractors	58	3 3 26 41 9
Wider geographical sourcing and sales: Spatial expansion of sourcing and distribution	58	5 12 53 12
Level of supply chain integration: Integration of physical and information flows aiming at improving seamless business processes	58	10 45 40
Importance of staff retention: Strategies of staff retention to overcome scarcity of e.g. truck drivers and logistics personals	58	3 3 16 41 19

31. Please assess each external factor according to its level of relevance for the development in the logistic sector, as well as the likely development of this indicator itself in the long term future.

Regarding the external trends, less important trends are the household size, development of the European population, the ageing society, the European market enlargement and deregulation.

The top 3 highly relevant trends for the European transport sector are the environmental awareness, energy costs and the harmonisation of infrastructure.

Other relevant trends are related to the energy demand, scarcity of raw materials, trade barriers and internalisation of external costs.

Table A.VII. 17 Answers question 31

Subquestions	#	% of answers
Ageing society	54	4 6 26 41 17 7
Development of EU population	54	7 35 33 11 11
Household size	54	7 9 52 19 11
Harmonisation of transport infrastructure	54	11 57 24 6
Internalisation of external costs / fair and efficient pricing	54	7 15 39 31 6
EU market enlargement	54	4 6 33 43 7 7
Urbanisation	54	4 4 17 44 24 7
Globalisation of the economy	54	20 31 39 9
Privatization / deregulation	54	4 11 26 35 15 9
Trade barriers	54	7 17 41 24 9
Raw material scarcity	54	7 7 56 20 9
Energy demand	54	9 35 48 7
Energy costs	54	4 28 57 9
Environmental awareness (e.g. waste reduction, resource saving)	54	4 52 35 7
Intensity of natural disasters / climate change effects	54	7 19 37 24 13

31B. Development up to 2030

In the follow up question 31B, the respondents were asked indicate the likely development of the importance of the external trend. Red indicates a strong increase, green indicates a decrease of importance.

Only two trends are expected to decrease in importance: the household size and trade barriers. All the other trends are expected to increase slightly or highly in importance. The main trends are energy costs, ageing society, environmental awareness, internalisation of external costs and energy demand.

Table A.VII. 18 Answers question 31

Subquestions	#	% of answers
Ageing society	54	6 4 6 48 22 15
Development of EU population	54	22 17 39 19
Household size	54	22 48 7 20
Harmonisation of transport infrastructure	54	7 17 56 6 13
Internalisation of external costs / fair and efficient pricing	54	4 11 46 24 15
EU market enlargement	54	4 7 28 43 17
Urbanisation	54	4 4 15 43 20 15
Globalisation of the economy	54	7 7 20 43 9 13
Privatization / deregulation	54	6 6 28 35 6 20
Trade barriers	54	6 33 28 17 4 15
Raw material scarcity	54	6 4 9 50 19 13
Energy demand	54	6 7 43 30 13
Energy costs	54	4 41 37 15
Environmental awareness (e.g. waste reduction, resource saving)	54	4 7 44 31 11
Intensity of natural disasters / climate change effects	54	4 6 22 33 15 20

33 We hereby give you the opportunity to add comments to the issues discussed in this questionnaire. Please indicate additional problems, barriers, trends and policy opportunities. Do you have suggestions concerning additional problems currently highly relevant to efficiency, competitiveness and sustainability of the European logistics sector?

The 2007 Freight Transport Logistics Action Plan was a far-reaching and ambitious plan to address the efficiency, competitiveness and sustainability of freight transport logistics. Some progress has been made, following initiatives from the EC. In other areas industry itself has progressed largely through private initiatives. It has been impossible to tackle some aspects of freight transport logistics which were addressed by the 2007 Freight Logistics Action Plan, because some of them have shown to be impractical. This should be taken into account when developing a follow –up.

Moreover, administrative barriers, (urban) road safety and specific policy measures on freight and logistics were mentioned. The suggestions are bundled in the responses on question 33 below.

33. Do you have additional policy suggestions to improve the efficiency, competitiveness and sustainability of the European logistics sector?

A further integration of logistic sector with various relevant sectors in specific countries should be developed, e.g. the Netherlands as 2nd globally exporter of agricultural products could strive for an alignment between high level logistics and high level agriculture sectors.

Creation of a European Logistics Policy institute to monitor the total logistics system performance, to develop medium and long term logistics policies and to act as a platform where policymakers and industry meet.

The efficiency, competitiveness and sustainability of the European logistics sector will benefit from a multimodal transport system with a strong rail freight component. In order to achieve this, the following recommendations were given: - Infrastructure charges: ensure alignment between road and rail infrastructure charges for freight and ensure that funds collected through road tolls are spent (at least partially) on the development of environmentally friendly-transport alternatives. - Fully internalise the external costs of transport, by applying the 'polluter pays' principle. Make the current voluntary provisions of the Eurovignette Directive mandatory at national level, charging lorries for the cost of air pollution and noise they generate. Expand this to ensure that additional costs are covered. - Social conditions: reinforce the control of social rules in road transport. Harmonise social rules and tax regimes across modes. - Customs: maintain existing dedicated simplified rail transit procedures as long as possible, preferably up to the entry into force of the Union Customs Code, or at least until all IT systems required on the basis of the Union Customs Code are available. A dedicated rail IT-based transit application would be desirable, allowing for declarations based on the available rail data (e.g. consignment note), and aligned with railways' production and logistic settlements. - Intermodal freight: harmonise technical requirements between modes, to ensure cross-modal compatibility. Limit changes in masses and dimensions of road vehicles and trailers which would hinder combined transport and the use of rolling highways, and restrict the use of road vehicles and trailers which are not compatible with intermodal freight given their size and dimension. In order to make better use of equipment longer and heavier trains should be realized, but also longer and heavier vehicles. Completing the rail freight-oriented network including clear priority rules for freight.

There should be a new Commissioner for mobility and logistics to show the equal importance of transport of passengers and of goods. This Commissioner should coordinate the policies actions across the Directorate Generals in charge of transport, trade, environment, climate change, ITC, taxes and customs for instance. A group of permanent stakeholder representatives should be created to allow continuous dialogue and mapping of priorities and of cost-effective regulatory measures. The EU Member States should also actively participate in order to ensure rapid implementation of the measures.

The creation of a European single enforcement area. Enforcement is fragmented throughout EU which leads to day to day problems. Establishing conditions for single windows and one-stop administrative shopping for administrative procedures in all modes is needed.

The creation of a network of secure truck parking areas in order to combat transport crime and to maintain the EU driving and resting time legislation is asked. EMS, in cross border traffic should be allowed, not only in intermodal but also in unimodal transport.

The urban freight and logistics sector is a key area in which efforts still have to be made to reach a.o. the ambitious targets and policy objectives set in the 2011 Transport White Paper. In order to improve urban logistics sufficient areas to load and unload, reasonable time schedules, promote night distribution, harmonization of regional rules based on EU standards. Recommending better use of the 24h of each day for urban deliveries and collections.

TEN roads are to be created for realising a 24 hour economy: no driving bans on these roads on weekends and holidays. Infrastructure can be better used by increasing it capacity by dynamic traffic management, by reducing lorry bans.

Establishing an EU maritime space without barriers.

The European Union needs to help industry with grants, fiscal incentives (carrots not sticks) and trade facilitation measures to innovate or implement new practices, freight transport technologies and IT which accelerate the achievement of lower emissions, reduced transport requirements, greater freight transport efficiency and lower costs. A solid logistics policy is needed to complete the internal market, do away with the barriers, promote best practices, in respect of subsidiarity.

Complete the single market for all freight transport modes. An integrated transport network, linking national infrastructure to core infrastructure along trans-European freight corridors is vital to the success of the economy. Industry, from its side, should continue to invest in initiatives to increase efficiencies through better use of available capacity (consolidation and cooperation), through the re-keying of information, re-developing IT systems and enhanced systems integration.

Further harmonise fiscal, social, technical and road safety rules is needed in road freight transport. Combat social dumping practices. Harmonising the state aid rules for road freight, rail freight and combined transport companies is needed.

Introduce a mandatory road charging scheme in the EU. If a congestion element would be part of the charge, then all road users should be included in the scheme. The scheme's revenues should be entirely earmarked to flow back to road transport related investments, e.g. to make road transport more sustainable. Moreover, charging should be used as a policy tool to incentivize the players to behave in a way that contributes to the EU transport policy objectives, e.g. to the modal shift towards environmental-friendly transport modes.

Logistics policy should be thought globally. More and earlier international coordination is necessary to avoid complexity and unnecessary costs. For instance, a holistic approach should be taken for trade negotiations to lower supply chain barriers. It should be followed for the current transatlantic trade negotiations (TTIP). Through greater mutual cooperation the U.S. and the EU should streamline customs processes and expedite the flow of trade through ports and airports, leading to both "pre-clearance" and the "immediate release" of goods. The EU should work on international standards for the adoption of common documentary and data standards to reduce administrative costs, errors and time for trade.

The EU should strictly monitor the application of the balanced Approach at local level to limit restrictions on night flights and focus on technology improvements for aircraft to limit aviation nuisance.

Develop power supplies for electric vehicles. And authorize use of the B permit for all electric vans despite weight higher than 3.5 tonnes to ensure a competitive offer of electric vehicles cost, efficiency.

Overall Conclusions

The questionnaire was online during 57 days and resulted in a response rate of 83 individuals. Of these 83, 52 respondents answered all questions. The majority (61%) answered in name of an organisation. One out of 5 answered in name of an association. A minority answered in name of a research or consultancy company or as an individual.

The majority of respondents are transport operator. Logistics service providers and forwarding companies were also numerously presented. Half of the respondents work for a multi-nationally organised company or association. One out of 5 is working for an SME. A minority of respondents is active in only one country. Country-wise Belgium, France, Germany, Sweden and the Netherlands are important.

70% uses uni-modal road transport, but 60% uses as well intermodal combinations. Half of the respondents use rail freight transport. And 45% use SSS or inland waterway transport. Air transport is not significantly used.

The main problems for the competitiveness of the European logistics sector are related to regulatory and administrative procedures. Increased congestion is one of the second-ranked main problems besides increasing energy costs, increasing taxation and differing labour markets. A lack of well interconnected European transport infrastructure and a lack of intermodal infrastructure are less but still significant. Shortage of qualified logistics staff and the level of training of this staff is less important. Difficult access to capital and a lack of warehousing are not significantly threatening the competitiveness of the sector.

It was asked to evaluate the impact of the past FTLAP actions on efficiency, competitiveness and sustainability of the European transport sector. The actions were not evaluated per actions but per action domain. The table below bundles the results of the evaluation. All action domains were evaluated rather positively. The *e-freight and ITS actions*, the *sustainable quality and efficiency* domain of actions performed very good, just as the *simplification of transport chains* action domain. The urban freight transport action domain was evaluated to have a less significant impact on competitiveness. But the impact on sustainability was highly ranked. The *green freight transport corridors* action domain is evaluated more modest than the other 5 domains.

Table A.VII. 19 Evaluation of the past FTLAP

	Efficiency	Competitiveness	Sustainability
E-freight and ITS actions	++	++	++
Sustainable quality and efficiency	+++	++	++
Simplification of transport chains	+++	+++	++
Vehicle dimensions and loading standards	+++	++	++
Urban freight transport	+++	+-	++++
Green freight transport corridors	+	+	+-

The respondents was asked to indicate the need for follow-up actions of the six FTLAP action domains evaluated above.

All action domains were evaluated rather positively. The *sustainable quality and efficiency* and *vehicle dimensions and loading standards* action domains were the only two which were advised to be stopped by more than 10% of the respondents. The follow-up *e-freight and ITS actions* should according to 48% of the respondents be developed at a European level, while 38% wants a follow-up by the private sector. The *sustainable quality and efficiency* domain needs, according to 35%, a follow-up at the European level, while 28% wants the follow-up initiatives be taken by the private sector. The *simplification of transport chains* action domain needs clearly a follow up at the European level (68%), just as the *vehicle dimensions and loading standards* action domain (60%). The urban freight transport action domain was the only action domain evaluated to have a follow-up need by the Member States. 37% scores this policy level as the most appropriate level to take initiatives, while still 28% wants to see European actions. The *green freight transport corridors* action domain should according to 62% of the respondents be taken up by the European level.

Table A.VII. 20 Need for follow-up actions of the past FTLAP

	No	Member State	EU level	Private sector
E-freight and ITS actions	3	2	48	38
Sustainable quality and efficiency	16	5	35	28
Simplification of transport chains	5	5	68	12
Vehicle dimensions and loading standards	12	2	60	14
Urban freight transport	5	37	28	11
Green freight transport corridors	7	13	62	5

Respondents were asked to score a long list of different societal and sectoral trends on importance. Highly relevant internal sectoral trends up to 2030 are the consolidation trend, the intermodality of freight transport, ICT technology and the integration of supply chains. Less relevant, but still significantly important, are the trends related to relocation of production to another continent than the EU, shift of production to countries close to the EU, centralisation, flexible supply bases, agility and adaptability, outsourcing and staff retention. A less significant trend is related to relocation of production to the EU. Regarding the external trends, less important trends are the household size, development of the European population, the ageing society, the European market enlargement and deregulation. The top 3 highly relevant trends for the European transport sector are the environmental awareness, energy costs and the harmonisation of infrastructure. Other relevant trends are related to the energy demand, scarcity of raw materials, trade barriers and internalisation of external costs.

In the follow up question, the respondents were asked indicate the likely development of the importance of the external trend. Only two trends are expected to decrease in importance: the household size and trade barriers. All the other trends are expected to increase slightly or highly in importance. The main trends are energy costs, ageing society, environmental awareness, internalisation of external costs and energy demand.

Then, the respondents were asked to identify additional policy suggestions to improve the efficiency, competitiveness and sustainability of the European logistics sector. A further integration of logistic sector and further developing a multimodal transport system with a strong rail freight component were mentioned. Completing the single market for all freight transport modes was asked. As an integrated transport network, linking national infrastructure to core infrastructure along trans-European freight corridors is vital to the success of the economy.

The creation of a European single enforcement area was mentioned as enforcement is fragmented throughout EU.

It was asked from the European Union to help industry with grants, fiscal incentives (carrots not sticks) and trade facilitation measures.

For road transport, the creation of a network of secure truck parking areas in order to combat transport crime and to maintain the EU driving and resting time legislation is asked. Furthermore it was asked to harmonise fiscal, social, technical and road safety rules is needed in road freight transport, combating social dumping practices. Harmonising the state aid rules for road freight, rail freight and combined transport companies is needed. Linked to this, an introduction of a mandatory road charging scheme in the EU was asked. The scheme's revenues should however be entirely earmarked to flow back to road transport related investments, e.g. to make road transport more sustainable. Moreover, charging should be used as a policy tool to incentivize the players to behave in a way that contributes to the EU transport policy objectives, e.g. to the modal shift towards environmental-friendly transport modes.

The urban freight and logistics sector needs to develop more initiatives in order to reach the ambitious targets and policy objectives set in the 2011 Transport White Paper. Sufficient areas to load and unload, reasonable time schedules, promoting night distribution, harmonization of regional rules based on EU standards were recommended.

Regarding logistics, is was mentioned that the logistics policies should be thought globally. For instance, a holistic approach should be taken for trade negotiations to lower supply chain barriers.

A specific Commissioner for mobility and logistics to show the equal importance of transport of passengers and of goods was suggested.

More practically oriented, it was asked to develop power supply services for electric vehicles and authorize the use of the B permit for all electric vans despite weight higher than 3.5 tonnes to ensure a competitive offer of electric vehicles cost, efficiency.

Annex VIII: Analysis of Logistics Performance Measurement

Analysis of Logistics Performance Measurement at national level

Initially, this intends to analyse the state of the art and state of practice related to studies of logistics performance measurement at national level. Currently used approaches to assess logistics performance at national level have been reviewed, in particular on EU-country level, but also examples for the USA and China have been analysed.

It can be seen that within the approaches the context of "national level" is used in different ways:

- Performance measurement of the logistic sector of a country comparing with previous periods (single-country);
- Benchmarking of logistic performance of different sectors within a country and different periods;
- Cross-country performance benchmark between different countries and different periods (multi-country);
- Benchmarking of logistic performance of different sectors between different countries and different periods.

The analyses have been done utilizing literature review and desktop-research using a structured assessment pattern and summarizing the main topics in fact-sheets to ensure the comparability of the different findings. The following categories are shown:

- name, author, year and timeline of the publication;
- the coverage and study area;
- type of study (statistical analyses, survey, case study);
- the category of performance measurement (coverage of key performance areas);
- description of the used approach and methodology;
- key results and level of logistics performance;
- first evaluation and assessment of the approach and results.

Overview of national level logistics performance measurement

The classification is adapted to the latest studies and discussions held in the International Transport Forum (Discussion Paper 2012-4/ OECD/ITF 2012) and distinguish three different research methods:

- Statistics-based studies:
  Statistics-based studies utilize statistical data (mainly national statistics figures), models and methods in deriving the level of logistics indicators. Statistics-based studies are mainly characterized by the usage of a well-established and verified statistical model. This is also the difference to case studies, which also may use official statistical data;
- Surveys:
  Surveys mainly use questionnaires for collecting data from respondents. The characteristic here is that the focus of the surveys is mainly on the demand-side of logistics and supply chains. That means mainly from the costumer and consumer side instead of the supply-side, shippers and logistics service providers (3PL), which is main the focus mostly in the statistics-based studies;
- Case and other studies:
  Case and other studies are characterized by investigations based on case study methodology and studies that cannot be categorized as statistics-based or surveys. Case studies are mainly used when sufficient statistics and survey

results are not available. Other studies are characterized by the usage of a mixed and not totally transparent and disclosed approach.

A substantial stream of academic literature and studies related to the performance measurement of logistics on national level is available and has been reviewed. These have also been reflected in the concrete evaluation and comparisons of the performance of the logistics sector analysed in chapter 2.

In the following for each category, the probably main important examples for national-level performance measurement will be analysed and described:

- Top 100 in European Transport and Logistics Services;
- Study of logistics market in Switzerland;
- Macro-level logistics in Sweden;
- Logistic costs and measurement;
- World Bank - Logistic Performance Index;
- Establish/ Davis Logistics Cost and Service Database;
- Excellence in Logistics;
- SCI Verkehr Logistikbarometer, Germany;
- The State of Logistics in the Baltic Sea Region;
- Finland State of Logistics surveys;
- Logistic costs in Norway;
- The state of French logistics (ASLOG);
- Logistics report UK;
- Annual state of logistics report USA;
- Report on Logistics of China.

The abstracts are given in the following overview. The detailed fact-sheets can be found after the description.

Statistics- based studies

- **Top 100 in European Transport and Logistics Services**
  The study measured the total costs of the European business logistics system. This includes all freight transportation, storage, trans-shipment and order picking, all inventory-maintenance expenditure, order processing, planning, management and administration expenditure, covering both in-house and outsourced logistics services. Three partly overlapping methods were applied:
  1) extrapolation based on road transport volumes, distances and freight types in different countries
  2) calculation using labour statistics and extrapolation with national economic and value-added data
  3) calculation using data about company and industry revenues spend on logistics activities (Input-Output accounting)
- **Study of the logistics sector in Switzerland (Logistikmarktstudie Schweiz)**
  The study measured the total cost of the logistics sector in Switzerland. Four main cost components are identified: transportation, handling, warehousing and other logistics costs. In-house production logistic costs are not taken into account. The approach is mainly based on cross-sectional data and has no dynamic information. Data is partly based on an analysis of existing statistics by public institutions such as the Federal Statistical Office (FSO) and the Federal Customs Administration (FCA). In addition, several interviews with companies, shippers and logistics service providers have been carried out. Three independent methods:
  1) extrapolation of freight transport volumes;
  2) calculation using labour statistics;
  3) calculation using company and industry revenues data.

- **Macro level logistics in Sweden (Svensk Makroslogistik 1997-2005)**
  The objective of this study was to create a tool for measuring macro-level logistics. Data analysis was based on national statistics. The study focused on gathering an overview of logistics costs in industry on national level between 1997and 2005. The reviewed cost components are grouped in three (four) categories:
  - direct transportation cost: comprise all costs that are occurred due to the transportation of goods (In-house and outsourced);
  - inventory carrying costs: include interest of 25 per cent of the inventory value combined with warehousing costs, meaning the costs of warehousing premises and other costs related to them;
  - warehousing costs: comprises all costs relating to the warehousing premises;
  - administration: comprise personnel and other overhead costs related to logistics activities.
- **The 2010 National Statistical Survey Report on Logistics of Key Enterprises in China**
  The China Federation of Logistics and Purchasing publishes the figures for China's logistics industry on a yearly basis based on data from the National Bureau of Statistics. The latest available figures give the situation in 2010. The main areas of consideration are:
  - Market size;
  - Logistics efficiency;
  - Outsourcing of logistics functions;
  - Development of transport infrastructure;
  - Performance of logistics enterprises.

Surveys

- **Connecting to compete 2012- Trade logistics in the global economy. The Logistics Performance Index and Its Indicators**
  A multidimensional assessment of logistics performance, the LPI compares the trade logistics profiles of 155 countries and rates them on a scale of 1 (worst) to 5 (best). The ratings are based on 6,000 individual country assessments by nearly 1,000 international freight forwarders, who rated the eight foreign countries their company serves most frequently. The LPI's six components include:
  - Efficiency of the clearance process (speed, simplicity, and predictability of formalities) by border control agencies, including customs;
  - Quality of trade and transport-related infrastructure (ports, railroads, roads, information technology);
  - Ease of arranging competitively priced shipments;
  - Logistics competence and quality of logistics services(transport operators, customs brokers);
  - Ability to track and trace consignments;
  - Timeliness of shipment delivery (the frequency with which shipments reach the consignee within the scheduled or expected delivery time).

The components were chosen based on recent theoretical and empirical research and on the practical experience of logistics professionals involved in international freight forwarding. The study also includes a set of domestic performance indicators for 143 countries. For these data, survey respondents assess the logistics environments in the countries where they work, providing information on the quality of infrastructure, the performance of core services, the friendliness of trade clearance procedures and the time, cost and reliability of import and export supply chains. These domestic indicators help to define logistics constraints within countries, not only at the gateways, such as ports or borders. They analyse the major determinants of overall logistics performance, focusing on country performance in the major determinants of overall

logistics performance: infrastructure, services, border procedures and time, and supply chain reliability. The LPI uses standard statistical techniques to aggregate the data into a single indicator. This single indicator can be used to compare countries, regions, and income groups.

- **Excellence in Logistics**
  From the year 1882 European Logistics Association (ELA) and A.T. Kearney published every 5 years the study "Excellence in Logistics", focused each time on different topics. The latest one in 2009 focuses primarily on benchmarking logistics costs and service level of 150 companies from different industries (among others mainly consumer goods, automotive, chemical and telecommunication industries) in 18 countries. The study analysis logistic costs of five categories:
  - Administration;
  - Inventory carrying;
  - Warehousing;
  - Transportation;
  - Transportation packaging.
- **SCI/Logistikbaraometer**
  The SCI/LOGISTIK BAROMETER is an indicator for the economic trend in the transport and logistics sectors. Since 2005, SCI Verkehr has continuously been observing prices and capacities as well as the latest trends and developments. More than 200 of the sector's decision-makers are interviewed every month. The results are analysed using the Ifo Business Climate Index approach. In addition and beside short-term economic expectation, the objective is to expose long-term growth determined trends;
- **State of Logistics in the Baltic Sea Region**
  The State of Logistics in the Baltic Sea Region survey was part of the LogOn Baltic project, which was an initiative funded by the European Regional Development Fund. The study was conducted across 9 regions in 8 countries (Lithuania, Finland, Latvia, Germany, Estonia, Denmark, Russia, and Sweden). Data was received between 2006 and 2007 from over 1.230 respondents in manufacturing, trading and logistics firms by a web-based survey (mostly). The survey focused on the following logistics issues:
  - Costs (broken down into transportation, warehousing, inventory carrying, administration and all other logistics-related costs);
  - development and competence needs;
  - outsourcing;
  - the operating environment;
  - firms' self-assessment regarding the level of their logistics operations.
- **Finland State of Logistics in 2012**
  This Survey 2012 is commissioned by Ministry of Transport and Communications Finland, and it is a continuation of similar surveys published in 1993, 1997, 2001, 2006 and 2009/2010 The level of logistics in Finnish manufacturing, wholesale and retail and logistics firms is assessed through logistics costs, key performance, indicators (KPI), logistics outsourcing and the operational preconditions in the location of Finnish manufacturing, trading and logistics companies. A total of 2.732 respondents answered the questionnaire (32 % manufacturing and construction, 28 % trade, 25 % logistics service providers, 5 % consultants and 10 % teaching);
- **Logistics costs in Norway**
  The main focus of the survey is to quantify the cost of logistics for 2007 by cost component, industry and region in Norwegian manufacturing and wholesaling industries. The results from the survey enable to compare the cost of logistics in Norway with similar international studies. The survey was conducted in 2008. A web-based questionnaire was chosen as the preferred survey tool. The database of information on the cost of logistics contains 540 companies from

manufacturing, wholesale, and building and construction industries. In the survey the cost of logistics is defined to include the following cost components:

- Transportation, including inbound, outbound and internal transport;
- Warehousing;
- Capital tied up in transportation and warehousing;
- Packaging;
- Insurance;
- Obsoleteness and wastage;
- Logistics administration.

- **State of French logistics 2010 (L'etat de l'art de la Logistique Française 2010)**

  The national French logistics association (ASLOG) published the latest (4th) French logistics survey in 2010. The data is based on interviews (online and paper interviews) in 346 French companies (mainly large companies). The objective of the study is to assess the state of logistics in France in comparison with other countries mainly in terms logistics costs. The main fields of investigation are:

  - Reliability of Customer service;
  - Customer complaint rate;
  - Reliability of Production service;
  - Reliability Suppliers service;
  - Reliability of purchase;
  - Outsourcing;
  - logistics costs (broken down into transportation, warehousing/inventory carrying, administration);
  - Turnover of stocks;
  - In addition to the previous surveys, qualitative assessment of Risk management (safety and security) and sustainability transport aspects.

Case and other studies

- **Statistical coverage and economic analysis of the logistics sector in the EU (SEALS project (2008))**

  As part of the FTLAP, the SEALS study was commissioned to improve knowledge of the logistics sector in the European Union and obtain a better understanding of its characteristics, its development and needs by using available statistics and additional data sources (SEALS, 2008). The SEALS study proposed an assessment scheme based on selected logistics performance indicators that are grouped into the following three key areas: i) macro-economic indicators (e.g., sector employment, turnover, value added, logistics intensity), ii) micro-economic indicators (e.g., cost composition of transport by mode, cost composition of warehousing, profitability margin by transport mode and warehousing), and iii) terminal indicators (e.g., throughput of terminals for commodity groups, terminal/berth productivity, terminal capacity utilization, delivery reliability and days of inventory in distribution centres, port efficiency);

- **Logistics costs and competitiveness: measurement and trade policy application**

  The study examines the issue of measuring logistics costs on national level, as well as identifying logistics-intensive sectors. It focuses on currently available data at the macro- and firm-levels. The following data sources have been used:

  - national accounts;
  - national input-output tables;
  - the International Comparison Project;
  - firm-level data;
  - and production and trade data.

  The paper gives cross-country comparisons concerning logistics costs relative to GDP and analyse the correlation towards the ranking of logistic performance relating to the World Bank´s Logistic performance Index

measurement (LPI). Finally, the study uses input-output data to identify logistics-intensive sectors.

- **Logistic Report UK 2013**
  The Logistics Report 2013 UK was published by the Freight Transport Association (FTA) United Kingdom. The report employs data acquired from several different sources:
  - the latest annual FTA Logistics Industry Survey 2012/13;
  - a selection of data and survey results from PwC including the 16th Global CEO Survey 2013;
  - the summaries of a series of roundtable discussions led by PwC;
  - the FTA Quarterly Transport Activity Surveys (QTAS);
  - FTA Manager's Guide to Distribution Costs;
  - official statistical publications.

  The aim is to identify key trends for the future, as well as assess their potential impact on logistics in the UK. The main results show a range of over 50 indicators that give different perspectives on logistics and the performance of the wider economy. The key considerate areas mainly for road transport industry are:
  - Safety;
  - Efficiency;
  - Transport data;
  - Economy.
- **24th Annual State of Logistics report USA**
  The Council of Supply Chain Management Professionals (CSCMP) USA publishes the Annual State of Logistics Report, which defines the current state of business logistics costs and the outlook for business logistics in the United States. The study uses the same approach from year to year, making the results comparable. The model and study approach is not opened and explained. The study presents mainly logistics costs in four main components:
  - inventory carrying (all costs for holding goods in storage);
  - transportation (charge of transporting goods);
  - logistics administration (indirect management, supporting staff and IT-expenses);
  - Shipper related costs (top level costs).

Analysis of Logistics Performance Measurement at company level

This analysis is in line with the review and state of practice related to studies of logistics performance measurement at national level. The "Company level" analysis will focus on Logistics Service Providers and especially on "Third Party Logistics Service Providers" (3PL) or company´s logistics department who manages own account logistics and transports or hire / reward haulage.

With this literature the questions to be answered were: What performance measurement approaches and indicators for Logistics Service Providers are proposed in literature and how useful are they?

In order to analyse the performance indicators for Logistics Service Providers, a literature review was conducted in several fields: literature on performance measurement in general, then focusing on Logistic Service Providers and on 3PL as special activity based service providers.

Definition

Logistics Service Providers in general can be defined as companies, which perform logistics activities of a customer either completely or only in part. These functions can include traditional activities such as transporting, warehousing, packaging, etc. but also less conventional activities as those related to custom clearance, billing as well as tracking and tracing (Delfmann et al., 2002; Lai, 2004).

Third Party Logistics Providers (3PL) are typically dealing with long-term outsourcing of logistics activities by a manufacturer instead of focusing only on transportation activities. They are coordinator of logistical activities, integrated on an intra or even inter-organizational level (Krauth et al, 2005).

Literature Review

Performance measurement is a topic, which is often discusses but rarely defined. Generally:
a) Performance measurement can be defined as the process of quantifying the efficiency and effectiveness of action;
b) A performance measure can be defined as a metric used to quantify the efficiency and/or effectiveness of an action;
c) A performance measurement system can be defined as the set of metrics used to quantify both the efficiency and effectiveness of actions. (Neely et al, 1995)

General Performance Measurement

The most well-known approaches of sector-wide business performance measurement are the Balanced Scorecard, the European Foundation of Quality Management Excellence model (EFQM model) as well as the "SMART" system:

Balanced Scorecards

Kaplan and Norton presented in 1992 the concept of the Balanced Scorecard (BSC). Since then it has been further developed and nowadays performance measurements of other frameworks and authors used parts of the BSC (e.g. Malina and Selto, 2001; Schneiderman, 1999; Bassioni, Price and Hassan, 2005). This way of measuring a business's performance combines hard and soft measurements to give managers a broad view of the business' performance. The BSC is divided into four parts that managers have to evaluate by using measurements suitable for their own organisation:
1.) Customer perspective:
Useful measurements, depending on business strategy, can be the time from order to final delivery, order accuracy, service level and the percentage of sold goods that are newly introduced to the market to measure the inventiveness of the business.
2) Internal business perspective:
Measurements focused on the business's core competence should be used to make sure that the customers' needs are fulfilled.
3) Innovation and learning perspective:
Measurements that can be used include the introduction time of new products, research and development (R&D) time and how much time it takes to learn how to produce new products.
4) Financial perspective:
Measurements focused on the financial perspective should be taken into account.

EFQM-Excellence Model

The EFQM business excellence model was developed in 1989 by the European Foundation of Quality Management (EFQM) to improve the quality of management in Western Europe. The EFQM model is used to measure and improve the overall quality of an organisation or company. Similar to the Business Scorecard approach, the EFQM Excellence model intend to help business to understand how to perform better.

One of the essential characteristics of the EFQM-model is that the model distinguishes between two parts that can be measured by Indicators, chosen by the needs of the company. These two parts are 'Enabling' criteria and 'Resulting' criteria. The idea is that by excelling in the categories provided by the EFQM, businesses' performance will increase with the help of complete and coherent performance measurements that can be compared towards best practices.

The enabling criteria are as follow:

- Leadership (executives and managers);
- People management (focus on employees);
- Policy and strategy (business targets, mission and value);
- Resources (usage of internal and external resources);
- Processes (processes to satisfy stakeholders/consumers).

And the result criteria are:

- People satisfaction (process to satisfy employees);
- Customer satisfaction: (fulfilment of targeted customers´ expectations);
- Impact on society (satisfy the expectations of local, national and international society);
- Business result (Achievement in relation to planed business performance and satisfying shareholders).

The "SMART" System

The strategic measurement analysis and reporting technique (SMART) system was developed as a result of dissatisfaction with traditional performance measures to integrate financial and non-financial performance indicators. The SMART system can be represented by a four-level pyramid of objectives and measures.

1) At the top is the corporate vision or strategy. At this level management assigns a corporate portfolio role to each business unit and allocates resources to support them;
2) At the second level, objectives for each business unit are defined in market and financial terms;
3) At the third level objectives and priorities can be defined for each business operating system in terms of customer satisfaction, flexibility and productivity;
4) At the fourth level, the department level, customer satisfaction, flexibility and productivity are represented by specific operational criteria: quality, delivery, process time and cost.

Specific performance measurement in the Logistics Service Providing sector

Even there are arguments for using sector-wide approaches for performance measurement, several studies and literature can be found that show that frameworks could be improved if they were focused on the special needs of specific issues of a sector. Especially further development of the Business Score Card and the EFQM Excellence model has therefore been done along with the development of new frameworks for Logistics Service Providers:

- *Gunasekaran et al. (2004): A framework for supply chain performance measurement:*
  Measurements of the performance of the whole supply chain are difficult since most frameworks only measure individual business' performance. Therefor this framework intends to tackle the problem by measuring performance at a supply chain level instead of at the single company. The framework has been developed by defining metrics and measurements gathered from previous research, conducted by a variety of authors, and interviews with representative from several businesses. That resulted in the development of a customised framework where the metrics are divided into Strategic, Tactical and

Operational levels among the four major activities within the supply chain; Plan, Source, Make/Assemble, Deliver;

- *Hermana, et al. (2005): Performance measurement for green supply chain management:*
  This framework has been developed with focus on Reverse Logistics Operation. Reverse Logistics is part of a business' after sales service and deals with the return flow of goods. The customer is therefore the key factor in this process. As it is seen as an 'extra' activity that has to be performed by the customer in case of warranty, repair, recycling or overstocks, it has to be done as efficiently as possible. Mostly the difference between 3PL performance measurements is the special need of information and technological systems, e.g. Track and Tracing Systems, such as already used in many postal services. This can enhance transparency in the location of the product and detailed customer data system can already provide the business with information of what has been returned to them. Next to information provision, businesses managing reverse logistics have to think about how to effective and efficiently manage the transport back to the manufacturer. Here the same measures as for 3PLs can be used, as those also have to use similar metrics to measure their performance. Therefore the common inventory for measuring reverse logistics is:
  - Lead time;
  - Supplier/partner performance;
  - Customer satisfaction.
- *The Association of German Engineers (VDI- Verband Deutscher Ingenieure):*
  A series of standard guidelines was developed by the Association of German Engineers, which defines appropriate ratios. This collection of performance indictors covers both 3PL and logistics department of a producing company. The indicators are intent to be used to measure the efficiency of the logistics of internal goods distribution as well as for internal controlling purposes. The indicators are divided into performance, costs and structural indicators in distribution:
  - Performance:
    - Mean throughput time at goods exit;
    - Standard deviation of throughput time at goods exit;
    - Order-picking items per employee hour;
    - Degree of service;
    - Confirmation rate of customer's desired delivery date;
    - Delivery date reliability;
    - Complaint rate.
  - Costs:
    - Evaluated turnover rate;
    - Mean costs for distribution activities per order-picking item;
    - Mean costs of transport per goods consignment.
  - Structural:
    - Mean number of order-picking items;
    - Mean dispatch weight per goods consignment;
    - Mean transport time per goods consignment;
    - Mean transport distance per goods consignment.
- Institute of Transport Logistics at TU Dortmund University (2011): Management Information System for 3PL:
  While there a number of standards that define appropriate indicators for internal distribution logistics, the framework of the TU Dortmund intend to close the gap of missing indicators both for internal and external logistics of 3PL. The result of this research project was to develop a management information system, which includes performance measurement indicators especially for small and medium-sized Logistics Service Providers and methods

for evaluating operationally relevant investment decisions. The indicators are divided into costs, performance, quality and structural indicators;

- *Divers frameworks:*
  A collection of indicators focused on own account haulage operations was developed by Weber (1993). In general these indicators can also be used for providers mainly operating with hire or reward haulage. However, both systems might differ in their objectives. The strategic target of works transport is often the best load utilization. In contrast Logistics Service Providers usually have to serve customers of different branches who have different requests to transport needs. This might lead to the fact that systems focused on hire or reward haulage operations also have to comprise performance indicators, which consider aims as time, flexibility and quality of transport.

  A lot of frameworks have been created and are available with focus on distribution and logistics of industry and trade companies and warehousing (e.g. Piontek 1996, Pfohl 1991, Syska 1990, Stölzle 1996, Krauth et al. 2005). But most of those performance measurement systems have similar problems: they focuses mainly on financial and costs aspects. Performance or quality of transport and sustainable aspects are not fully covered. And if transport activities are considered the objectives differ from those of 3PL: For example indicators for goods turnover were not included.

  For measuring logistics service quality, Mentzer et al. (2001) refers to following areas: personnel contact quality, order release quantities, information quality, ordering procedures, accuracy, condition and quality discrepancy, handling and timeliness. This will be measured with the indicators: lead time, order cycle time, inventory replenishment time, inventory turnover, order fill rate etc.

  Another point of view is given by Vaidyanathan (2005). This framework evaluates 3PL from the customer and shipper perspective. A set of criteria is defined to evaluate 3PL. These evaluation criteria typically include quality, cost, capacity, delivery capability and financial stability. In addition operating and pricing flexibility and IT capabilities play important roles. Performance indicators include e.g. shipment and delivery times, error rates and responsiveness to unexpected events.

  Caplice and Sheffi (1995) reviewed the logistics performance measurement systems of different industry firms with own logistics departments: The Logistics and product supply department of Goodyear Inc. e.g. uses KPI´s to control and evaluate the whole supply chain in the in the areas of:
  - Customer focus:
    - Satisfaction;
    - Order fill rate.
  - Human resources:
    - Staffing;
    - Safety;
    - Attendance.
  - Asset management:
    - Inventory investment;
    - Process management;
    - Productivity;
    - Cost (inventory, transport, distribution).

Within the project BE LOGIC − Benchmark Logistics for Co-Modality- (2009b), a collaborative project co-founded by the European Commission in the scope of the 7th Framework Programme for Research and Development, different benchmarking methodologies have been defined and analysed for a number of relevant real cases,

which resulted in a web-based benchmarking tool. The focus is on the analysis of the impact of external environ-ment drivers and supply chain and freight transport trends on the performance of the freight transport system. The latter is expressed in terms of a representative set of Aggregate Performance Indicators (APIs) examined per transport mode or type of terminal and encompassing the following benchmarking areas:

I. Transport chain (e.g., frequency of service, flexibility of service, reliability of service, environmental intensity, energy intensity, operating cost);
II. Terminal (e.g., terminal utilisation and congestion, environmental pollution, energy use, infrastructure charges;
III.Policy (e.g., taxation levels, transport funding).

The most Important KPI areas and indicators have been developed and defined based on literature review and stakeholder consultation in the field of:

- Cost;
- Transport time;
- Flexibility;
- Punctuality;
- Quality;
- Sustainability.

Hutchinson Ports Holding Limited, a worldwide operating investor, developer and operator of ports, internally attempted to produce indicators to compare the performance of its port operations. However, that exercise demonstrated the difficulty in making meaningful comparisons. There are too many factors that influence the performance of a port and many of these factors are outside the control of the port authority and terminal operator. An Important area to evaluate and measure is the issue of customs resp. inspections performance because that determines and affects the performance of the whole supply chain.

Berlin and Pütter (2013) refer to a research project that developed and implemented ecological- oriented strategies and performance measurements for Logistics Service Providers, focused on SME, to be integrated in the whole management strategy. In several case studies strategic environmental objectives have been defined, such as low energy consumption, lower fuel consumption in the fleet, less noise pollution and the use of the latest technologies. Correspondingly, KPI´s were defined as energy consumption per square meter or the fuel consumption of the vehicle fleet per 100 km.

Lately, the "2014 Third-Party Logistics Study" (2014) presented the state of logistics outsourcing and the 3PL market by shedding light into the following areas: i) 3PL usage (e.g., revenues, % and composition of total logistic expenditures, outsourcing, consolidation of 3PL service providers, types of services offered vs. demanded), ii) "big data" needs and systems/tools to accommodate them, iii) preferential sourcing (e.g., preferential trade agreements), iv) required skills for supply chain leaders, and v) shipper-3PL relationships (e.g., 3PL selection criteria, shipper-3PL collaboration).

In addition, a substantial stream of academic literature related to the performance assessment of logistics service providers is available. Liu and Lyons (2011) propose five key elements (dimensions) of operational performance of logistics service providers: cost, quality, flexibility, delivery and innovation. Knemeyer and Murphy (2004) conceptualise 3PL performance as performance of logistics operations (including responsiveness, costs, service availability, adaptability), marketing channel performance (including order cycle time, geographic coverage, after-sales support) and asset reduction. Lai et al (2002; 2004) decompose the performance of transport logistics service providers into customer-facing dimensions such as service effectiveness for shippers and for consignees (which include reliability and

responsiveness of supply chain processes) and operational efficiency in service provision (including the dimensions of costs and asset utilisation).

Fact-Sheets of Logistics Performance Measurement studies on national level

Overview:

1. Top 100 in European Transport and Logistics Services;
2. Study of logistics market in Switzerland;
3. Macro-level logistics in Sweden;
4. Logistic costs and measurement;
5. World Bank - Logistic Performance Index;
6. Logistics Cost and Service Database;
7. Excellence in Logistics;
8. SCI Verkehr Logistikbarometer, Germany;
9. The State of Logistics in the Baltic Sea Region;
10. Finland State of Logistics surveys;
11. Logistic costs in Norway;
12. The state of French logistics (ASLOG);
13. Logistics report UK;
14. Annual state of logistics report USA;
15. Report on Logistics of China.

Fact-Sheets of Logistics Performance Measurement studies on national level

Overview:

1. Top 100 in European Transport and Logistics Services;
2. Study of logistics market in Switzerland;
3. Macro-level logistics in Sweden;
4. Logistic costs and measurement;
5. World Bank - Logistic Performance Index;
6. Logistics Cost and Service Database;
7. Excellence in Logistics;
8. SCI Verkehr Logistikbarometer, Germany;
9. The State of Logistics in the Baltic Sea Region;
10. Finland State of Logistics surveys;
11. Logistic costs in Norway;
12. The state of French logistics (ASLOG);
13. Logistics report UK;
14. Annual state of logistics report USA;
15. Report on Logistics of China.

1	Top 100 in European Transport and Logistics Services
Name	Top 100 in European Transport and Logistics Services
Author	Christian Kille, Martin Schwemmer (Study by Fraunhofer Center for Applied Research on Supply Chain Services SCS)
Year of publication, timeline	2013/2014 (Published yearly)
Type of study	Statistics-based study
Coverage and study area	National level: EU28 plus Norway and Switzerland Sector level: Nine major logistics markets segments

1	Top 100 in European Transport and Logistics Services
	Company level: About 200 profiles of largest logistics service providers
Coverage of key performance areas	Total annual expenditure on logistics services per country and logistic market segments: "Efficiency" of the logistic sector in terms of providing logistic service to low costs (sector and company level) "Effectiveness" in terms of benefits to national economy regarding employment and value-added effects
Approach and methodology	The study measured the total costs of the European business logistics system. This includes all freight transportation, storage, trans-shipment and order picking, all inventory-maintenance expenditure, order processing, planning, management and administration expenditure, covering both in-house and outsourced logistics services. Three partly overlapping methods were applied: 1) extrapolation based on road transport volumes, distances and freight types in different countries; 2) calculation using labour statistics and extrapolation with national economic and value-added data; 3) calculation using data about company and industry revenues spend on logistics activities (Input-Output accounting).
results and level of logistics performance	National level: Per country: macro-economic data, assessment of respective logistic markets, infrastructural aspects and top list (regarding logistic revenues) of national market leading logistic service providers: ▪ Total volume of logistics in Europe in 2012 (EU28+Norway and Switzerland) was estimated at 930 bn € (6,7% of the total GDP): o Market volumes per countries in bn €: Top: Germany (228), France (127), UK (99,2) Down: Malta (0,3), Cyprus (0,7), Slovenia (1,8) Industry level: Share of Logistic costs of different industry clusters: ▪ Top 5 industries on logistics demand sum up for nearly 60% of the total market volume: food, construction, metal working chemical, agriculture; ▪ Share of Logistic costs in relation to the revenues of the industry clusters: Top: Agriculture (7,8%), trading sectors and recycling (6,7%)Living, furniture (5,5%) Down: Public sector, small business without sales tax reporting and service industries (each 0,5%). Sector level: Share of revenues of logistics segments on total logistics revenues: ▪ Top 3 practice-oriented logistics segments: Contract logistics (41%), Warehousing (11%), General Truckload and Ocean Cargo (each 9%). Company level: TOP 100 in Europe and TOP 50 in the world of the largest logistics company regarding logistics revenues: ▪ Top 3 global: DHL Deutsche Post (46,3 bn. €), UPS (41 bn. €), China Railway (40 bn. €); ▪ Top 3 Europe: DHL Deutsche Post (46,3 bn. €), Maersk (29,7 bn. €), DB Mobility Logistics AG (19,9 bn. €).

1	Top 100 in European Transport and Logistics Services
evaluation and assessment of the approach and results	▪ The evaluation approach focuses only on logistics revenues and costs of the logistics sector; ▪ Robust approach: validation of results with three independent estimation methods; ▪ Wide range from national to sector and company level; ▪ More details on national level available in addition to costs, such as level of outsourcing, and some other; ▪ Focus is given to the supply side of the logistics sector. Lack of performance measurement regarding consumer, costumer and policy point of view; ▪ The limitation of performance measurement of logistic revenues and costs is poor and not enough to evaluate the logistic in an adequate way. Main key performance areas, e.g. reliability, responsiveness and environmental sustainability, are not addressed.

2	Logistikmarktstudie Schweiz
Name	Study of the logistics sector in Switzerland (Logistikmarktstudie Schweiz)
Author	Prof. Dr. Wolfgang Stölzle, Prof. Dr. Erik Hofmann, Dipl.-Wi.-Ing. Kerstin Lampe (Study of the University of St. Gallen- Institute of logistics)
Year of publication, timeline	2014 (Published yearly)
Type of study	Statistics-based study
Coverage and study area	National level: Switzerland Sector level: Nine major logistics markets segments Company level: Top 20 list of largest logistics service providers in Switzerland
Coverage of key performance areas	"Efficiency" of the logistic sector in terms of providing logistic service to low costs (sector and company level) "Effectiveness" in terms of benefits to national economy regarding employment and value-added effects
Approach and Methodology	The study measured the total cost of the logistics sector in Switzerland. Four main cost components are identified: transportation, handling, warehousing and other logistics costs. In-house production logistic costs are not taken into account. The approach is mainly based on cross-sectional data and has no dynamic information. Data is partly based on an analysis of existing statistics by public institutions such as the Federal Statistical Office (FSO) and the Federal Customs Administration (FCA). In addition, several interviews with companies, shippers and logistics service providers have been carried out. Three independent methods: 1) extrapolation of freight transport volumes; 2) calculation using labour statistics; 3) calculation using company and industry revenues data.
results and level of logistics performance	Total volume of logistics in Switzerland in 2012: 38 bn. € (6,4% of the total GDP) Sector level: Share of revenues of logistics segments on total logistics revenues: ▪ Top 3 logistics segments: Less-Than-Truckload logistics (41%), General Truckload (19%), Contract Logistics (17%). Company level: Top of the largest logistics company regarding

2	Logistikmarktstudie Schweiz
	logistics revenues in Switzerland: ▪ Top 3: PostMail AG, PostLogistics AG, SBB Cargo AG.
evaluation and assessment of the approach and results	▪ The evaluation approach focuses only on logistics revenues and costs of the logistics sector; ▪ Robust approach: validation of results with three independent estimation methods; ▪ Wide range from national to sector and company level; ▪ Focus is given to the supply side of the logistics sector. Lack of performance measurement regarding consumer, costumer and policy point of view; ▪ The limitation of performance measurement of logistic revenues and costs is poor and not enough to evaluate the logistic in an adequate way. Main key performance areas, e.g. reliability, responsiveness and environmental sustainability, are not addressed.

3	Macro level logistics in Sweden
Name	Macro level logistics in Sweden (Svensk Makroslogistik 1997-2005)
Author	THOMAS ELGER, KARL-JOHAN LUNDQUIST & LARS-OLOF OLANDER - LUNDS UNIVERSITET
Year of publication, timeline	Published 2008
Type of study	Statistics-based study
Coverage and study area	National level: Sweden
Coverage of key performance areas	Measuring logistics costs on national level "Efficiency" of the logistic sector in terms of providing logistic service to low costs (sector and company level) "Effectiveness" in terms of benefits to national economy regarding employment and value-added effects
Approach and Methodology	The objective of this study was to create a tool for measuring macro-level logistics. Data analysis was based on national statistics. The study focused on gathering an overview of logistics costs in industry on national level between 1997and 2005. The reviewed cost components are grouped in three (four) categories: ▪ direct transportation cost: comprise all costs that are occurred due to the transportation of goods (In-house and outsourced); ▪ inventory carrying costs: include interest of 25 per cent of the inventory value combined with warehousing costs, meaning the costs of warehousing premises and other costs related to them: ○ warehousing costs: comprises all costs relating to the warehousing premises. ▪ administration: comprise personnel and other overhead costs related to logistics activities.
results and level of logistics performance	The absolute cost of logistics in 2005 were EUR 25,7 bn (about 10% of total GDP), of which inventory-carrying costs accounted for the major share (46%; with 3% direct warehousing costs), followed by transportation costs (37%). Transportation costs increased most between the years 1997 and 2005 (from 26% in 1997 to 37% in 2005). Whereas the inventory carrying costs

3	Macro level logistics in Sweden
	decreased most (59% in 1997 to 46% in 2005), when administration costs remained stable (about 18%).
evaluation and assessment of the approach and results	▪ The evaluation approach focuses only on logistics revenues and costs of the logistics sector; ▪ Focus is given to the supply side of the logistics sector. Lack of performance measurement regarding consumer, costumer and policy point of view; ▪ The limitation of performance measurement of logistic revenues and costs is poor and not enough to evaluate the logistic in an adequate way. Main key performance areas, e.g. reliability, responsiveness and environmental sustainability, are not addressed.

4	Logistics costs and competitiveness: measurement and trade policy application
Name	Logistics costs and competitiveness: measurement and trade policy application
Author	Ben Shepherd; in cooperation with the World Bank
Year of publication, timeline	Published 2011 (various base years: between 2002 and 2009)
Type of study	Case and other studies
Coverage and study area	National level: OECD countries Sector level: industry sectors
Coverage of key performance areas	Comparisons of logistics costs on national level (OECD countries) Identification of logistic –intensive sectors Efficiency" of the logistic sector in terms of providing logistic service to low costs (sector and company level) "Effectiveness" in terms of benefits to national economy regarding employment and value-added effects
Approach and Methodology	The study examines the issue of measuring logistics costs on national level, as well as identifying logistics-intensive sectors. It focuses on currently available data at the macro- and firm-levels. The following data sources have been used: ▪ national accounts; ▪ national input-output tables; ▪ the International Comparison Project; ▪ firm-level data; ▪ production and trade data. The paper gives cross-country comparisons concerning logistics costs relative to GDP and analyse the correlation towards the ranking of logistic performance relating to the World Bank´s Logistic performance Index measurement (LPI). Finally, the study uses input-output data to identify logistics-intensive sectors.
results and level of logistics performance	The results of the study focus on preliminary empirical analysis and recommendations for future measurement efforts. He main findings in that can be summarized as followed: 1.) The study finds that there is little systematic evidence of a link between the size of the logistics sector and economic outcomes, such as trade openness; 2) The relationship between the size of the logistics sector and logistics performance is non-monotonic;

4	Logistics costs and competitiveness: measurement and trade policy application
	3) Third, the size of the logistics sector only increases in per capita income up to a certain point, before the relationship turns negative; 4) Direct indicators of price and performance are more clearly related to economic outcomes, and have a more straightforward relation with per capita income; 5) By using input-output data to identify logistics-intensive sectors, it can be shown that improvements in logistics performance could lead to sectorial reallocations in favour of relatively heavy industries in developing countries, which is consistent with the goal of export diversification.
evaluation and assessment of the approach and results	▪ This study is one of the most recent scientific cross-country studies in this field. It examines the issue of measuring logistics costs from an applied trade policy research perspective; ▪ Therefore recommendations and findings of the paper do not only focus on logistics revenues and costs of the logistic sector; ▪ It emphasize that that measures of sectorial size, such as logistics costs relative to GDP, may be of limited use to researchers and policymakers due to the lack of unique and complete the interpretation in terms of performance or economic outcomes of logistics. Main key performance areas, e.g. reliability, responsiveness and environmental sustainability, are not addressed; ▪ The problem of availability and quality of current data have been analysed especially in terms of clear sectorial definition; ▪ In addition the study recommends focusing on compiling data that capture logistics performance most accurately, rather than sector size.

5	The Logistics Performance Index and Its Indicators
Name	Connecting to compete 2012- Trade logistics in the global economy. The Logistics Performance Index and Its Indicators
Author	Arvis, J-F - Mustra, M. A. – Ojala, L. - Shepherd, B. - Saslavsky, D
Year of publication, timeline	2012 (published every 2 years since 2007/2008)
Type of study	Questionnaire-based survey
Coverage and study area	National level: cross-country comparisons between 155 countries
Coverage of key performance areas	Comparisons of trade logistic profiles of 155 countries: "Reliability" in terms of shipment delivery "Efficiency" in terms of providing logistic service to low costs (sector and company level) "Effectiveness" in terms of benefits to national economy regarding employment and value-added effects "Quality" in terms of Infrastructure and logistics competence and logistics services "Responsiveness" in terms of providing and sharing information within the supply chain.

5	The Logistics Performance Index and Its Indicators
Approach and Methodology	A multidimensional assessment of logistics performance, the LPI compares the trade logistics profiles of 155 countries and rates them on a scale of 1 (worst) to 5 (best). The ratings are based on 6,000 individual country assessments by nearly 1,000 international freight forwarders, who rated the eight foreign countries their company serves most frequently. The LPI's six components include: ▪ Efficiency of the clearance process (speed, simplicity, and predictability of formalities) by border control agencies, including customs; ▪ Quality of trade and transport-related infrastructure (ports, railroads, roads, information technology); ▪ Ease of arranging competitively priced shipments; ▪ Logistics competence and quality of logistics services (transport operators, customs brokers); ▪ Ability to track and trace consignments; ▪ Timeliness of shipment delivery (the frequency with which shipments reach the consignee within the scheduled or expected delivery time). The components were chosen based on recent theoretical and empirical research and on the practical experience of logistics professionals involved in international freight forwarding. The study also includes a set of domestic performance indicators for 143 countries. For these data, survey respondents assess the logistics environments in the countries where they work, providing information on the quality of infrastructure, the performance of core services, the friendliness of trade clearance procedures, and the time, cost, and reliability of import and export supply chains. These domestic indicators help define logistics constraints within countries, not just at the gateways, such as ports or borders. They analyse the major determinants of overall logistics performance, focusing on country performance in the major determinants of overall logistics performance: infrastructure, services, border procedures and time, and supply chain reliability. The LPI uses standard statistical techniques to aggregate the data into a single indicator. This single indicator can be used to compare countries, regions, and income groups.
results and level of logistics performance	Key findings of the 2012 LPI: Cross-country ranking: ▪ High-income countries dominate the top 10- most are well-established key logistics players with an important role in global or regional supply chains (Singapore, Hong Kong, Finland, Germany Netherlands); ▪ The bottom 10 are all low-income countries, and 8 are in Africa (Burundi, Djibouti, Haiti, Chd, Nepal); ▪ On average, LPI scores remain much higher for high-income countries than for poorer ones. High-income countries outperform; ▪ But income alone cannot explain why performance varies widely among countries in certain income groups, particularly in the low- and middle-income groups. Against others in their income group, the most over performing non-high-income countries are Vietnam, India, China, and South Africa. The most underperforming no high-income countries are Djibouti,

5	The Logistics Performance Index and Its Indicators
	Republic of Congo, Iraq, Angola, Cuba, Montenegro, Libya, etc.; ▪ High performers remain strong, while developing countries are slowly catching up. Yet the gap between the highest performing countries and the lowest performing countries is still wide. Domestic. ▪ Infrastructure: o Rating in top ranking is far more higher than those in lower ranking countries; o Respondents are most satisfied with ICT infrastructure; o By contrast, rail infrastructure inspires general dissatisfaction o Satisfaction with road infrastructure is especially low in South Asia and the Middle East and North Africa. Satisfaction with rail infrastructure is higher in the Middle East and North Africa and Europe and Central Asia than elsewhere, though it is still lower than for other infrastructure types. ▪ Service: o Rail transport service provision, like rail infrastructure, consistently receives low ratings. And as with infrastructure, countries in the top quintile receive by far the highest ratings for service provider quality and competence; o Both rail infrastructure and services receive low ratings, even in the top LPI quintile, consistent with Europe's long-term shift from rail freight to trucking. ▪ Border procedures and time: o The median import lead time for port and airport supply chains is more than 3.5 times longer and the export lead time even 4 times in low-performing countries than in high performing countries. ▪ Delays, reliability and service quality: o In the bottom LPI performer, 60% of respondents report that shipments are often or nearly always delayed by compulsory warehousing or pre-shipment inspection; o The lack of reliability and unpredictable delays do more damage than the average costs and time.
evaluation and assessment of the approach and results	▪ Broad view on logistic performance; ▪ Wide coverage of countries, and key performance areas; ▪ Possibility to analyse development due to timeline; ▪ Results are specially hints where lower performing countries should improve their performance; ▪ Recommendations for policy makers mainly based on stakeholder assessment; ▪ Lack of environmental sustainability indicators and direct costs comparisons.

6	Establish/Davis Logistics costs and service Database
Name	Establish/ Davis Logistics costs and service Database
Author	Management Consulting Company Establish Inc.
Year of publication, timeline	2013 (Yearly published since 1975)
Type of study	Questionnaire-based survey
Coverage and study area	Company level: Mainly based in US
Coverage of key performance areas	Company level: Comparison and measurement of cost levels and service performance of companies against industry profiles: "Efficiency" of the logistics in terms of minimizing share of logistics costs on total revenues (company level) "Quality" of service in terms of lead time and order fulfilment on company level
Approach and Methodology	The Database was established in 1975 to provide a means for companies to compare performance to a peer group. It is an on-going web-survey and compares measures cost levels, service performance of companies against industry profiles. By participating in the questionnaire, companies have access to the Database and receive reports. The Database reports costs as a percentage of sales, broken down on five levels ▪ Transportation; ▪ Warehousing; ▪ Order Processing; ▪ Administration; ▪ Inventory carrying. Respondents are asked to give the costs for primary and secondary transportation separately. Inventory-carrying costs are calculated by multiplying the average inventory of the previous fiscal year by 0.18. The cost comparison consists of company's costs, expressed as a percentage of sales or cost per hundredweight shipped, compared to the average and quartiles of a group of similar companies. The criteria for selecting the comparison groups are Industry and Product Value, Volume (weight shipped) and Sales Revenues. The service comparisons consist of company´s lead time and fill rates compared to the average of a group of similar companies.
results and level of logistics performance	Total logistics costs of the average company in 2013 were 8,41% of sales and increased Logistics costs increased from 2012 to 2013 (7,87% in 2012) by 6,9%. Overall logistics costs are on an upward trend. Companies with higher product values continue to have lower logistics costs. Smaller companies continue to have higher logistics costs. Top share on total logistic spend is "Transportation" (44%), Inventory carrying (25%) and Warehousing (24%) on total logistic spend. Service performance levels have remained about the same for several years.

6	Establish/Davis Logistics costs and service Database
evaluation and assessment of the approach and results	▪ Limited view on logistic performance. Main key performance areas, e.g. reliability, responsiveness and environmental sustainability, are not addressed; ▪ Focus on cost comparisons for shippers; ▪ Only cost comparisons as relative share on total sales, not absolutely; ▪ Collecting data via an open web-based questionnaire may initially seem to be an unreliable method, but the questionnaire form is well structured, and the logistics cost components in particular are well defined and comprehensively; ▪ However, even if the coverage of the survey is theoretically global, most respondents are located in developed countries, mainly the United States.

7	Excellence in Logistics
Name	Excellence in Logistics
Author	European Logistics Association (ELA) / A.T. Kearney - Consulting
Year of publication, timeline	2009 (published every 5 years)
Type of study	Questionnaire-based study
Coverage and study area	Company level: among others mainly consumer goods, automotive, chemical and telecommunication industries in 18 countries
Coverage of key performance areas	"Efficiency" of the logistics in terms of minimizing share of logistics costs on total revenues (company level)
Approach and Methodology	From the year 1882 European Logistics Association (ELA) and A.T. Kearney published every 5 years the study "Excellence in Logistics", focused each time on different topics The latest one in 2009 focuses primarily on benchmarking logistics costs and service level of 150 companies from different industries (among others mainly consumer goods, automotive, chemical and telecommunication industries) in 18 countries. The study analysis logistic costs of five categories: ▪ Administration; ▪ Inventory carrying; ▪ Warehousing; ▪ Transportation; ▪ Transportation packaging.
results and level of logistics performance	According to the study logistics costs have significantly increased by 20% between 2003 and 2008 (from 6,1% of sales to 7,3% of sales). There is an equal distribution of the decreasing trend between all cost categories. The transport costs increased within this time period by 35% due to the ongoing globalisation trend and the increasing transportation distances.

7	Excellence in Logistics
evaluation and assessment of the approach and results	▪ Limited view on logistic performance, narrow view focus on logistic costs. Main key performance areas, e.g. reliability, responsiveness and environmental sustainability, are not addressed; ▪ Focus on benchmarking logistics cost of shippers; ▪ Mainly large multi-national companies are involved; ▪ Only cost comparisons as relative share on total sales, not absolutely.

8	SCI/Logistikbarometer
Name	SCI/Logistikbaraometer
Author	SCI Verkehr GmbH Germany
Year of publication, timeline	Since 2005 published monthly
Type of study	Questionnaire-based study
Coverage and study area	Company level: about 200 logistics companies (3PL) mainly in Germany
Coverage of key performance areas	"Efficiency" of the logistics in terms of minimizing share of logistics costs on total revenues (company level)
Approach and Methodology	The SCI/LOGISTIK BAROMETER is an indicator for the economic trend in the transport and logistics sectors. Since 2005, SCI Verkehr has continuously been observing prices and capacities as well as the latest trends and developments. More than 200 of the sector's decision-makers are interviewed every month. The results are analysed using the Ifo Business Climate Index approach. In addition and beside short-term economic expectation, the objective is to expose long-term growth determined trends.
results and level of logistics performance	Main key findings for the beginning of 2014: ▪ In the beginning of 2014 the business climate Index reaches the most positive level since June 20011; ▪ Three of four companies are expecting a positive increase of the business climate; ▪ Despite this the costs are increasing; ▪ Price adjustments are mainly missing and this is a main topic; ▪ No decreasing of price level will be expected in the coming months; ▪ In 2014 more companies are intend to increase their investments; ▪ Most of the companies have been satisfied with business in 2013; ▪ Despite this the decreasing prices are seen as the most biggest problem in 2013.
evaluation and assessment of the approach and results	▪ Limited view on logistic performance. Main key performance areas, e.g. reliability, responsiveness and environmental sustainability, are not addressed; ▪ Focus on short-term economic expectation; ▪ The Index does not directly identify the different elements or disclose the figures but it shows current trends; ▪ Respondent Companies are mainly based in Germany.

9	State of Logistics in the Baltic Sea Region
Name	State of Logistics in the Baltic Sea Region
Author	Lauri Ojala, Tomi Solakivi, HanneMari Hälinen, Harri Lorentz, Torsten M. Hoffmann
Year of publication, timeline	2007 (singular study)
Type of study	Questionnaire-based study
Coverage and study area	Company level: 1.230 companies from manufacturing, trading and logistics industries
Coverage of key performance areas	"Efficiency" of the logistics in terms of minimizing share of logistics costs on total revenues (company level) "Effectiveness" in terms of benefits to national economy regarding employment and value-added effects "Quality" in terms of logistics competence and logistics services
Approach and Methodology	The State of Logistics in the Baltic Sea Region survey was part of the LogOn Baltic project, which was an initiative funded by the European Regional Development Fund. The study was conducted across 9 regions in 8 countries (Lithuania, Finland, Latvia, Germany, Estonia, Denmark, Russia, Sweden). Data was received between 2006 and 2007 from over 1.230 respondents in manufacturing, trading and logistics firms by a web-based survey (mostly). The survey focused on the following logistics issues: ▪ Costs (broken down into transportation, warehousing, inventory carrying, administration and all other logistics-related costs); ▪ development and competence needs; ▪ outsourcing; ▪ the operating environment; ▪ firms' self-assessment regarding the level of their logistics operations.
results and level of logistics performance	Key findings: ▪ Logistic costs: Total costs varied from 16% to 11% of turnover. Large firms have lower total logistics costs in relation to turnover than smaller ones. Logistics costs differ between manufacturing and trading firms, but transport and inventory carrying costs are the largest individual cost components. Absolute logistics costs, especially those of transport, were expected to increase in all regions, especially in the EU's New Member States. ▪ Development and competence needs: The level of competence development required in a region correlates to some extent with GDP. In manufacturing and trading the most important development areas are IT systems, customer service, and logistics costs. For these firms, procurement is a future priority for personnel competence development. For logistics service providers, developing service capacity and service quality are the most important development needs for firms as a whole. Transport management is a priority for personnel competence development; ▪ Logistics outsourcing issues: Outsourcing is moving towards broader, more complex, and customised service solutions. Activities such as transport have been outsourced to a higher degree in regions with higher GDP per capita and more mature industries. The amount of more complex logistics outsourcing is low in all the regions,

9	State of Logistics in the Baltic Sea Region
	although there is variation in terms of future priorities. ▪ An assessment of the operational environment: Most of the firms studied regarded their overall operational environment as good. However, their satisfaction was markedly lower when asked to compare their location to that of their competitors. ▪ Firms' selfassessment regarding logistics: The level of external and internal (operational) cooperation between firms in the supply chain seems to be more advanced in countries that have a more mature market (such as in Germany and Sweden). In Poland, Estonia and Latvia, there is considerable scope for improvement in operational logistics, both internally in firms as well as in their operations with suppliers, service providers and customers.
evaluation and assessment of the approach and results	▪ Broader view on logistic performance but main key performance areas are missing, e.g. reliability and sustainability; ▪ Mix between manufacturing, trading and logistics company; ▪ Data from the Baltic Sea region is mainly from small and medium sized and micro firms and not from the largest corporations. Therefor the results are not compatible to other studies.

10	Finland State of Logistics surveys
Name	Finland State of Logistics in 2012
Author	Tomi Solakivi, Lauri Ojala, Harri Lorentz, Sini Laari, Juuso Töyli
Year of publication, timeline	2012 (series of surveys 1993, 1997, 2001, 2006, 2009)
Type of study	Questionnaire-based study
Coverage and study area	Company level: 2.732 companies in Finland (32 % manufacturing and construction, 28 % trade, 25 % logistics service providers, 5 % consultants and 10 % teaching)
Coverage of key performance areas	"Reliability" in terms of shipment delivery "Efficiency" in terms of providing logistic service to low costs (national and company level) "Effectiveness" in terms of benefits to national economy regarding employment and value-added effects "Quality" in terms logistics preconditions
Approach and Methodology	This Survey 2012 is commissioned by Ministry of Transport and Communications Finland, and it is a continuation of similar surveys published in 1993, 1997, 2001, 2006 and 2009/2010 The level of logistics in Finnish manufacturing, wholesale and retail and logistics firms is assessed through logistics costs, key performance, indicators (KPI), logistics outsourcing and the operational preconditions in the location of Finnish manufacturing, trading and logistics companies. A total of 2.732 respondents answered the questionnaire (32 % manufacturing and construction, 28 % trade, 25 % logistics service providers, 5 % consultants and 10 % teaching).

10	Finland State of Logistics surveys
results and level of logistics performance	Key findings: ▪ The effect of logistics on the competitiveness is one of the current key themes of the report. Logistics is considered to have a great effect to the competitiveness of the company. Large trading companies report that in average as much as 43 % of the company competitiveness originates from logistics. In addition, some 40-50 % of company competiveness can be affected by company´s own actions and decisions; ▪ Logistics costs of Finnish manufacturing and trading firms are on average 12,1 % of sales (11,9 % in 2009), including costs incurred in overseas subsidiaries. The share of transportation costs (at 4.6 %) has slightly increased, which is mainly due the significant decline in transport costs; ▪ The industry weighted logistics costs in 2011 were € 33,1 billion in 2011 (€ 34,7 billion in 2009), of which over half was in-house costs. Without overseas subsidiaries, total logistics costs of Finnish firms equaled 8,6 % of GDP in 2011 (10.2 % in 2009). The decline is mainly caused by the diminishing share of manufacturing in the Finnish GDP; ▪ Low Cost Countries appear to be an attractive option for the sourcing and manufacturing activities of Finnish companies. 55 % of companies answering the question plan to expand their manufacturing in Low Cost Countries. The corresponding number for firms expanding their domestic manufacturing was 37 %; ▪ Logistics KPI:s (delivery accuracy and days of sales and days of payables outstanding of Finnish firms) seem to be on a good level. The largest change from 2009 is the shorter cash to cash –cycle times of trading firms; ▪ Finland ranked third in World Bank's Logistics Performance Index (LPI) in 2012; ▪ The companies in South Finland seem to be most satisfied with their logistics preconditions. The second most satisfied are the companies in West Finland, and the third most satisfied in North Finland. The least satisfied companies are located in East Finland.
evaluation and assessment of the approach and results	▪ Broader view on logistic performance but mainly consideration on sustainable aspects of logistics are missing; ▪ Mix between manufacturing, trading and logistics company; ▪ The data reported in 2006, 2009, 2010 and 2012 comprises the largest national logistics survey database in the worlds.

11	Logistics costs in Norway
Name	Logistics costs in Norway
Author	Inger Beate Hovi and Wiljar Hansen (TOI- Institute of Transport Economics Oslo)
Year of publication, timeline	2010 (singular study)
Type of study	Questionnaire-based study
Coverage and study area	Company level: 540 companies in from manufacturing, wholesale, and building and construction industries.
Coverage of key performance areas	Quantification of logistics costs in Norway: "Efficiency" in terms of providing logistic service to low costs (sector and company level) "Effectiveness" in terms of benefits to national economy regarding employment and value-added effects.

11	Logistics costs in Norway
Approach and Methodology	The main focus of the survey is to quantify the cost of logistics for 2007 by cost component, industry and region in Norwegian manufacturing and wholesaling industries. The results from the survey enable to compare the cost of logistics in Norway with similar international studies. The survey was conducted in 2008. A web-based questionnaire was chosen as the preferred survey tool. The database of information on the cost of logistics contains 540 companies from manufacturing, wholesale, and building and construction industries. In the survey the cost of logistics is defined to include the following cost components: ▪ Transportation, including inbound, outbound and internal transport; ▪ Warehousing; ▪ Capital tied up in transportation and warehousing; ▪ Packaging; ▪ Insurance; ▪ Obsoleteness and wastage; ▪ Logistics administration.
results and level of logistics performance	Key findings: ▪ The survey shows logistics costs that on average constitute 14,2 % of the turnover; ▪ The cost share is 16,7 % of turnover for the wholesalers and 13,7 % of turnover for the manufacturing industries; ▪ The building and construction industry have the lowest logistics cost share in the survey; ▪ The estimated cost of logistics as a percentage of turnover among Norwegian manufacturing and wholesale industries is in line with results from similar studies in other countries; ▪ The total cost of logistics for Norway is calculated at approximately NOK 254 billion in 2007. This corresponds to 14,7 % of the Norwegian mainland GDP.
evaluation and assessment of the approach and results	▪ Limited view on logistic performance, narrow view focus on logistic costs. Performance measurement of main key performance areas, e.g. reliability, quality, sustainability is missing; ▪ Focus on benchmarking logistics cost of shippers; ▪ Mainly large multi-national companies are involved; ▪ Only cost comparisons as relative share on total sales, not absolutely.

12	The state of French logistics (ASLOG)
Name	L'etat de l'art de la Logistique Française 2010
Author	French National Logistics Association (ASLOG)
Year of publication, timeline	2010 (series of survey)
Type of study	Questionnaire-based study
Coverage and study area	National / Company level: 346 French companies (20% mobility sector (automotive, rail, etc.), trade sectors (14%), food (14%), construction (12%), consumer products (6%), and various other sectors (26%))
Coverage of key performance areas	"Reliability" in terms of production and supplier service "Efficiency" in terms of providing logistic service to low costs (sector and company level) "Effectiveness" in terms of benefits to national economy regarding employment and value-added effects

12	The state of French logistics (ASLOG)
	"Quality" in terms of logistics service
Approach and Methodology	The national French logistics association (ASLOG) published the latest (4th) French logistics survey in 2010. The data is based on interviews (online and paper interviews) in 346 French companies (mainly large companies). The objective of the study is to assess the state of logistics in France in comparison with other countries mainly in terms logistics costs. The main fields of investigation are: ▪ Reliability of Customer service; ▪ Customer complaint rate; ▪ Reliability of Production service; ▪ Reliability Suppliers service; ▪ Reliability of purchase; ▪ Outsourcing; ▪ logistics costs (broken down into transportation, warehousing/inventory carrying, administration); ▪ Turnover of stocks. In addition to the previous surveys, qualitative assessment of Risk management (safety and security) and sustainability transport aspects.
results and level of logistics performance	Key findings: ▪ The rate of customer complaints is on a low level (3,3%) and decreasing from 9.7% in 2005; ▪ The level of outsourcing: o Warehousing and inventory: 40%; o Transport 85%; o Packaging 51%. ▪ The total logistics costs share is 11,9% of turnover: o transport costs account for more than half of total costs (54%) of net sales; o warehousing/inventory carrying: 26%; o administrative costs 20%.
evaluation and assessment of the approach and results	▪ Broader view on logistic performance but mainly consideration on sustainable aspects of logistics are only touched; ▪ Qualitative assessment of Risk management (safety and security) are given; ▪ Focus on benchmarking logistics costs of shippers; ▪ Mainly large multi-national companies are involved; ▪ Only cost comparisons as relative share on total sales, not absolutely are given.

13	Logistic Report UK
Name	Logistic Report UK 2013
Author	Published by the Freight Transport Association (FTA) United Kingdom in cooperation with PwC
Year of publication, timeline	2013 (publisher yearly)
Type of study	Other study (different sources)
Coverage and study area	National Level: UK (mainly road transport Sector)
Coverage of key performance areas	"Efficiency" in terms of providing logistic service to low costs (sector and company level) "Effectiveness" in terms of benefits to national economy regarding employment and value-added effects

13	Logistic Report UK
	"Quality" in terms of safe transport (accidents)
Approach and Methodology	The Logistics Report 2013 UK was published by the Freight Transport Association (FTA) United Kingdom. The report employs data acquired from several different sources: ▪ the latest annual FTA Logistics Industry Survey 2012/13; ▪ a selection of data and survey results from PwC including the 16th Global CEO Survey 2013; ▪ the summaries of a series of roundtable discussions led by PwC; ▪ the FTA Quarterly Transport Activity Surveys (QTAS); ▪ FTA Manager's Guide to Distribution Costs; ▪ official statistical publications. The aim is to identify key trends for the future, as well as assess their potential impact on logistics in the UK. The main results shows a range of over 50 indicators that give different perspectives on logistics and the performance of the wider economy. The key considerate areas mainly for road transport industry are: ▪ Safety; ▪ Efficiency; ▪ Transport data; ▪ Economy.
results and level of logistics performance	Key findings: ▪ Goods vehicle operator licences are down 15 per cent in 2011, compared to pre-recession levels (2007); ▪ New van registrations peaked in 2007 but since then have fallen, a reduction of 29 per cent by 2012. New hgv registrations dropped by 10 per cent over the same period, but recovered slightly in 2012, increasing by 6 per cent on 2011; ▪ Road transport operator profit margins fell to around 1 per cent in 2012 ▪ The price of oil has hovered around $100 per barrel (bbl) for the past two years, resulting in little change to the high pump price for a litre of fuel; ▪ Unaccompanied trailer movements falling in 2012 by 6 per cent compared to 2011; ▪ Reduction in port and air freight traffic in 2012 compared to 2011; ▪ Domestic intermodal rail has continued to increase, reaching 6.4 billion tonne kilometres in 2012, as more operators explore different modes to transport goods; ▪ In terms of compliance, better targeting by enforcement agencies led to an increase in detection of incidences of overloading, drivers' hours and roadworthiness prohibitions; ▪ Safety continues to improve with workplace accidents and road casualties linked to hgvs down in 2012 compared to 2011.

13	Logistic Report UK
evaluation and assessment of the approach and results	▪ Limited view on logistic performance, narrow view focus on road transport industry; ▪ Performance measurement of main key performance areas, e.g. reliability, quality, sustainability is missing; ▪ Focus on providing overview of road transport sector and road transport data; ▪ Study approach become not clear and transparent.

14	CSCMP´s Annual State of Logistics Report (USA)
Name	24th Annual State of Logistics report
Author	Rosalyn Wilson (Penske Logistics), Published by the Council of Supply Chain Management Professionals (CSCMP) USA
Year of publication, timeline	2013 (published yearly)
Type of study	Other studies (modelling based study)
Coverage and study area	National level (US companies)
Coverage of key performance areas	"Efficiency" in terms of providing logistic service to low costs (national and sector level) "Effectiveness" in terms of benefits to national economy regarding employment and value-added effects
Approach and Methodology	The Council of Supply Chain Management Professionals (CSCMP) USA publishes the Annual State of Logistics Report, which defines the current state of business logistics costs and the outlook for business logistics in the United States. The study uses the same approach from year to year, making the results comparable. The model and study approach is not opened and explained. The study presents mainly logistics costs in four main components: ▪ inventory carrying (all costs for holding goods in storage); ▪ transportation (charge of transporting goods); ▪ logistics administration (indirect management, supporting staff and IT-expenses); ▪ Shipper related costs (top level costs).
results and level of logistics performance	Key findings for 2012: ▪ U.S. logistics costs reached $1,33 trillion, a 3,4% gain from 2011 levels; ▪ Logistics costs as a percentage of GDP: 8,5 %, the same as in 2011; ▪ Inventory carrying costs rose 4%; ▪ Warehousing costs increased by 7,6%; ▪ Trucking costs (rates paid by users) increased by 2,9%; ▪ Truck tonnage increased 2.3% over 2011 levels; ▪ The report predicted that the shortage of qualified drivers, now believed to stand at about 30,000, could swell to nearly four times that by 2016. Only about 17% of the current driver population is under 35, according to the report; ▪ Rail transport costs decreased 4,9%, from an increase of more than 16% in 2011; ▪ Ocean costs fell by 0,9% last year as vessel capacity rose 7,2%.

14	CSCMP´s Annual State of Logistics Report (USA)
evaluation and assessment of the approach and results	▪ No transparency in study approach; ▪ Limited view on logistic performance, narrow view focus on logistic costs; ▪ Performance measurement of main key performance areas, e.g. reliability, quality, sustainability is missing; ▪ Reader friendly form; ▪ Quick outlook to current situation in US logistics industry are given.

15	Report on Logistics (China)
Name	The 2010 National Statistical Survey Report on Logistics of Key Enterprises
Author	National Development and Reform Commission (NDRC), National Bureau of Statistics (NBS) and China Federation of Logistics and Purchasing (CFLP)
Year of publication, timeline	2011 (published yearly)
Type of study	Statistics-based study
Coverage and study area	National level
Coverage of key performance areas	"Efficiency" in terms of providing logistic service to low costs (national and sector level) "Effectiveness" in terms of benefits to national economy regarding employment and value-added effects "Quality" in terms of infrastructure
Approach and Methodology	The China Federation of Logistics and Purchasing publishes the figures for China's logistics industry on a yearly basis based on data from the National Bureau of Statistics. The latest available figures give the situation in 2010. The main areas of consideration are: ▪ Market size; ▪ Logistics efficiency; ▪ Outsourcing of logistics functions; ▪ Development of transport infrastructure; ▪ Performance of logistics enterprises.
results and level of logistics performance	Key findings for 2010: ▪ The value-added was 2.700 billion yuan in 2010, up by 16,7% from 2009; ▪ The ratio of total logistics cost to GDP decreased from 18,3 % in 2006 to 17,8% in 2010 (twice the ratios observed in most developed countries (e.g. USA: 7,7% in 2010)); ▪ Logistics demand coefficient (It refers to the logistics value-to-GDP ratio) in 2010 was 3,2, up from 2,8 in 2009; ▪ Total logistics costs increased also by 16,7 % to 7,1 trillion Yuan (EUR 805 bn.); ▪ Transportation (3,8 trillion Yuan) accounted for 54 % of the total costs, followed by storage costs of 2,4 trillion Yuan (33,9 % of the total). The last component, management costs (0,9 trillion Yuan), accounted for 12,1 % of the total.

evaluation and assessment of the approach and results	▪ No transparency in study approach; ▪ Limited view on logistic performance, narrow view focus on logistic costs and efficiency; ▪ Performance measurement of main key performance areas, e.g. reliability, sustainability is missing.

Fact Sheets

Sample of Good Practice for Key performance Indicators (KPI)

1	**Logistics process efficiency**
KPA	Efficiency
KPI Name	Logistics process efficiency
Level	national
Description	The indicator shows the logistics intensity as the percentage ratio of logistics costs (inputs) as share of total production cost.
Objective	The indicator intends to show how efficient the "production" of logistics services in terms of costs in comparison to the overall production costs is. The measurement of logistics intensity can be used for inter-country comparison as well as for comparisons over time.
Measurement	percentage ratio of logistics costs (inputs) as share of total production cost: $LPE = \frac{Logistics\_costs_{country}}{Total\_production\_costs_{country}}$
Remarks	Basic statistical data is currently not available for all countries. Structural business statistics from EUROSTAT could probably be complemented by data to calculate logistics costs on business level.
Reference study, source	SEALS; TOP100; Logistics costs and competitiveness; Excellence in Logistics

2	Capacity utilisation
KPA	Efficiency
KPI Name	Capacity utilisation
Level	national /company
Description	This indicator shows how much capacity is used. On national level it refers mainly to transport vehicle utilisation, cargo handling efficiency and Infrastructure utilisation. From the viewpoint of service provider capacity utilisation refers mainly to operational performance dimensions, such as warehouses and other cargo handling facilities, and vehicles.
Objective	Capacity utilisation intends to quantify the extent to which the available resources are used.
Measurement	The indicator can be measured in terms of: ▪ Vehicle utilisation: vehicle load factors, share of empty runs per vehicle mode; ▪ Cargo handling and infrastructure efficiency: share of throughput relative to the total capacity of terminals and transhipment points.
Remarks	Basic statistical data currently not available. Derivation of indicator possible under assumptions with statistical data and special surveys.
Reference study, source	World Bank LPI, SEALS, Promit; BeLogic

3	Clearance processes
KPA	Efficiency
KPI Name	Clearance processes
Level	national /company
Description	This indicator intends to benchmark the efficiency of the clearance processes by border control agencies, including customs. This important trade facilitation dimension related mainly on national level.
Objective	The efficiency of international logistics processes is strongly related to the clearance processes by border control agencies, including customs. Complex and inefficient customs clearance processes creating serious bottlenecks.
Measurement	▪ Mainly Qualitative expert assessment regarding speed, simplicity and predictability of formalities of the border clearance process in national level; ▪ Quantification: Costs caused by clearance processes as share of total logistics costs: $\frac{Logistics\_costs_{clearance}}{Logistics\_costs_{total}}$
Remarks	With a perception based survey clearance processes are surveyed by the World Bank within the scope of the LPI. Source for data on company level currently not available; need for conceptual efforts.

3	Clearance processes
Reference study, source	World Bank LPI, company data

4	Profitability
KPA	Efficiency
KPI Name	Profitability
Level	company
Description	This indicator shows the efficiency of performance on company or sector level.
Objective	To monitor the profitability performance of logistics companies is to look on the profit margins per company or per sector.
Measurement	Profitability margin of logistics companies: operating revenues per company.
Remarks	Data availability: Company information, commercial databases. It should be taken into account that profit margins are only a small indication for the total efficiency of a company /sector and sometimes does not show necessarily that companies are efficient.
Reference study, source	SEALS, TOP100; Establish Davis Database.

5	Value added
KPA	Effectiveness
KPI Name	Value added of logistics
Level	national
Description	The indicator represents the contribution of the logistics sector to national economy.
Objective	The benchmark and analyses of the indicator between countries and over time shows the interdependences between logistics activities and economic development. It measures the economic performance and effectiveness of the sector at national level.
Measurement	It can be measured. as share of value added of the logistics sector in total GDP $\frac{ValueAdded_{Logistics}}{GDP_{Total}}$ or as value added of the sector per persons employed

5	Value added
	$\frac{ValueAdded_{Logistics}}{Employment_{Logistics}}$
Remarks	There are no official statistics available that demarcate logistics sector as defined within this report. Raw assessment possible via symmetrical input output statistics evaluation. But: availability of data is very limited, as these statistics are not available for every European Member State or year. Timeline assessment hardly possible: need of further efforts to improve data quality (consistency, comparability, timeliness, geographical coverage).
Reference study, source	Several studies on national level: SEALS; TOP100; Logistics costs and competitiveness; Excellence in Logistics; World Bank LPI.

6	Turnover
KPA	Effectiveness
KPI Name	Logistics sector turnover
Level	national
Description	Total turnover of the logistics sector.
Objective	The indicator is closely related to the indicator "value added of logistics" but incorporate additionally the intermediate consumption of the sector and is suitable to benchmark and monitor development per country over time.
Measurement	It can be measured as total turnover of the sector in relation to the GDP: $\frac{Turnover_{Logistics}}{GDP_{Total}}$
Remarks	There are no official statistics available that demarcate logistics sector as defined within this report. Eurostat database can deliver data on commercial logistics services, not for own logistical activities: need for conceptual efforts.
Reference study, source	SEALS; TOP100; Logistics costs and competitiveness; Excellence in Logistics.

7	Reliability
KPA	Effectiveness
KPI Name	Reliability of service
Level	company

7	Reliability
Description	The indicator intends to show an overall reliability of the operation and service performance on company level, including: 1) Variation in transit times; 2) Accuracy of order fulfilment; 3) Punctuality.
Objective	1) Variation in transit times: Indicates the reliability of the transportation function; 2) Accuracy of order fulfilment (i.e., error-free orders): Indicates the reliability of complete shipments; 3) Punctuality (on-time provision of logistics services): Assess the number of cases the logistics service fulfilled on time.
Measurement	1) Variation in transit times: Variation in travel times, i.e. deviation from the average travel time: $\frac{TT_{Max} - TT_{Min}}{TT_{Average}}$ 2) Accuracy of order fulfilment (i.e., error-free orders) Ratio of the number of error-free orders over the total orders shipped $\frac{Orders_{Error-free}}{Orders_{Total}}$ 3) Punctuality % of logistics services fulfilled on time within a given time range.
Remarks	A general reliability of the service can be evaluated e.g. by a qualitative expert assessment or by creating an quantifiable total index of the three related issues.
Reference study, source	Several studies; e.g. BeLogic, Promit;

8	Quality
KPA	Effectiveness
KPI Name	Quality management
Level	company
Description	The indicator intends to evaluate the overall quality management performance of services on company level in terms of: ▪ Service visibility / traceability through the supply chain; ▪ Quality systems; ▪ General information flow; ▪ Customer satisfaction.
Objective	Service visibility / traceability through the supply chain: The availability and accuracy of tracking and tracing system of the supply chain internally and for the customer enables monitoring the status of the service. Quality systems: The presence of certifications resp. quality assurance systems certifies a company to a higher extend of quality and is therefore more attractive. Information flow: The indicator should assess how good the communication is between LSP and customers. It may concern general communication as well as electronic data interchange.

8	Quality
	Customer satisfaction: The indicator assesses the percentage of complaints of the logistics service.
Measurement	Mainly qualitative measurement and assessment. Customer satisfaction: % of customer complaints of logistics services over total number of logistics services.
Remarks	Source for data currently not known. Data collection within the scope of primary research possible: need for conceptual efforts.
Reference study, source	BeLogic; PROMIT.

9	Flexibility
KPA	Effectiveness
KPI Name	Flexibility
Level	company
Description	Flexibility in terms of: 1) Demand and capacity; 2) Changes in time table; 3) Robustness.
Objective	The indicator intends to evaluate the capacity of flexibility in offering and fulfilling logistics services on company level: 1) Ability to adapt changes in demand and capacity: How flexible are offered logistics services regarding variation of volumes, capacity, size and special requirements; 2) Ability to adapt changes in time table: When is the last possibility to make changes in fixed activities, e.g. to change a destination or source point of a shipment; 3) Ability to cope with unexpected disruptions: The indicator assesses the general flexibility of logistics services to cope with serious disruptions, e.g. cancellations, strikes etc., or urgent/unexpected deliveries.
Measurement	Mainly qualitative measurement; Expert rankings Possible quantitative measurement: ▪ average time for changing delivery conditions; ▪ fastest delivery time for urgent deliveries.
Remarks	Source for data currently not known. Punctual surveys can deliver such data: need for conceptual efforts.
Reference study, source	BeLogic, Promit.

10	Regularity
KPA	Effectiveness
KPI Name	Regularity of services
Level	Company
Description	Regularity of services / On-time service provision.
Objective	This indicator evaluates the regularity of service performance on company level in terms of: 1) the ability to offer custom made services; 2) on-time service provision.
Measurement	Mainly qualitative measurement: Availability of ad-hoc service solutions and percentage of on-time service provision.
Remarks	Source for data currently not known. Punctual surveys can deliver such data: need for conceptual efforts.
Reference study, source	BeLogic, PROMIT.

11	Logistics costs
KPA	Costs
KPI Name	Logistics costs
Level	national / company
Description	"Logistics costs" is a commonly used business key performance indicator, both on national and company level. Typically Logistics costs can be divided into the following cost components: ▪ transportation; ▪ warehousing; ▪ inventory carrying; ▪ administration; ▪ all other logistics-related costs.
Objective	On national level the benchmark of the level of logistics costs as total annual expenditure on logistics services per country and logistic market segments. It can be used to measure the size and competitiveness of the logistics sector per country. To benchmark costs structure on company level, it can be assessed per cost components as percentage of total costs and also as percentage of transport performance (tkm).
Measurement	For evaluating and comparing logistics costs on national level, it can be measured in percentage of Gross Domestic Product (GDP) $\frac{Costs_{Logistics}}{GDP_{Total}}$ To benchmark costs components on company level, it can be assessed as percentage of total production costs, sales or turnover and also as total costs per transport unit (tkm)

11	Logistics costs
	$\frac{Costs_{Component}}{Costs_{Total}}$ $\frac{Costs}{TKM}$
Remarks	Data availability: Different approaches to generate total logistics costs per country. This approach effectively measures the size of the logistics sector, but does not necessarily indicate anything about performance. Although there is some evidence of a link between the two in the data, the relationship is non-monotonic, which means that it is difficult to draw solid conclusions on performance based only on sector size
Reference study, source	Mostly all analysed studies son national level (e.g. Top 100 in European Transport and Logistics Services, Study of logistics market in Switzerland, Macro-level logistics in Sweden; Finland State of Logistics surveys, Logistic costs in Norway; SEALS; Logistics costs and competitiveness; Excellence in Logistics; World Bank LPI).

12	Emissions of air pollutants
KPA	Environmental sustainability
KPI Name	Emissions of air pollutants
Level	national / company
Description	Negative environmental emissions of air pollutants caused by logistics sector
Objective	Reflecting the performance in the area of environmental sustainability, the emissions of air pollutants of the logistics sector is an important indicator to compare the environmental sustainability of the sector on country or company level. Main pollutants are CO2, NOx, NMVOCs, PM10, SOx. The emissions of the sector are mainly caused by transport logistics.
Measurement	The emissions of the sector are mainly caused by transport logistics and can be measured on national and company level by mode and per unit: CO2 (carbon dioxide): $\frac{CO2_{Logistics}(kg)}{Tkm}$ NOx (Nitrogen oxide): $\frac{NOx_{Logistics}(kg)}{Tkm}$ NMVOCs (non methane volatile organic compounds) $\frac{NMVOC_{Logistics}(g)}{Tkm}$ PM10 (Particulat Matter) $\frac{PM10_{Logistics}(g)}{Tkm}$ SOx (Sulphur emissions) $\frac{SOx_{Logistics}(g)}{Tkm}$
Remarks	There are no official statistics available that demarcate logistics sector as defined within this report. Indicator available for transport logistics.
Reference study, source	BeLogic, PROMIT; Enerdata; European Environment Agency's (EEA): Annual Transport and Environment Reporting Mechanism (TERM); OECD Green Growth Indicators.

13	Energy consumption
KPA	Environmental sustainability
KPI Name	Energy consumption
Level	national / company
Description	Final energy consumption of logistics sector
Objective	Reducing final energy consumption and therefore emissions of air pollutants is an important policy objective. This indicator will benchmark the performance of logistics energy consumption both on national and company level.
Measurement	The energy consumption of the logistics sector on national level can be evaluating e.g. by measuring the percentage in total national energy consumption. $\frac{Energy\_use_{Logistics}(TWH)}{Energy\_use_{Total}(TWH)}$ Also the share of renewable energy in total energy consumption of the sector could be and indicator on national level. $\frac{Energy\_renewable_{Logistics}(TWH)}{Energy\_use_{Logistics}(TWH)}$ On company level the energy consumption could be measured e.g. by consumption per square meter logistics facility: $\frac{Energy\_use_{Logistics}(KWH)}{Logistics\_facilities(m2)}$ and in terms of fuel consumption of the vehicle fleet: fuel use per tkm.
Remarks	Source for data currently not known. Punctual surveys can deliver such data: need for conceptual efforts
Reference study, source	BeLogic, Promit; Berlin and Pütter (2013); European Environment Agency's (EEA): Annual Transport and Environment Reporting Mechanism (TERM); OECD Green Growth Indicators

14	Emissions of noise
KPA	Environmental sustainability
KPI Name	Emissions of noise
Level	national / company
Description	Emissions of noise caused by logistics sector
Objective	Emissions of noise of the logistics sector are mainly relating to transport logistics. Reducing transport noise both at source and through mitigation measures to ensure overall exposure levels minimize impacts on health; is an important policy objective. Therefore an indication of noise is an important indicator both at national and company level.

14	Emissions of noise
Measurement	Percentage of population exposed to transport noise exposure levels (in Ldn): E.g. 1: 45<55 dB, 55-65 dB, 65-75 dB and >75 dB.
Remarks	Data partly available on national level- differences in methodologies preclude comparisons between Member States. Another possibility for a national noise indicator, which could be introduced rapidly but may be rather expensive, is through direct random-field social surveys; this is already being done in the Netherlands on a national basis every five years. A similar type of questionnaire for use by all Member States would provide comparative results for the EU.
Reference study, source	European Environment Agency's (EEA): Annual Transport and Environment Reporting Mechanism (TERM); OECD Green Growth Indicators.

15	Damages / Thefts
KPA	Safety / Security
KPI Name	Damages / Losses / Accidents
Level	company
Description	1) Damages to cargo: Damaged during transport or handling; 2) Losses of cargo /theft: Lost during transport or handling; 3) Accidents of staff: Lost workforce by accidents of employees.
Objective	The focus of service providers is to secure the safety and security of products and working staff during transport and handling in terms of: 1) Avoiding damages (including accidents); 2) Avoiding losses and thefts; 3) Avoiding accidents of employees.
Measurement	1) Damages: $\frac{number.of.orders_{damaged}}{number.of.orders_{Total}}$; 2) Losses/ Thefts $\frac{number.of.orders_{lost/stolen}}{number.of.orders_{Total}}$; 3) accidents of staff $\frac{labour\_hours_{missed\_caused\_byaccidents}}{labour\_hours_{Total}}$.
Remarks	Estimations about cargo theft are made by the TAPA (Transported Asset Protection Association). Furthermore, data on cargo thefts are reported irregularly in trade journals. Need for conceptual efforts.
Reference study, source	BeLogic; VDI- Association of German Engineers; Cargo Theft Report – Europol 2009.

16	Security of infrastructure and transport facilities
KPA	Safety / Security
KPI Name	Security of infrastructure and transport facilities
Level	national

16	Security of infrastructure and transport facilities
Description	Ensure the security of infrastructure and transport facilities
Objective	National authorities are responsible for providing the infrastructure and transport facilities needed to ensure an acceptable level of physical security of the logistics supply chain as well as guaranteeing the proper functioning of transport infrastructure services under normal conditions as well as in the event of a natural disaster. Therefor the security of infrastructure and transport in order to protect the supply chain and critical nodes is an important indicator on national level.
Measurement	A direct quantitative measurement of security in the logistics chain on national level is difficult, though indirect qualitative assessment conducted by expert analysis is the most practicable way. This can be done e.g. by assessment of the costs incurred due crime, violence, terrorism and organized crime in commercial logistics activities.
Remarks	Basic data not available; need for sustained data collection and conceptual efforts.
Reference study, source	OECD (Infrastructure Service Unit).

17	Employment
KPA	Employee development
KPI Name	Logistics sector employment
Level	national
Description	Logistics sector employment in relation to total employment.
Objective	This indicator represents the share of employment of the logistics sector. The comparison between countries indicates the importance and benefits of the sector to national economy regarding employment effects.
Measurement	It can be measured on national level by the share of logistics sector employment on total employment: $\frac{employment_{Logistics}}{employment_{Total}}$
Remarks	National level evaluation possible via EUROSTAT structural business statistics data. In general there are no statistics known that enable to locate logistics employees in companies that not directly act as logistics firm.
Reference study, source	SEALS; TOP100; Logistics costs and competitiveness; Excellence in Logistics; World Bank LPI

18	Satisfaction of personnel
KPA	Employee development
KPI Name	Satisfaction of personnel
Level	company
Description	Level of satisfaction of personnel of the logistics sector.
Objective	The level of satisfaction of personnel at company level could also be an indicator comparing issues such as the development of personnel competence, the creation of favourable working conditions (e.g., work-life balance, family-friendly employment), the employment of disadvantaged groups (e.g., older people, disabled) on company level.
Measurement	This indicator can be measured in a qualified way, e.g. seeking expert assessment. A possibility to quantify this indicator could be to look at the labour turnover rate of the company, i.e. the average length of working with the company.
Remarks	The qualified comparisons across countries could be difficult due to cultural differences.
Reference study, source	Basic data not available; need for sustained data collection and conceptual efforts.

19	Labour productivity
KPA	Employee development
KPI Name	Labour productivity
Level	company
Description	Labour productivity is the output generated per hour of work undertaken.
Objective	Improvements in labour productivity intend to monitor the efficiency of logistics operations per workload.
Measurement	On company level it can measured in e.g. total turnover per labour hour: $LP = \frac{Turnover}{Total\_Labour\_hours}$
Remarks	It should be taken into account that the labour productivity of a sector depends on the specific service segment (e.g. contract logistics is more labour intensive than simple transport logistics)
Reference study, source	SEALS; Krauth et al (2005b); Establish Davis Database.

20	Qualified labour
KPA	Employee development
KPI Name	labour skills of the logistics sector
Level	National / company
Description	This indicator evaluates the qualification and skills of the personnel in the logistics sector or per company.
Objective	The topic of workforce engagement and personnel relates to the creation of working conditions and environment that enables employees in the logistics sector to improve their efficiency and skills. This includes issues such as the development of personnel competence, the creation of favourable working conditions (e.g., work-life balance, family-friendly employment), the employment of disadvantaged groups (e.g., older people, disabled). Development of personnel competence refers to the increase and harmonisation of logistics competence across Member States through the development of minimum training standards and a Europe-wide logistics qualification and certification scheme.
Measurement	At national level, this could be assessed by the number/percentage of employees in the logistics sector with relevant vocational training (e.g., attending training sessions and receiving training certificates); at 3PL/company level the relevant metric refers to company employees. $\frac{employees_{voc.training}}{employees_{Total}}$ On national level the degree of education in the logistics sector can be measured by the availability of vocational training standards, qualification and certification scheme standards as percentage of total vocational certifications. $\frac{Certification_{Logistics}}{Certification_{Total}}$
Remarks	Basic data not available; need for sustained data collection and conceptual efforts.
Reference study, source	

Annex IX: Possible indicators assessment

Data on	Description	Possible indicators	availibility (not final)		supposed source
			access	coverage	
Centralisation / Decentralisation	Consolidation of operations in a single location in order to exploit economies of scale and risk pooling effects.	No. of warehouses / country	not public	only few	Fraunhofer SCS
		m2 / warehouse	not public	only few	Fraunhofer SCS
Transport consolidation	Transport collaboration and consolidation + transport bundling, route planning and control	Load factor (t / veh.)	available	partly	Eurostat
	Number of trips	no. of trips	available	partly	Eurostat
	absolute tonnage per mode and year per country	tonnage (t / mode)	available	EU28	Eurostat
	tonne-kilometers per mode and year per country	vehicle / train-tkm	available	EU28	Eurostat
	average transport distance per mode per country	tkm / t	available	partly	Eurostat
	Empty runs	number of empty trips	available	EU28	Eurostat
On-/Off-/Near shoring of production (manufacturing logistic trends)	Relation between location of production activities / operations and the market (per industrial sector and country (in Europe) / per region (US, Asia)	Domestic to international (also ExtraEU) transport chain (tkm, transport performance)	derivable	partly	Eurostat
Intermodal transport	Shift from road to rail and waterway	Modal share of intermodal transport per country	not available		UIRR / UIC combinedTransport-Report (combi-consult)
Reverse logistics (Transport)	Integrated returns network (store to DC), Non-integrated returns network (3rd party warehousing), Return to supplier	Share of transport performance (tkm) of reverse transports	not available		
Reverse logistics (Production)	Remanufacturing (reclaimed products components), Reuse (refurbishing, Recycling)	Recycling quota (%)	not available		
Flexible supply base (company uses more than one supply base)	Company uses more than one supply source (risk mitigation, cost-efficiency, flexibility)	Rate of horizontal / vertical supply chain differentiation / linkage (no. of suppliers)	not available		
Logistics	2 parties	No. of trips /	available	EU28	Eurostat

Data on	Description	Possible indicators	availibility (not final)		supposed source
			access	coverage	
collaboration and consolidation	(manuf./manuf,; manuf./LSP) collaborate to increase logistics efficiency (horizontal / vertical)	veh.-km			
		Costs of warehousing	derivable	partly	Top 100, Eurostat, others
		No. of warehouses	not public	only few	
		Vehicle dimensions	derivable	EU28	Eurostat
		Value density (€ / t)			
Transport bundling, route planning and control	Consolidation of two or more freight shipments. Optimisation of route planning and tracking of freight (RTI)	Load factor (t./veh.)	derivable	partly	Eurostat
Technology - ICT	IC Technology may be an essential part of logistic, but unclear if trend	Share of investments (technological / total)			
E-Commerce (part of logistics postponement)	Major commerce transactions performed electronically. Products or modules are usually kept centrally and are assembled and delivered directly to the customer only on order.	Size of transport units	derivable	partly	
		Number of vehicle movements	derivable	partly	
		Vehicle dimensions	derivable	partly	
		Vehicle fleet of small vehicles (%)	derivable	?	
E-procurement (to be combined with E-commerce)	Procurement of goods and services over the Internet, including identifying suppliers, selecting products or services, making purchase commitments, completing financial transactions, obtaining service and using exchanges	same KPI like in e-commerce			
Logistic postponement (Transport)	Delay the delivery of finished products to a region or a distribution center until the demand is known with a higher degree of certainty. By doing so, companies are able to store units centrally and avoid high inventories at the respective distribution centers	Inventory stock turn rate	retrievable	only few	
		No. of warehouses / country	not public	only few	
		m2 / warehouse	not public	only few	
Form postponement (assemble-to-order, to be combined	Making a product suitable for a specific market or customer at the latest possible point in a supply chain. Possible by only	Inventory stock turn rate	retrievable	only few	

Data on	Description	Possible indicators	availibility (not final)		supposed source
			access	coverage	
with Logistic postponement) (Production)	keeping modules, generic or semi-finished products				
LSP value added services	Logistic service providers often offer their customers numerous supplementary value-added services	Share of value added services within total turnover (monetary values € for all different logistic activities)	not available		
Outsourcing and specialisation	Many logistic service providers outsource their transport activities to external hauliers and specialize in providing customized logistics solutions	owned and hired fleet share (poss. for road)	available	partly	Eurostat
Individualisation / Specialised logistics	Customers requirements for more complex and customized solutions	Vehicle dimensions			
		No. of warehouses / country	not public	only few	
		Value density (€ / t)			
		Costs of warehousing / capital costs of warehousing	derivable	partly	Top 100, Eurostat, others
Shift of costs to logistic operators	Outsourcing of production related processes to the logistic sector	Logistic costs (€)	not available		
Growing global sales channel and fragmentation and volatility	Enterprises' expansion into new regions all over the world	Im-/Exports value density per country,	retrievable		
Multi-local operation	Geographic expansion of sourcing and distribution	Average distance of European transportation flows/trip length distribution	derivable		
Company part of network economies (contract logistics)	Outsourcing of production related processes to the logistic sector	Rate of outsourcing per industrial sector	not available		
Increase of direct deliveries	Increase of deliveries directly from factory or warehouse to the customer	?			

Data on	Description	Possible indicators	availibility (not final)		supposed source
			access	coverage	
Supply chain integration	Integration of physical and information flows for creating seamless business processes and eliminating redundant activities across the supply chain	?			
Information sharing	Timely and accurate flow of information across the supply chain for facilitating the coordination of operations among supply chain partners	?			
Shortage of talents	Shortage of truck drivers and experienced warehouse staff, possibly also for activities: Transport/Inventory/warehousing/administration/packaging/handling	No. of persons employed in transport and logistic sector	not available	only few	
Quantities of freight transported	for EU28 per country and total	Tonnes lifted per mode, Road, rail, inland, short sea shipping	available	EU28	Eurostat
Freight transport activity (cross-border, intra-EU trade)	for EU28 per country and total	Tonne-kms, Road, rail, inland, short sea shipping	available	EU28	Eurostat
Modal split	for EU28 per country and total	Tonne-km, Road, rail, inland, short sea shipping	available	EU28	Eurostat
Freight handling	for EU28 per country and total	Handling factor = ratio of tonnes-lifted to the actual weight of goods produced or consumed	derivable	EU28	Eurostat
Fleet size	for EU28 per country and total	Number of vehicles, Road, rail, inland waterway, short sea shipping, intermodal/co-modal	available	EU28	Eurostat
Average vehicle size (in tonnes)		Average vehicle size (in tonnes), Mainly for road freight vehicles	derivable	EU28	Eurostat

Data on	Description	Possible indicators	availibility (not final)		supposed source
			access	coverage	
Average age of fleet (in years)		Average age of fleet (in years), Mainly for road, inland waterway barges, short sea vessels	derivable	EU28	Eurostat
Fleet composition in terms of clean technologies		Numbers of road freight vehicles with Euro IV / Euro V / Euro VI, ratio over total number of vehicles, possibly for barges			KBA
Transport infrastructure		Number of kilometers of TEN-T highways and rail lines	derivable	EU28	Eurostat / CIA-Factbook
Utilisation of terminals (EU 28 total)		Percentage of use of available terminal capacity, Road/rail, inland waterway, intermodal	not public		
Congestion		Percentage of congested transport corridors over total length of transport corridors (per mode), Average Congestion time			
Macro level		Share of value added of the logistics sector in total value added	not public	EU28	Top 100
Macro level		Share of turnover of the logistics sector in total turnover;	not public	EU28	Top 100
Macro level		Share of persons employed of the logistics sector in total number	not available		
Macro level		overall logistic expenses	not public	EU28	Top 100
Macro level		Share of logistics costs on the total product costs	not public	only few	Top 100, ELA Logistcs Study (AT Kearney)

Data on	Description	Possible indicators	availibility (not final)		supposed source
			access	coverage	
Macro level		number of logistic service providers	available	partly	Eurostat/other
Macro level		Transport performance (tonne-kilometres) per GDP (Transport intensity)	derivable	EU28	Eurostat
Macro level		Productivity – value added per employee in the logistic sector			SEALS, ELA study
Macro level		Logistics intensity (percentage ratio of logistics costs (inputs) as share of total production cost per sector)	not public	only few	Top 100
Macro level		Logistics efficiency (utilization of vehicles and transhipment facilities)	derivable	only few	Eurostat, UIC study
Micro level	Per type of logistic market segements, Transport/Inventory/warehousing/administration/packaging/handling	Fuel costs/capital costs/ real estate/toll costs/labour costs/total share of transport and logistics as % of production costs	derivable	partly	Eurostat / other / SEALS
Micro level	Industry sectors share of logistics costs	Share of logistics costs on the total product costs	not public	only few	Top 100
Cross border procedures	Transport/each mode of transport	Average time for administrative requirements	not available		
Cross border interoperability	Transport/each mode of transport	Time required for technical adaptations (esp rail)/friction costs of adaptations	not available		
Environmental costs	Transport/Inventory/warehousing/administration/packaging/handling	Emission factors (CO2/NOx/SOx)	available	EU28	Eurostat
Safety	Transport/Inventory/warehousing/administration/packaging/handling	Number of accidents /Number of	not available	partly	Eurostat

Data on	Description	Possible indicators	availibility (not final)		supposed source
			access	coverage	
		losses of life			
Noise	Transport/Inventory/warehousing/administration/packaging/handling	Noise levels	not available		
Market structure	Transport/Inventory/warehousing/administration/packaging/handling	Total turnover/ total number of service providers/average turnover per service provider and number of employees /share of SME''s	retrievable	only few	Top 100
Salary effects	Transport/Inventory/warehousing/administration/packaging/handling	Average wages	retrievable	EU28	Eurostat
Transport intensity		tonnes / inhabitant	available	EU28	Top 100