



Investing in the Future of Jobs and Skills

Scenarios, implications and options in anticipation of future skills and knowledge needs

Sector Report Transport and Logistics



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Preface

This report presents the final results of the study *Comprehensive analysis of emerging competences and economic activities in the European Union in the transport and logistics sector*. The report is part of a series of sixteen future-oriented sector studies on innovation, skills and jobs under the same heading, commissioned by the European Commission (DG Employment, Social Affairs and Equal Opportunities). Eleven of these studies were executed by a core consortium led by TNO (Netherlands Organization for Applied Scientific Research) and consisting of TNO Innovation Policy group (Leiden, the Netherlands), TNO Labour (Hoofddorp, the Netherlands), TNO Innovation and Environment (Delft, the Netherlands), SEOR Erasmus University (Rotterdam, the Netherlands) and ZSI (Centre for Social Innovation, Vienna, Austria). The core consortium was in charge of the overall management of the study, the further elaboration and application of the overall approach and methodology, as well as data collection and analysis. This study on future skills and jobs in the transport and logistics sector has been executed by a core team of TNO in close collaboration with SEOR and ZSI.

The study was carried out during the period January 2008-May 2009. Stakeholders in the sector, including the European sectoral partners and representatives of various other organisations, have been involved in various ways and forms throughout the study. This included a sectoral kick-off meeting at the start of the study and three multisectoral stakeholder meetings in Brussels during which intermediate results of the studies were presented and discussed. Valuable workshop discussions in the frame of the project were held and inputs received from a number of experts. A draft final version of this report was validated and complemented during a second external, final workshop in Brussels on 5 and 6 February 2009. The final workshop brought together an apt mixture of different European and national sector experts representing the industry, European social partners, other various representative organizations, academia as well as the European Commission (see Annex 2 for a full list of participants). The workshop, which formed an explicit and integral part of the methodological approach, yielded a number of helpful comments and insights which have been used in further finalising the study. We express our sincere gratitude to all workshop participants and to all those that contributed to this study.

A special word of thanks holds for the European Commission, notably Jean-François Lebrun and Manuel Hubert, and Radek Owczarzak of the European Foundation for the Improvement of Living and Working Conditions who proved to be excellent guides during the project.

Delft, 1 April 2009

Dr Frans A. van der Zee (overall project leader)

1 General introduction

This report presents the final results of the study Comprehensive analysis of emerging competences and economic activities in the European Union in the transport and logistics sector. The report is part of a series of sixteen future-oriented sector studies on innovation, skills and jobs under the same heading, commissioned by the European Commission (DG Employment, Social Affairs and Equal Opportunities). The study was executed by a consortium led by TNO (Netherlands Organization for Applied Scientific Research) and consisting of TNO, SEOR – a consultancy of Erasmus University (Rotterdam, the Netherlands) and ZSI (Centre for Social Innovation, Vienna, Austria). The study was carried out during the period January 2008-May 2009.

While the main focus of the study is on the future of skills and jobs by 2020, the study is both backward- and forward-looking in nature. It analyses recent relevant sector developments and trends and, at the same time, depicts the current state of play in the sector with an emphasis on innovation, skills and jobs. Current trends and developments form the stepping stone and fundament for the second and third future-oriented part of the study which is scenario-based, forward-looking and exploratory in nature.

Background and context

The study should be placed against the background of the EU's renewed Lisbon strategy in which securing and improving EU competitiveness and redeploying the European economy to new activities with more value-added and new and better jobs are key. In the process of change and restructuring to adapt to new realities, there is a need for a more strategic management of human resources, encouraging a more dynamic and future-oriented interaction between labour supply and demand. Without there is the risk that bigger shortages, gaps and mismatches of skills will result not only in structural unemployment but also hamper longer-term competitiveness.

Skills and jobs are of vital importance for the future of the European economy and have recently gained increasing attention, both at national and EU level. As stressed by the European Council in March 2008, investing in people and modernising labour markets is one of the four priority areas of the Lisbon Strategy for Growth and Jobs. The New Skills for New Jobs initiative launched in December 2008 (European Commission, 2008) elaborates on how this could best be done. The initiative aims to enhance human capital and promote employability by upgrading skills, as well as to ensure a better match between the supply of skills and labour market demand. More transparent information on labour market trends and skills requirements, but also the removal of obstacles to the free movement of workers in the EU, including administrative barriers would help achieve this goal, and improve occupational, sector and geographical mobility. The initiative also stresses the need to improve the Union's capacity for skills assessment (by improved monitoring and forecasting), anticipation (by better orientating skills development) and matching with existing vacancies. The current financial and economic crisis makes these challenges even more pressing. Further strengthening the economic resilience and flexibility of the European economy and its Member States calls, along with other measures, for support of employment and further facilitation of labour market transitions (European Commission, 2008a:10).

Approach and methodology

The study takes a longer term future perspective, and looks ahead to 2020, but also back, and takes a highly aggregated European perspective. While it is fully acknowledged that more detailed Member State and regional analyses are important and vitally important for anticipating future skills and knowledge needs, the European perspective has been central in this analysis. Key to the study and a common point of departure was the use of a pre-defined methodological framework on innovation, skills and jobs (Rodrigues, 2007). During the course of this study this framework has been further developed, operationalised and applied to the sector. The approach combined desk research and expert knowledge available in a broad and dedicated research team with the knowledge and expertise of 'external' sector experts. The purpose of this *common uniform methodology* is to deliver results that enable comparisons across and between sectors and hence enable the preparation of possible future actions to investigate the topic of new future jobs and skills for Europe, by encouraging a more effective interaction between innovation, skills development and jobs creation. The methodology is structured along various steps, each step providing inputs and insights for next steps to come. Overall, the methodology covers the following steps:

- Step 1. Identification of economic activities to be considered (i.e. sector selection)
- Step 2. Main economic and employment trends and structures by sector
- Step 3. Main drivers of change
- Step 4. Main scenarios
- Step 5. Main implications for employment – changes by job function
- Step 6. Main implications for skills – emerging needs by job function
- Step 7. Main strategic choices to meet future skills and knowledge needs
- Step 8. Main implications for education and training
- Step 9. Main recommendations
- Step 10. Final Workshop.

Further and next steps

The results of this study – along with 15 other sector studies using the same approach and being released at the same time - will serve as a guide in launching further EU-led but also other actions, by industry, sectoral partners, education and training institutes and others. One important aim of the study is to promote the strategic management of human resources and to foster stronger synergies between innovation, skills and jobs in the sector in the medium and longer run, taking into account the global context and encouraging adaptations to national and regional specificities. A very important element in further enabling and facilitating these goals is sound and continuous monitoring together with a uniform and consistent way of analysing future skills and knowledge needs for the various decision-making levels involved. The approach taken in this study aims to provide a broader framework that does exactly this. Further dissemination and explanation of the methodology at the Member State, regional and local level are therefore vital in the follow-up of this EU level study, as is its actual take-up. The results of the study include implications, conclusions and recommendations to anticipate future skills and knowledge needs. It does not in any way, however, assess or evaluate current or planned policies. Conclusions and recommendations may therefore coincide but may also oppose current policies and/or policy plans at the EU, national or regional level. The implications, conclusions and recommendations logically follow from scenarios – credible plausible sector futures – meant to better structure and anticipate possible future developments.

Looking ahead in times of crisis

Even though the year 2020 may currently seem far off for most of us, the future will announce itself earlier than we think. In times of financial and economic crisis there is a logical tendency to focus on the now and tomorrow; withstanding and surviving the crisis are prime. Nevertheless, at the same time the medium and longer term ask for adequate attention. In this current age of continuing and pervasive globalisation, strong technological change and innovation affecting production and consumption around the globe, timely preparations to be able meet future skills and job needs are called for more than ever before. This is even more true in the face of an ageing European society and ditto workforce.

Contents in three parts

The report consists of three main parts. Part I analyses recent relevant sector developments and trends and depicts the current state of play in the sector, with an emphasis on innovation, skills and jobs. The findings of Part I of the report combine original data analysis using Eurostat structural business statistics and labour force survey data with results from an extensive literature review of relevant already existing studies. While giving a clear and concise overview of the most important trends and developments, the prime function of Part I is to provide the fundamentals and building blocks for Part II of the study. The findings of Part I are based on the present and the recent past. The second part of the report is future-oriented and looks at sectoral developments and more specifically developments in skills and jobs in and towards 2020. The core of part II consists of plausible future scenarios and their implications for jobs, skills and knowledge. These implications have been analysed for various job functions. In a final part III, a range of main strategic options ('choices') to meet the future skills and knowledge needs is reviewed, including implications for education and training. The study concludes with a number of recommendations for the sector (individual firms, sector organizations, sectoral partners), education and training institutes and intermediary organisations, and last but not least, policy-makers at various levels, ranging from the EU to the local level. Terminology used in this report is further explained and defined in a Glossary at the end of this report.

Part I

Trends, Developments and State-of-Play

Part I. Trends, Developments and State-of-Play

Guide to the reader

Part I presents the results of steps 1, 2 and 3 of the common methodology applied to the transports and logistics sector. Step 1 delineates and defines the sector. Step 2 presents the main economic and employment trends and developments in the sector (mapping) and reports the results of a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis. Step 3 analyses the main drivers of change of relevance for the sector based on a meta-driver approach and expert opinion. Part I of the report consists of 8 chapters. Chapter 2 identifies and statistically defines the sector. Chapter 3 provides an overview of the structural characteristics of the sector, including developments and trends in employment, production and value added. It contains information on work organisation (part-time/full-time, gender, age), and industrial relations, but also on emergent trends by function. It also addresses existing partnerships for innovation, skills and jobs, one of the possible policy instruments to better prepare for and adapt to the future, facilitate mutual learning and boost innovative capacity both at the sector and firm level. While not part of the methodology as such, partnerships form an interesting example of how the development of skills and jobs can be linked to innovation. Chapter 4 discusses the value chain (network) and its evolution over time, including issues of restructuring and relocation. Chapter 5 focuses on innovation, R&D and technological change, while chapter 6 analyses the impact of globalisation and trade on and for the sector. Chapter 7 highlights the importance of regulation especially in relation to employment. Chapter 8 provides the results of a SWOT analysis of the sector. Chapter 9 concludes with an overview of the most important drivers for the sector.

2 Defining the sector

The transport sector is one of the most important sectors for the European economy. Its importance stems not only from its size (which is estimated to be € 803 billion or 6.6% of European GDP in 2007), but also from the fact that it plays a crucial role in connecting other economic actors with each other.

The transport sector is characterized by a great diversity and different transport modes that come with different technologies, regulations, challenges and know how and skills requirements. The main categorizations can be made as follows:

- Air transport (passenger and freight)
- Transport by waterway/sea
 - International high sea transport (passenger and freight)
 - Ship transport on rivers, canals and lakes (passenger and freight))
- Rail transport (passenger and freight)
 - Subway, metro and tram system
 - Domestic trains
 - International trains
 - High speed trains
- Road transport (short distance and long distance, passenger and freight, heavy and light commercial vehicles)
 - Passenger transport (bus, coach and taxi)
 - Short distance freight trucks (heavy and light)
 - Long distance freight trucks (mostly heavy).

Another important distinction has to be made between passenger and freight transport, especially in the road sector. This is also the sector within transport where the most SMEs are present. Many road transport firms are micro-enterprises with less than 10 employees or even one-truck-one-driver firms. In the rail sector, major distinctions have to be made between domestic/regional train transport, international trains, high-speed trains and trams, metros and subways.

In this report transport and logistics are defined as the sectors 60, 61, 62 and 63 in the European NACE classification. NACE stands for Classification of Economic Activities in the European Community. The sectors 60 to 63 comprise the activities as described in detail in Table 2.1 in this report. The focus will be on the subsectors in NACE 60 to 63 which have the highest employment figures.

The data in this report is based on the NACE Rev 1.1 classification since time series are only available for this categorisation. As per January 2008 the new NACE Rev 2 classification entered into force. For the transport and logistics sector, NACE Rev. 2 differs in some relevant structural aspects from NACE Rev 1.1 as it can be seen by comparing Table 2.1 and Table 2.1. Because of this, a direct translation of NACE Rev 1.1 into NACE Rev. 2 cannot be easily performed. The most obvious change has been the renaming from “Transport, storage and communication” of NACE Rev 1.1 to “Transport and Storage” in NACE Rev. 2 with “Information and Communication” being assigned a different code (section J58 in NACE Rev. 2). The other significant change in NACE Rev 2 has been the introduction of a clearer distinction between passenger and freight transport and the introduction of new codes, e.g. for transport-related services.

Table 2.1: The transport sector in the NACE Rev 1.1 classification (sectors 60 to 63)

NACE Rev 1.1	Description
60	Land transport; transport via pipelines
60.1	Transport via railways
60.10	Transport via railways
60.2	Other land transport
60.21	Other scheduled passenger land transport
60.22	Taxi operation
60.23	Other land passenger transport
60.24	Freight transport by road
60.3	Transport via pipelines
60.30	Transport via pipelines
61	Water transport
61.1	Sea and coastal water transport
61.10	Sea and coastal water transport
61.2	Inland water transport
61.20	Inland water transport
62	Air transport
62.1	Scheduled air transport
62.10	Scheduled air transport
62.2	Non-scheduled air transport
62.20	Non-scheduled air transport
62.3	Space transport
62.30	Space transport
63	Supporting and auxiliary transport activities; activities of travel agencies
63.1	Cargo handling and storage
63.11	Cargo handling
63.12	Storage and warehousing
63.2	Other supporting transport activities
63.21	Other supporting land transport activities
63.22	Other supporting water transport activities
63.23	Other supporting air transport activities
63.3	Activities of travel agencies and tour operators; tourist assistance activities n.e.c.
63.30	Activities of travel agencies and tour operators; tourist assistance activities n.e.c.
63.4	Activities of other transport agencies
63.40	Activities of other transport agencies

Source: EUROSTAT Website http://ec.europa.eu/environment/emas/documents/nace_en.htm, tr, 9, left)

Table 2.2: The transport sector in the NACE Rev 2 classification

NACE Rev 2	Description
Section H	Land transport and transport via pipelines
49.1	Passenger rail transport, interurban
49.10	Passenger rail transport, interurban
49.2	Freight rail transport
49.20	Freight rail transport
49.3	Other passenger land transport
49.31	Urban and suburban passenger land transport
49.32	Taxi operation
49.39	Other passenger land transport n.e.c.
49.4	Freight transport by road and removal services
49.41	Freight transport by road
49.42	Removal services
49.5	Transport via pipeline
49.50	Transport via pipeline
50	Water transport
50.1	Sea and coastal passenger water transport
50.10	Sea and coastal passenger water transport
50.2	Sea and coastal freight water transport
50.20	Sea and coastal freight water transport
50.3	Inland passenger water transport
50.30	Inland passenger water transport
50.4	Inland freight water transport
50.40	Inland freight water transport
51	Air transport
51.1	Passenger air transport
51.10	Passenger air transport
51.2	Freight air transport and space transport
51.21	Freight air transport
51.22	Space transport
52	Warehousing and support activities for transportation
52.1	Warehousing and storage
52.10	Warehousing and storage
52.2	Support activities for transportation
52.21	Service activities incidental to land transportation
52.22	Service activities incidental to water transportation

Source: Eurostat Website: http://ec.europa.eu/eurostat/ramon/index.cfm?TargetUrl=DSP_PUB_WELC

3 Structural characteristics of the sector: past and present

3.1 Production, value-added and employment trends in th EU

The EU holds an internationally strong position in the area of transport and transport services. 30% of the worldwide air transport, 40% of the maritime fleet are controlled by EU companies. The share of EU export in transport equipment accounts for 16% of the global total (EC, 2006).

The transport sector (and in particular the road sector) had a total added value of € 530.2 billion in 2006. The annual growth rate in added value between 1995 and 2006 has been 4.3%, this is almost double the annual growth of 2.3% in added value of the total European economy for the same period. Table 3.1 provides an overview.

Table 3.1: Sectoral value added and overall GDP, totals 2006 (million Euro) and growth by period (annual averages in %). Transport (NACE 60 61 62 63)

	(NACE 60 61 62 63)				Overall economy			
	GDP 2006, in Million Euro	95-00	00-06	95-06	GDP 2006, Million Euro	95-00	00-06	95-06
EU 27	530 231	5.5 %	3.3 %	4.3 %	11 468 970	2.8 %	2.0 %	2.3 %
EU 15	498 509	5.9 %	3.3 %	4.4 %	10 883 245	2.8 %	1.9 %	2.3 %
NMS	31 722	0.5 %	3.6 %	2.2 %	585 725	2.7 %	3.7 %	3.2 %

Source: Eurostat/TNO data

The highest added value can be found in the NACE sector 60, transport over land. In this sector, about € 270 billion added value was generated in 2006 in the EU; this is 51% of the total value added in the transport sector. The annual growth of added value in this NACE subsector 60 is 3.2% over the period 1995-2006.

Table 3.2: Sectoral value added, average annual growth 1995-2006, share in country 2006, change in share 1995-2006, share in EU 2006 and change in share in EU 1995-2006. Land transport; transport via pipelines (NACE 60)

NACE 60	Value added		Share in country		Share in EU	
	2006	95-06 %	2006	95-2006 (total change)	2006	95-2006 (total change)
EU	269 787	3.2 %	2.3 %	0.2 %	100 %	0 %
EU 15	247 195	3.1 %	2.3 %	0.2 %	92 %	0 %
NMS	22 591	3.4 %	3.8 %	-0.1 %	8 %	0 %

Source: Eurostat/TNO data

In NACE sector 61, water transport, about € 27.7 billion added value was generated in 2006 in the EU, this is 5% of the total value added in the transport sector. Table 3.3 provides details.

Table 3.3: Sectoral value added, average annual growth 1995-2006, share in country 2006, change in share 1995-2006, share in EU 2006 and change in share in EU 1995-2006. Water transport (NACE 61)

NACE 61	Value added		Share in country		Share in EU	
	2006	95-06 %	2006	95-2006 (total change)	2006	95-2006 (total change)
EU	27,668	5.3 %	0.2 %	0.1 %	100 %	0 %
EU 15	27,490	5.4 %	0.3 %	0.1 %	99 %	1 %
NMS	178	-5.2 %	0.0 %	0.0 %	1 %	-1 %

Source: Eurostat/TNO data

In NACE sector 62, air transport, about € 35,6 billion added value was generated in 2006 in the EU, this is 7% of the total value added in the transport sector. Table 3.4 provides details.

Table 3.4: Sectoral value added, average annual growth 1995-2006, share in country 2006, change in share 1995-2006, share in EU 2006 and change in share in EU 1995-2006. Air Transport (NACE 62)

NACE 62	Value added		Share in country		Share in EU	
	2006	95-06 %	2006	95-2006 (total change)	2006	95-2006 (total change)
EU	35 594	1.5 %	0.3 %	0.0 %	100 %	0 %
EU 15	34 333	1.3 %	0.3 %	0.0 %	97 %	-2 %
NMS	1 262	12.6 %	0.2 %	0.1 %	3 %	2 %

Source: Eurostat/TNO data

Finally, in NACE sector 63, activities of travel agencies and tour operators, about € 197.2 billion added value was generated in 2006 in the EU, this is 37% of the total value added in the transport sector. Table 3.4 provides details.

Table 3.5: Sectoral value added, average annual growth 1995-2006, share in country 2006, change in share 1995-2006, share in EU 2006 and change in share in EU 1995-2006. Supporting and auxiliary transport activities; activities of travel agencies (NACE 63)

NACE 63	Value added		Share in country		Share in EU	
	2006	95-06 %	2006	95-2006 (total change)	2006	95-2006 (total change)
EU	197 183	6.7 %	1.7 %	0.5 %	100 %	0 %
EU 15	189 492	7.3 %	1.7 %	0.6 %	96 %	4 %
NMS	7 691	-1.0 %	1.4 %	-0.6 %	4 %	-4 %

Source: Eurostat/TNO data

Trends in value added

Table 3.6 provides a summary of the volume of the different types of transport in the EU, and the trends in the development of those volumes. Of all transport activities, road freight transport stands out as the most important activity in terms of volume as well as in terms of growth (on average 5.5% per annum between 2004 and 2006), Low growth can be noticed for inland waterways transport (on average 0.8% per annum between 2000 and 2006).

Table 3.6: Volume trends in Different Types of Transport

NACE	Type of transport	Volume	Trend
60	Rail freight EU27	435 billion metric ton kilometers in 2006	11.2% increase since 2003 (=3.6% per annum)
60	Rail passengers EU27	381 billion passenger kilometers in 2006	6.2% increase since 2003 (=2.0% per annum)
60	Road transport (freight) EU27	1887 billion metric ton kilometers in 2006	11.2% increase since 2004 (=5.5% per annum)
60	Road transport (passengers) EU27	5067 billion passenger kilometers in 2004	17% increase since 1995 (=1.8% per annum)
61	Inland waterways transport EU27	138 billion metric ton kilometers in 2006	3.8% increase since 2000 (=0.6% per annum)
61	Sea transport (freight) EU15	3189 million metric tons loaded and unloaded in 2003	9.5% increase since 1999 (=2.3% per annum)
61	Sea transport (passengers) EU15	403.5 million incoming and outgoing passengers in 2003	20% increase since 1999 (=4.7% per annum)
62	Air transport (passengers) EU 27	738.4 million passengers in 2006	4.7% increase in 2006-07
62	Air transport (freight) EU 27	10,95 million tonnes in 2005	-0.5% increase in 2005-06

Sources: Various EUROSTAT publications 2006-2008

Trends in employment

The transport sector (and in particular the road sector) is an important employer in Europe. In 2006, the transport sector employed some 9.62 million persons in the EU25.¹ With 7.59 million employees, the EU15 (i.e. the old member states) represents the largest share of those employed in the transport sector. Table 3.7 and figure 3.1 provide an overview.

Table 3.7 Employment*, total numbers 2006, annual average growth 2000-2006, share in EU 2006 and total change of share in EU 2000-2006. Transport (NACE 60 61 62 63)

	Employment in persons 2006	Annual average growth 2000-2006	Share in EU 2006	Total change of share in EU 2000-2006
EU	9 611 816	2.0 %	100 %	0 %
EU15	7 589 260	2.5 %	79 %	2 %
NMS	2 022 556	0.2 %	21 %	-2 %
Winning	5 668 928	3.4 %	59 %	7 %
Losing momentum	420 630	-0.7 %	4 %	0 %
Upcoming	2 767 910	-0.1 %	29 %	-2 %
Retreating	754 348	-6.6 %	8 %	-5 %

Concentration >100

g *Winning:*

r France ,Italy, Netherlands, Denmark, Spain, Austria,
o Finland, Sweden, Czech Republic, Estonia, Latvia,
w Lithuania, Hungary, Romania, Slovakia

h

d *Losing momentum:*

e Belgium, Luxembourg, Bulgaria, Slovenia

li

n

e

Concentration <100

Upcoming:

Germany, Ireland, Portugal, United Kingdom

Retreating:

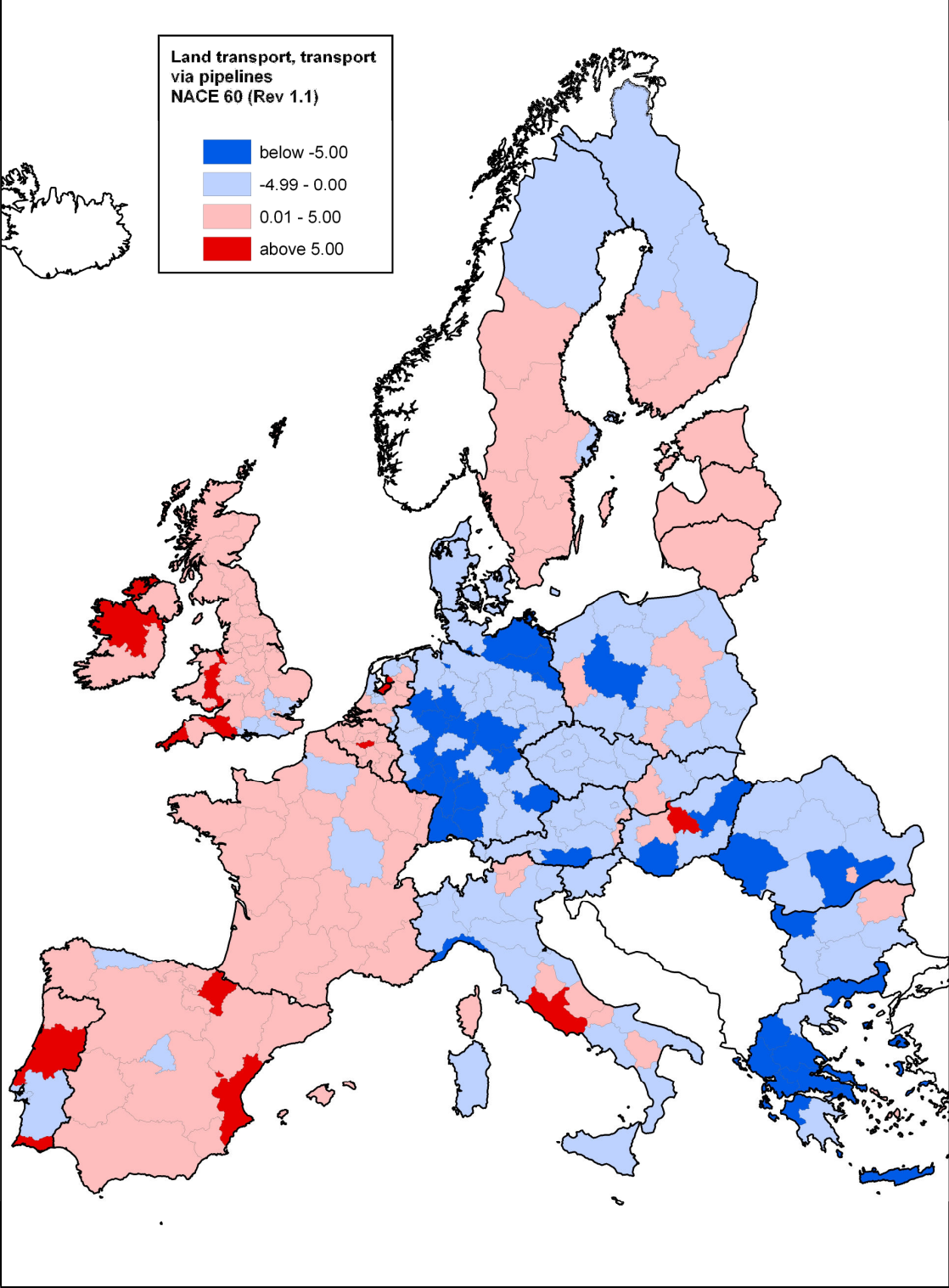
Greece, Poland

* employers and employees

Source: Eurostat/TNO

¹ The EU15, or the old Member States, comprises the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom. In 2004, the EU was expanded with the following 10 countries: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland Slovakia, and Slovenia. Together with the EU15 these are referred to as the EU25. In 2007, another two countries were admitted: Bulgaria and Romania. This brings the total number of EU member countries to 27 at present (EU27). The latter two expansions have not always been fully captured by the statistics yet.

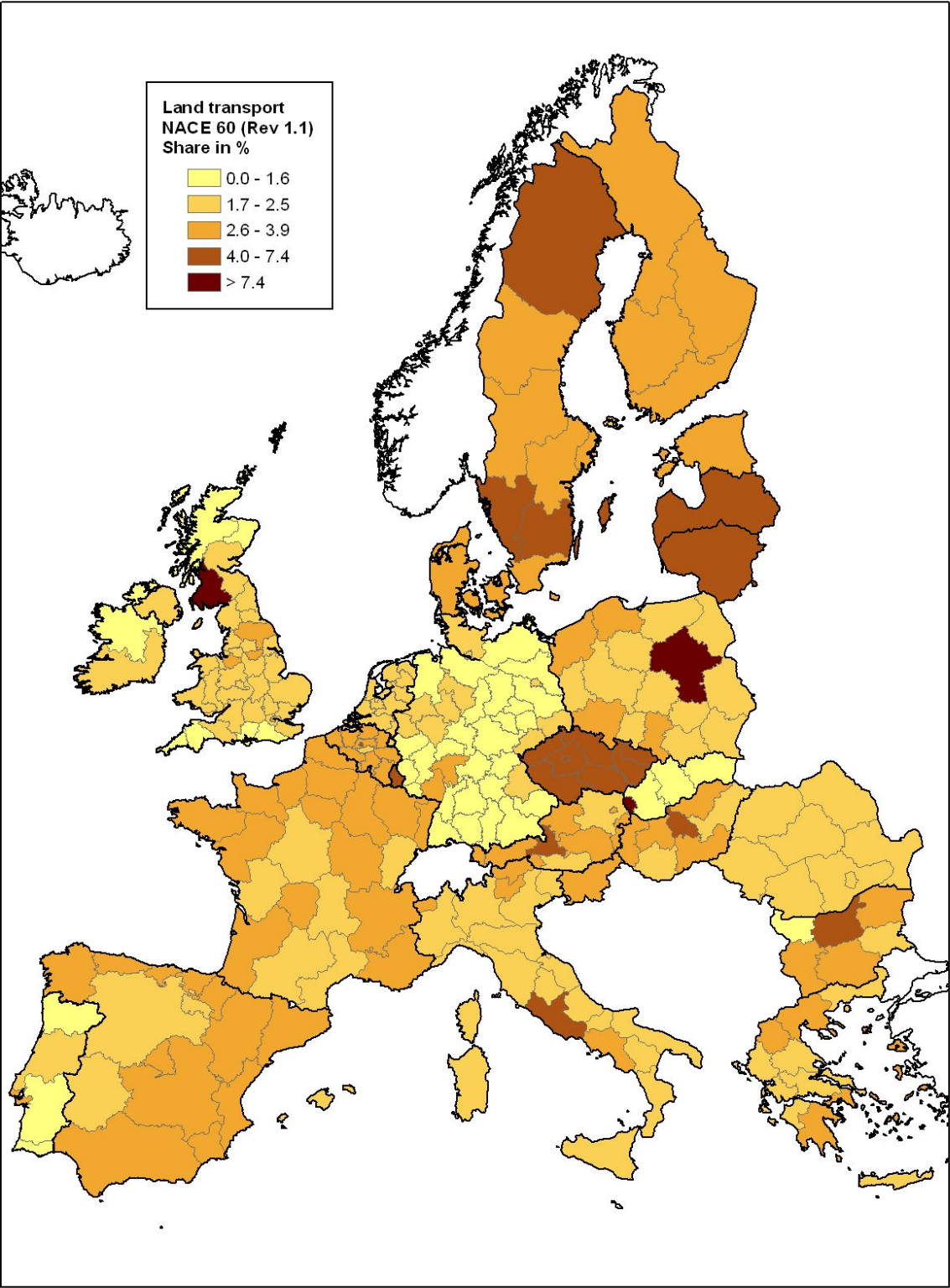
Figure 3.1 Employment changes in the land transport sector by region, 1999-2005 (% p.a.)



ource: Eurostat/TNO

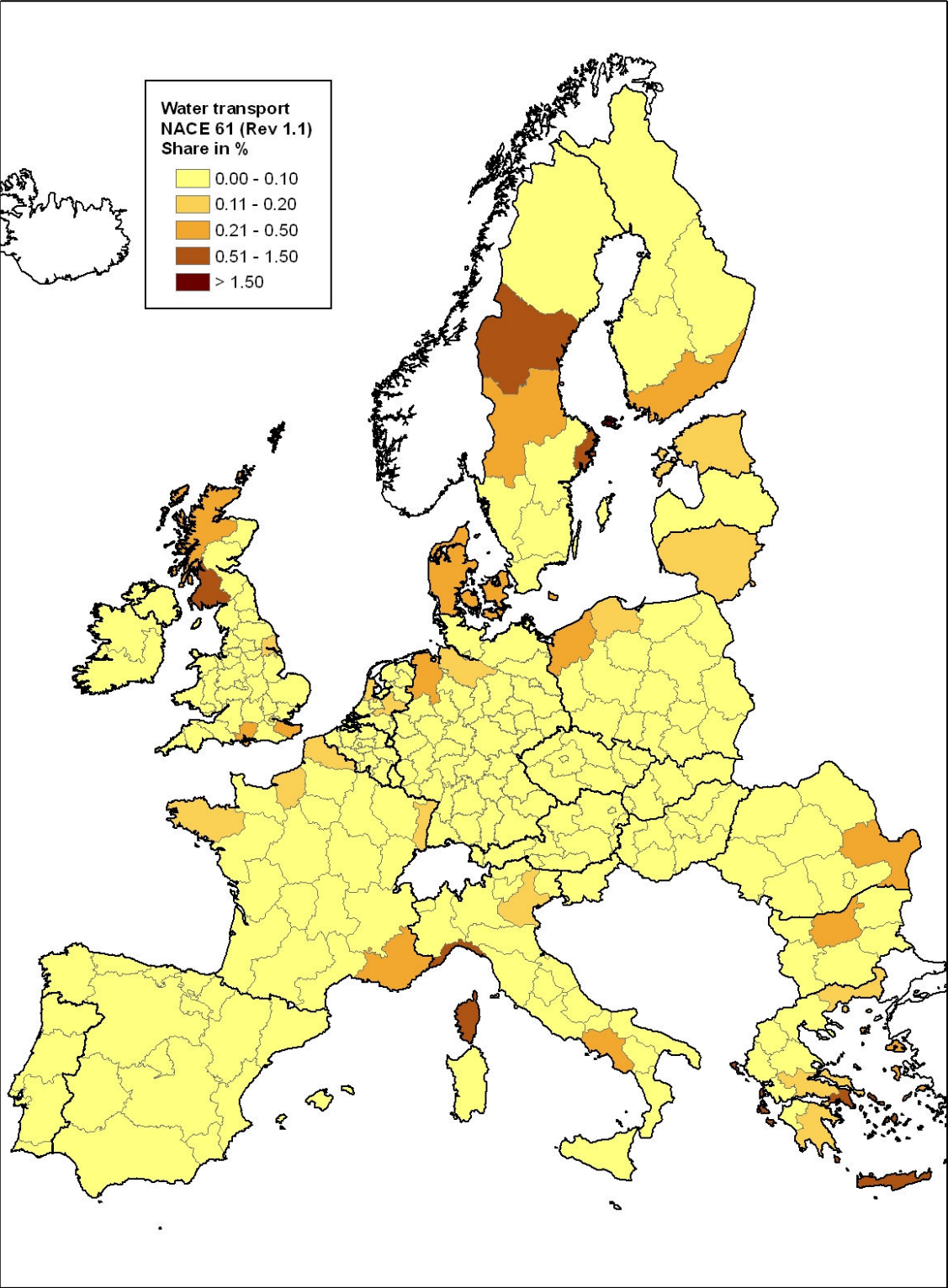
The regional specialisation in employment of the sector are shown in Figure 3.2 **Vertical share in the land transport sector by region in total employment by NUTS 2 region, 2006**. What the Figures clearly show is not only a specialisation of different EU countries but also within countries themselves. Regions that have a high specialisation in the sector are in Northern Europe. The land transport sector is a fairly important sector in terms for employment for most regions across the EU, with only low specialisation in Germany and Slovakia. Employment is most concentrated in a number of geographical clusters, predominantly located in one region in Poland, in countries like Latvia, Lithuania and Czech Republic, one region in United Kingdom and two different regions in Sweden. For the water transport, only few regions in Sweden, France, Greece and the United Kingdom have higher specialisation. In the air transport, only some regions in United Kingdom, France and Germany have some degree of specialisation and for the supporting and auxiliary sector, some specialised regions are in United Kingdom and Germany.

Figure 3.2 Vertical share in the land transport sector by region in total employment by NUTS 2 region, 2006



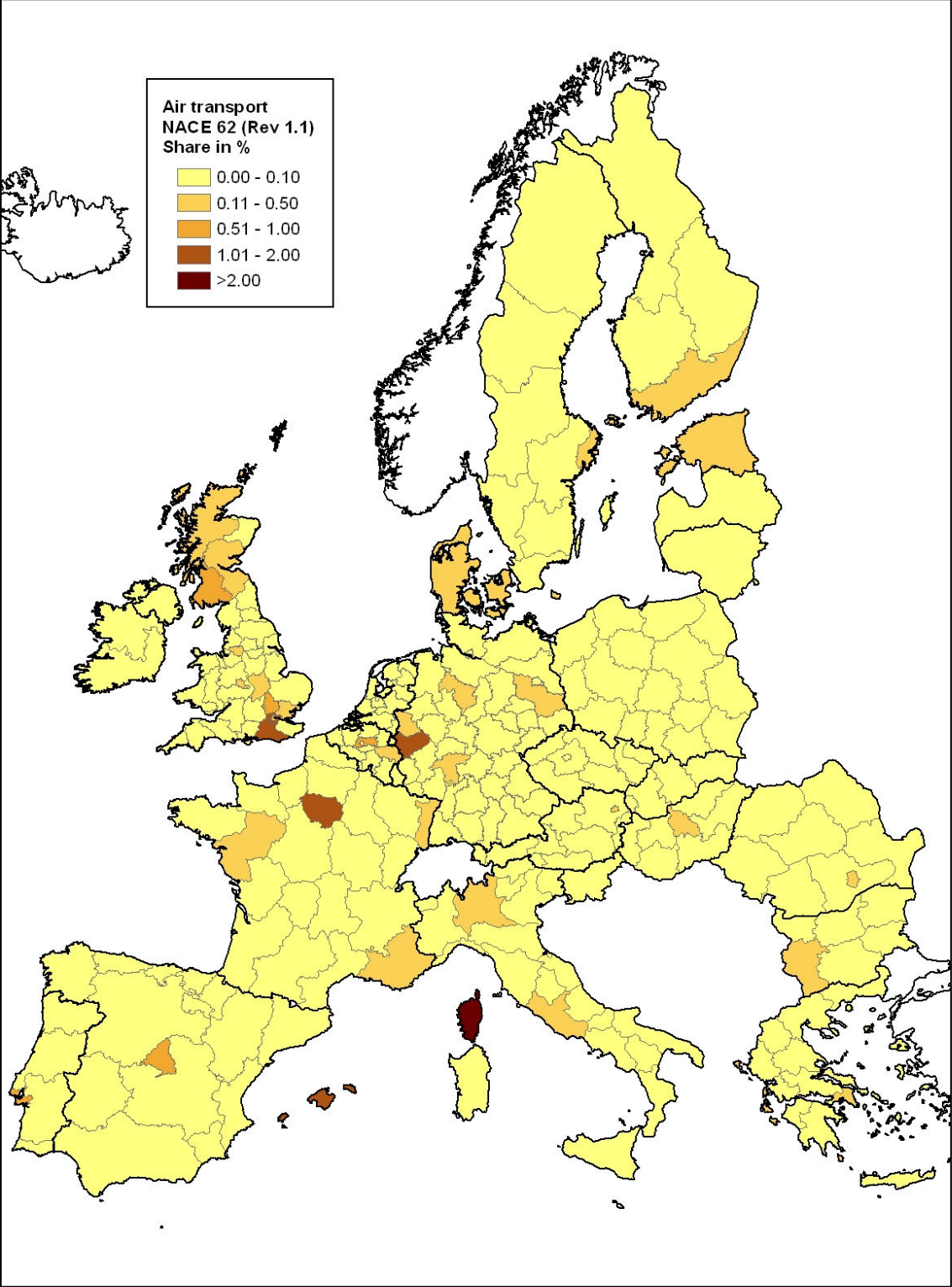
Source: Eurostat/TNO

Figure 3.3 Vertical share in the water transport sector by region in total employment by NUTS 2 region,2006



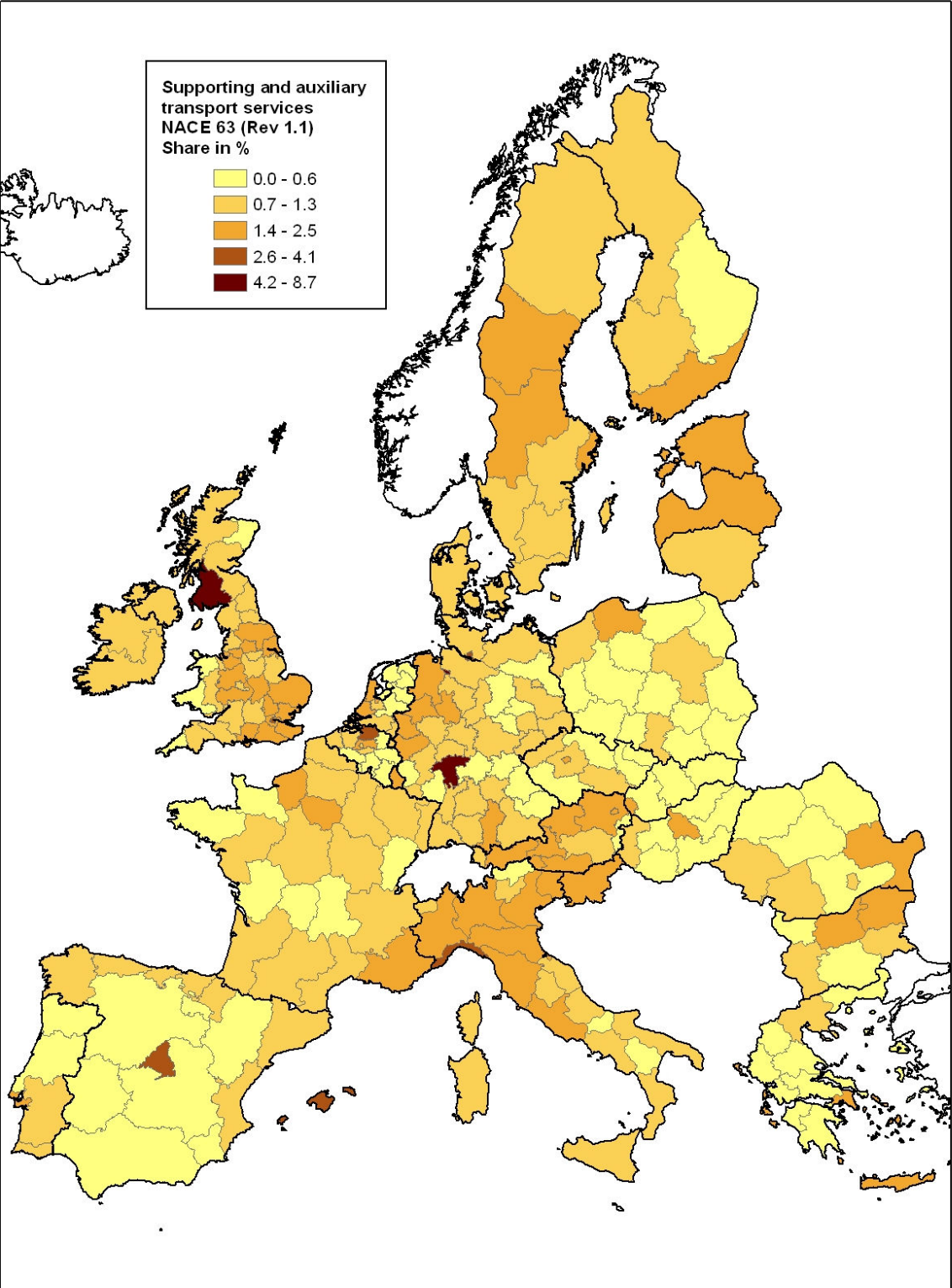
Source: Eurostat/TNO

Figure 3.4 Vertical share in the air transport sector by region in total employment by NUTS2 region,2006



Source: Eurostat/TNO

Figure 3.5 Vertical share in the supporting and auxiliary transport sector by region in total employment by NUTS2 region, 2006



Source: Eurostat/TNO

The NACE sector 60, transport over land, is the largest of the transport NACE subsectors where 5.84 million persons are working; this is 61% of the total employment in the transport sector. The annual growth in this NACE subsector 60 is 0.6 %, and is below the 2.0 % annual growth for the total transport sector.

Table 3.8: Employment*, total numbers 2006, annual average growth 2000-2006, share in EU 2006 and total change of share in EU 2000-2006. Land transport; transport via pipelines (NACE 60)

NACE 60	Employment in persons, 2006	Annual average growth 2000-2006	Share in EU 2006	Total change of share in EU 2000-2006
EU	5 848 792	0.6 %	100 %	0 %
EU15	4 275 997	1.1 %	73 %	2 %
NMS	1 572 795	-0.8 %	27 %	-2 %

* employers and employees

Source: Eurostat/TNO

In NACE sector 61, water transport, about 214,000 persons are working in Europe, this is only 2% of all employment in the transport sector. Table 3.9 provides more details.

Table 3.9: Employment*, total numbers 2006, annual average growth 2000-2006, share in EU 2006 and total change of share in EU 2000-2006. Water transport (NACE 61)

NACE 61	Employment in persons, 2006	Annual average growth 2000-2006	Share in EU 2006	Total change of share in EU 2000-2006
EU	214 541	2.3 %	100 %	0 %
EU15	194 045	3.5 %	90 %	8 %
NMS	20 496	-6.2 %	10 %	-8 %

* employers and employees

Source: Eurostat/TNO

In NACE sector 62, air transport, about 608,000 persons are working in Europe; this is about 6% of all employment in the transport sector. Table 3.10 provides more details.

Table 3.10: Employment*, total numbers 2006, annual average growth 2000-2006, share in EU 2006 and total change of share in EU 2000-2006. Air Transport (NACE 62)

NACE 62	Employment in persons, 2006	Annual average growth 2000-2006	Share in EU 2006	Total change of share in EU 2000-2006
EU	607 723	-0.2 %	100 %	0 %
EU15	584 431	0.4 %	96 %	4 %
NMS	23 292	-9.9 %	4 %	-4 %

* employers and employees

Source: Eurostat/TNO

Finally, in NACE sector 63, supporting and auxiliary transport services, about 2,941,000 persons are working in Europe, this is about 31% of all employment in the transport sector. Table 3.11 provides more details.

Table 3.11: Employment*, total numbers 2006, annual average growth 2000-2006, share in EU 2006 and total change of share in EU 2000-2006. Supporting and auxiliary transport activities; activities of travel agencies (NACE 63)

NACE 63	Employment in persons, 2006	Annual average growth 2000-2006	Share in EU 2006	Total change of share in EU 2000-2006
EU	2 940 760	5.9 %	100 %	0 %
EU15	2 534 787	5.7 %	86 %	-1 %
NMS	405 973	6.8 %	14 %	1 %

* employers and employees

Source: Eurostat/TNO

Table 3.12: provides an overview of employment in the transport sector in the EU in 2006

	total	Road (freight)	Road (passengers)	Railways	Inland water transport	Sea Transport	Air Transport	Others ²
EU-27	8 884 010	2 832 404	1 840 000	900 000	43 492	171 440	407 062	2 689 612
EU-15	7 045 599	2 217 748	1 414 686	528 258	35 199	154 429	377 189	2 318 090
NMS	1 838 411	614 656	425 314	371 742	8 293	17 011	29 873	371 522

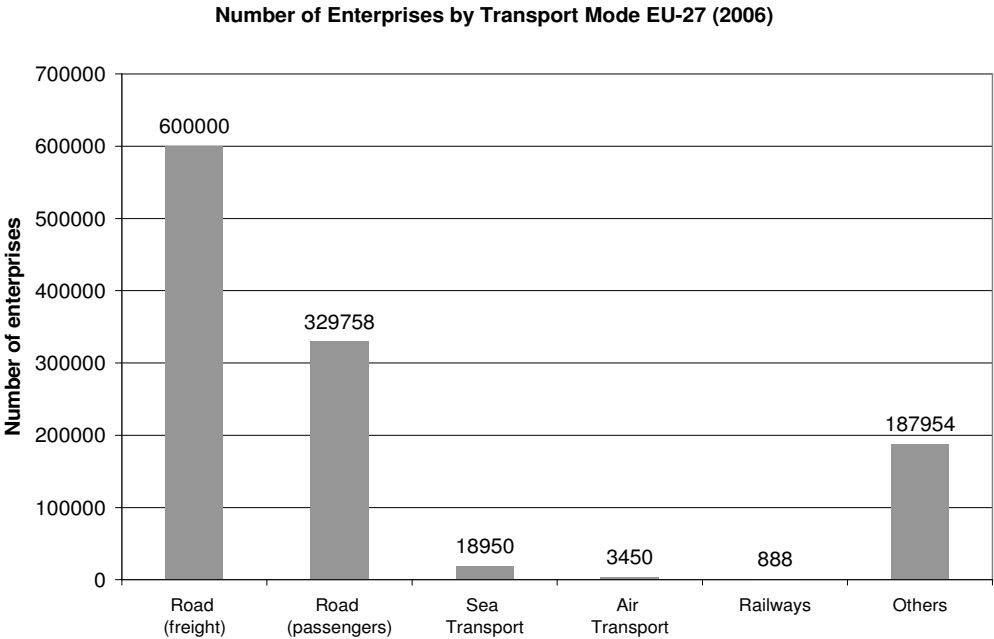
Source: European Commission: EU energy and transport in figures 2009

² Others include: pipelines, travel and tour agencies and other auxiliary transport activities

3.2 Employment structure and work organization

While some segments of the transport sector are dominated by large (and often monopolistic) companies (such as air and train transport), in the important freight transport by road segment small companies predominate.

Figure 3.3: Number of enterprises by mode of transport for EU-27

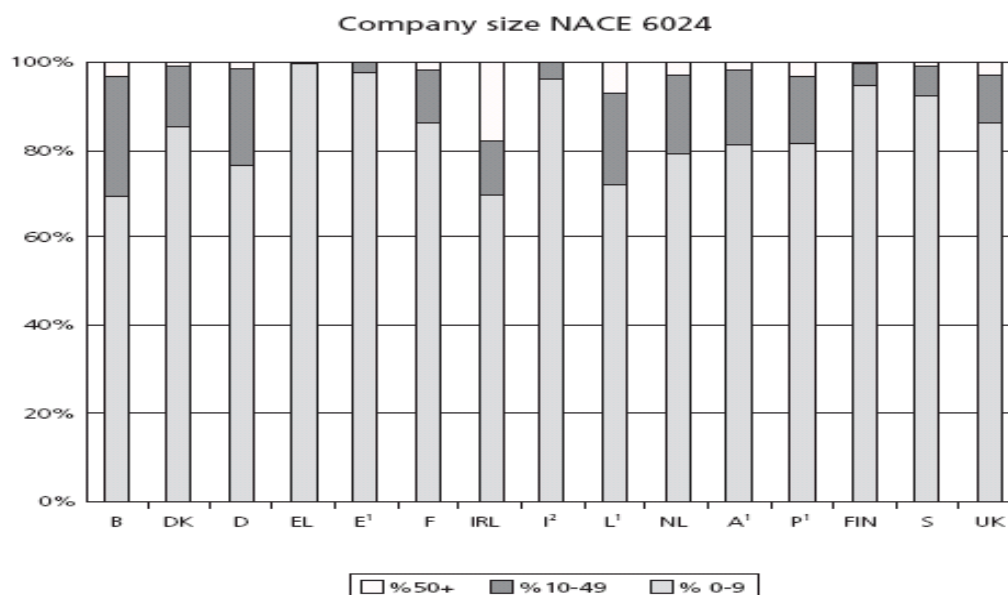


Source: European Commission: EU energy and transport in figures 2009

Differences exist between the EU countries, but 65% to over 95% of the freight transport by road companies have less than 10 employees and many of those are one-person firms. In most EU countries, small companies are over-represented in this sector when compared with the national average. Figure 3.4 gives an overview.

Figure 3.4: Number of trucks per company in European freight transport by road (%)

Company size in freight transport by road (%)



Note: NACE 6024 is freight transport by road

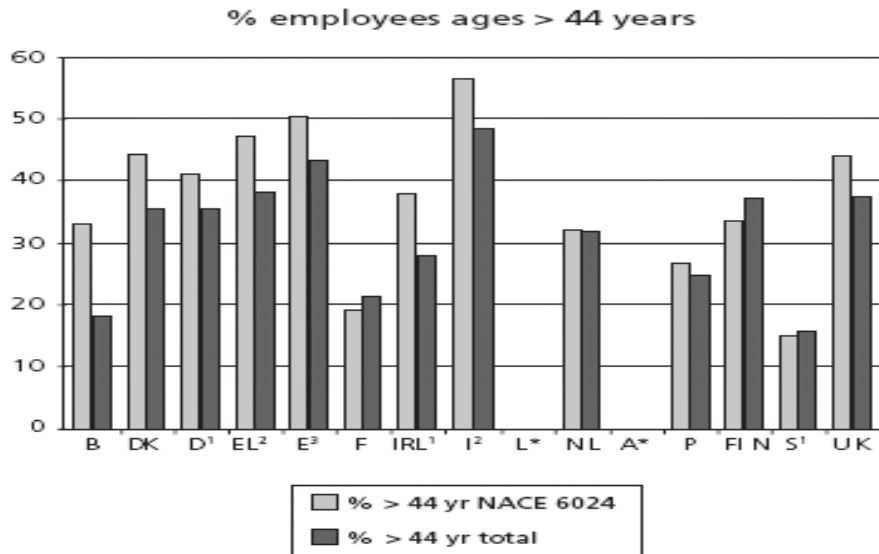
Source: Irene L.D. Houtman, EU road freight transport sector: Work and employment conditions, European Foundation for the Improvement of Living and Working Conditions, 2006

Age and gender

The transport sector has a gender issue when it comes to employment and recruitment. Labour force survey data shows that only 21.1% of the persons employed in the sector in 2005 were women. In road transport, the female share of the workforce was only 13.9%. The percentage of women working in the road freight transport sector is very much lower than in the overall economy (figure 3.5). It shows that this segment of the transport sector is especially dominated by men. Possible reasons for the low presence of female employees in this sector could be that the work has a higher physical workload or that it is more unfavourable for family life. But social reasons like difficulties for women to enter male-dominated occupations as well as safety issues on European roads, especially concerning long distance freight transport and safe parking areas (in order to observe resting periods) could also play a role.

The transport sector's age profile is also an issue for concern with only 17.5% of the workforce in the age group 15 to 29 and 57.5% of the workforce in the sector aged 30 to 49. Hence, a paramount source of future labour shortage in the transport sector will be retirement. In most EU countries, the percentage of employees older than 44 in the freight transport by road sector is higher than the average percentage for all sectors (see figure 3.6). This difference is especially pronounced in Belgium (B), Ireland (IRL), Denmark (DK), and Greece (EL).

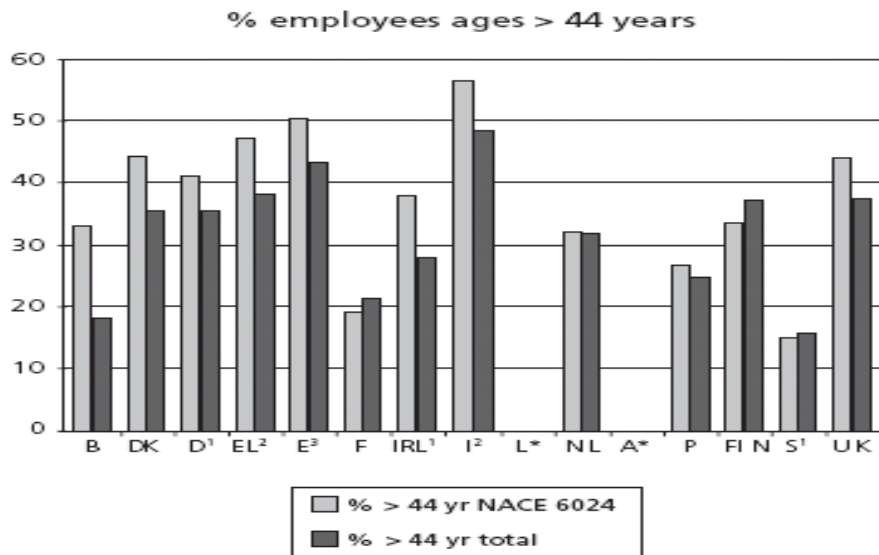
Figure 3.6: percentage of employees older than 44 that is economically active varies considerably across the EU countries.



Note: NACE 6024 is the code of: Freight transport by road.

Source: Irene L.D. Houtman, EU road freight transport sector: Work and employment conditions, European Foundation for the Improvement of Living and Working Conditions, 2006

Figure 3.6: percentage of employees older than 44 that is economically active varies considerably across the EU countries.



Note: NACE 6024 is the code of: Freight transport by road.

Source: Irene L.D. Houtman, *EU road freight transport sector: Work and employment conditions*, European Foundation for the Improvement of Living and Working Conditions, 2006

Work organization

Work organization refers to the way work processes have been designed and structured and involves issues such as job autonomy, work intensity, training and learning opportunities, social interaction and social support, and violence/aggression.

Training and learning opportunities in road transport are lacking in several EU countries. However, the situation appears to be changing. It is boosted by the trend that transport oriented companies are switching to logistics-oriented and require a higher customer service level. With increasing fuel prizes, insurance prizes and extreme competition in the road transport sector, employers have a vital interest to keep expenses to an absolute minimum. Therefore increased training is being carried out for low-fuel driving, efficient handling of goods as well as for health issues.

Work organization issues that are of relevance in the transport sector are:

- Work intensity has increased due to increased traffic congestion and the use of 'lean' strategies such as just-in-time.
- Training and learning opportunities in road transport are lacking in several EU countries. However, the situation appears to be changing. It is boosted by the trend that transport-oriented companies are switching to logistics-oriented and require higher customer service level;
- Job autonomy is obviously lower than the national average in most EU countries. The degree of control that workers exercise over their work is limited in road transport;
- Social interaction and social support also play an important role. A high percentage of drivers in freight and passenger transport by road work in isolation. They have few contacts with their colleagues and supervisors; and
- Drivers in public transport are increasingly being confronted by violence/aggression of passengers.

Health and safety

The road transport sector displays a high level of occupational accidents. The main causes of accidents in the sector are:

- Road accidents;
- Falling from high surfaces, ground level falls, trips and slips;
- Contact with moving or stationary objects, being struck by falling and moving objects;
- Physical effort, handling, lifting and carrying objects, awkward movement.

Physical work environment

The physical work environment in the transport sector is characterized by a specific set of ambient, ergonomic and safety conditions, and by access to specific equipment and technology. The most significant risks facing employees in the transport sector are noise, vibrations, lighting, temperature fluctuations/heat, emissions/contact dangerous substances, dust, strenuous postures/lifting, prolonged sitting, repetitive work, and road safety. It has to be noted, however, that technological progress has improved working conditions, for example in

regard to ergonomics, assistance by handling heavy objects, reduction of noise and pollution as well as safety and protection. Table 3.13 summarizes these risks in the EU15 countries.

In addition to work organization, health and safety, and the physical work environment, also issues like working hours, income, and also social protection determine the quality of employment in the transport sector.

Table 3.13: Main risks related to physical work environment

Risk factor	B	DK	D	EL	E	F	IRL	I	L	NL	A	P	FI	S	UK
Noise	•	•		•p	•	•	•				•		•	•	•
Vibrations	•	•		•p	•				•	•	•		•	•	•
Lighting													•		
Temperature fluctuations/heat		•		•p		•							•	•	
Emissions/contact dangerous substances	•			•p	•				•				•	•	•
Dust				•p											
Strenuous postures/lifting	•	•g	•						•	•		•	•	•	•
Prolonged sitting	•	•	•						•		•		•	•	•
Repetitive work		•p											•		
Road safety	•	•		•	•			•	•			•	•		•

For countries that provided information on both transport of goods and persons:

•p = transport of persons; •g = transport of goods, • = both sub-sectors

Source: Irene L.D. Houtman, EU road freight transport sector: Work and employment conditions, European Foundation for the Improvement of Living and Working Conditions, 2006

3.3 Employment - main trends by job function

One of the most interesting indicators for analysing the future on jobs and skills is the trends and developments that can be identified at the (micro) level of job functions. More than aggregate employment and more than figures about gender and age distribution can changes in job functions tell us something about ongoing change and restructuring in the sector. Changes in (the need for) competences and changes in the distribution of job functions are closely linked to each other, both at the level of the sector and at the level of the firm. Competences are combined in occupation profiles, and can be distinguished in core competences, specialization competences or complementary competences (Rodrigues, 2007:34). Another distinction is between theoretical, technical and social competences (i.e. knowledge, skills and competences in ECVET) (ibidem). Identifying the changes in job functions by sector is a first step towards a better understanding of the changing competence needs in the sector. Competences for the purpose of this study are assumed to be located in a

general grid defined by the main occupation functions: general management, marketing, financial and administrative management, R&D, logistics, production management, production, quality and maintenance (Rodrigues, 2007:35).

As a first step towards identifying trends in competences, the observed changes in the distribution of job functions over time will be analysed, using Labour Force Survey (LFS) data.³ In the second part (the scenario-based future-oriented part), a further elaboration of these changes on the need for new and existing competences will be provided. The analysis starts with an analysis of the state-of-play, i.e. the situation as per 2006. Subsequently, changes in job functions over time are discussed, in general (overall) and for different categories of workers classified according to educational level.

Employment by occupation: state-of-play and main changes

Drivers and mobile plant operators represent the largest share of employees in the EU (45%), whereas the share in the EU-15 is at 43% and the NMS even 53%. The second highest shares can be found in professionals and technicians as well as clerks with 11 to 17% (see Table 3.14). Ship and aircraft control technicians, machinery mechanics, craft trade workers and other machine and plant operators have the lowest shares of employees with under 5%. This can also be due to the facts that some of these activities may fall within services that are covered by other NACE codes (e.g. GA50: Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel) or are highly automatised. There are also no substantial differences in employment shares by occupation between old and new member states, except for the number of drivers and mobile plant operators which has already been mentioned above.

Table 3.14: Share of employment by occupation in transport (NACE 60+ 61+ 62+ 63), 2006 (in %)

	EU	EU 6	EU 9	EU 15	NMS
Managers	7	7	8	8	6
Ship aircraft control/technicians	2	2	3	2	1
Professionals/technicians	12	14	9	11	13
Clerks	15	18	15	17	10
Service workers	4	4	6	5	4
Machinery mechanics	3	2	2	2	4
Craft trade workers	3	3	2	2	5
Drivers/mobile plant operators	45	42	45	43	53
Other plant/machine operators	1	1	0	1	1
Elementary occupations	8	8	10	9	5

Table 3.15 depicts the changes in share of employment by occupation in transport over the time-frame from 2000 to 2006. In most occupations, the changes have not been substantial, except for drivers and mobile plant workers in the NMS that registered an increase by 19% on the one hand and other plant machine operators (also in the NMS) with a decrease of 12%, whereas the overall share of the latter group has been generally low. The situation within the EU-15 remained basically stable.

³ Data on occupational structure follow the availability of overall employment figures presented earlier.

Table 3.15: Change in share of employment by occupation in transport (NACE 60+ 61+ 62+ 63), 2000-2006 (in %)

	EU	EU 6	EU 9	EU 15	NMS
Managers	0	0	0	0	0
Ship aircraft control/technicians	0	0	0	0	0
Professionals/technicians	2	2	1	2	0
Clerks	-1	0	-2	-1	0
Service workers	0	0	0	0	-1
Machinery mechanics	0	-1	0	0	0
Craft trade workers	0	0	0	0	-3
Drivers/mobile plant operators	2	-2	-3	-2	19
Other plant/machine operators	-2	0	0	0	-12
Elementary occupations	1	0	3	2	-2

Occupations and qualification level

The share of the low qualified workforce in the transport and logistics sector lies at 28% for the total EU, whereas it is even only 7% for the NMS. The largest amount of these people works in elementary occupations (47% for the total EU, 48% for the EU-15 and 31% for the NMS.) In the segment of low educated workers the contrast between EU-15 and NMS is especially high as it can be seen in Table 3.16.

Table 3.16: Share of low qualified* employes by occupation in transport (NACE 60+ 61+ 62+ 63) 2006 (in %)

	EU	EU 6	EU 9	EU 15	NMS
Total	28	32	36	33	7
Managers	16	16	23	19	1
Ship aircraft control/technicians	6	10	4	7	0
Professionals/technicians	10	13	12	12	1
Clerks	20	22	25	22	5
Service workers	19	20	24	22	5
Machinery mechanics	20	28	29	28	2
Craft trade workers	17	22	28	24	6
Drivers/mobile plant operators	37	46	48	46	8
Other plant/machine operators	29	38	36	36	13
Elementary occupations	47	50	48	48	31

Table 3.17: Change in share of low qualified*employees by occupation in transport (NACE 60+ 61+ 62+ 63), 2000-2006

	EU	EU 6	EU 9	EU 15	NMS
Total	-7	-3	-9	-5	-5
Managers	-2	1	-4	-1	-2
Ship aircraft control/technicians	0	1	0	0	0
Professionals/technicians	-2	0	-3	-1	-1
Clerks	-5	-3	-7	-5	-1
Service workers	-5	-1	-7	-3	-5
Machinery mechanics	-10	-6	-5	-5	-11
Craft trade workers	-5	-6	-8	-6	-2
Drivers/mobile plant operators	-12	-4	-11	-7	-6
Other plant/machine operators	11	-4	-5	-5	-1

Elementary occupations	-10	-4	-19	-10	-8
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Employees with medium qualification comprise the highest share in the transport and logistics sector. For all EU countries they represent 58% of the workforce and for the NMS even 81%. Employees with medium education can be mostly found in the job categories of machinery workers, service workers, craft trade workers and clerks. In the NMS, even 90% of drivers and mobile plant operators have a medium education, while in the EU-15 the figure lies only at 50%. In the EU-15 at least 50% of the workforce in all functions has a medium-level occupation except for aircraft and control technicians with the highest share of high qualified employees and elementary occupations with the highest share of low qualified workers.

Table 3.18: Share of medium qualified* employees by occupation in transport (NACE 60+ 61+ 62+ 63),2006 (%)

	EU	EU 6	EU 9	EU 15	NMS
Total	58	55	47	52	81
Managers	52	54	46	50	58
Ship aircraft control/technicians	46	49	45	48	39
Professionals/technicians	52	54	42	50	56
Clerks	64	64	55	61	84
Service workers	60	58	53	56	81
Machinery mechanics	73	69	56	64	95
Craft trade workers	75	71	54	65	91
Drivers/mobile plant operators	59	51	45	50	90
Other plant/machine operators	63	52	55	54	85
Elementary occupations	47	44	44	45	67

Table 3.19: Change in share of medium qualified*employees by occupation in transport (NACE 60+ 61+ 62+ 63), 2000-2006 (in %)

	EU	EU 6	EU 9	EU 15	NMS
Total	5	1	6	3	4
Managers	3	0	4	2	6
Ship aircraft control/technicians	-3	5	-10	-2	-3
Professionals/technicians	-4	-4	-2	-3	-7
Clerks	3	1	2	2	-3
Service workers	1	-4	6	1	0
Machinery mechanics	9	7	-1	3	11
Craft trade workers	4	7	1	4	3
Drivers/mobile plant operators	12	3	10	6	8
Other plant/machine operators	-18	-4	-2	-2	-1
Elementary occupations	7	2	16	8	8

Only 14% of all employees in the transport and logistics sector of the total EU have a high qualification, whereas most of them (45% for EU-15 and 61% for the NMS) work as ship/aircraft controllers or technicians. The other categories with a substantial share of high qualified people are professionals and technicians and managers and to a much lesser extend clerks and service workers. There only very few machinery mechanics, crafts workers, drivers

and mobile plant operators, machine operators and elementary occupations staffed with high qualified workforce, especially in the NMS.

Table 3.20: Share of high qualified*employees by occupation in transport (NACE 60+ 61+ 62+ 63), 2006 (in %)

	EU	EU 6	EU 9	EU 15	NMS
Total	14	13	17	15	12
Managers	32	29	32	30	41
Ship aircraft control/technicians	48	40	51	45	61
Professionals/technicians	39	33	46	38	43
Clerks	16	14	21	16	12
Service workers	21	21	22	22	14
Machinery mechanics	6	3	15	8	3
Craft trade workers	7	7	18	10	3
Drivers/mobile plant operators	4	3	6	5	2
Other plant/machine operators	8	10	10	10	2
Elementary occupations	6	6	8	6	2

Table 3.19: Change in share of high qualified workers* in employment by occupation in transport (NACE 60+ 61+ 62+ 63), 2000-2006 (in %)

	EU	EU 6	EU 9	EU 15	NMS
Total	2	2	3	2	1
Managers	-1	-1	0	-1	-4
Ship aircraft control/technicians	2	-6	10	2	3
Professionals/technicians	5	5	5	4	9
Clerks	2	2	5	2	3
Service workers	3	5	1	3	5
Machinery mechanics	1	0	6	2	-1
Craft trade workers	1	-1	7	2	-2
Drivers/mobile plant operators	0	1	1	1	-2
Other plant/machine operators	7	8	7	7	2
Elementary occupations	2	2	4	2	0

If looking at the tables that depict the changes in shares per qualification group (Table 3.17, Table 3. and Table 3.19) it gets obvious that the qualification requirements are getting higher throughout the sector. The shares of people with low qualification has declined in every occupation with the highest drops in drivers and mobile plant operators, machine mechanics and even elementary occupations. Also the shares of medium qualified workers has declined from 2000 to 2006 with the highest figure of minus 18% for other plant and machine operators for the total EU. The shares of high qualified people has experienced slight to moderate growths throughout the time period. In general it looks as if there has been a migration from low to medium qualification needs and from medium to high qualification needs in almost all occupations.

These figures indicate that the transport and logistics sector actually consists of employees which are better educated than the general perception of the sector with a rather “low skill image” may suggest.

3.4 Productivity and labour costs

Apparent labour productivity (defined here as value added divided by the number of persons employed) for the European transport services sector was € 42,000 in 2004 (table 3.22), which was slightly higher than the non-financial business economy average (€ 40,900). However, with 140% the wage-adjusted labour productivity (= apparent labour productivity / average personnel costs) of the transport services sector was slightly lower than the non-financial business economy average of 148%. The ratios for the different sub-sectors varied considerably: transport via pipelines (890%) and water transport (270%) had ratios well above the non-financial business economy average, while the ratios of the sub-sectors other land transport (120 %), air transport (120%), and railway transport (124%) are the lowest in the transport services sector as well as the non-financial business economy in general (Eurostat 2007).

Table 3.20: Apparent Labour Productivity and Wage-Adjusted Labour Productivity, 2004

Economic (sub-) sector	Apparent labour productivity (‘000 euros)	Average personnel costs (‘000 euros)	Wage adjusted labour productivity (%)
<i>Transport services</i>	42.0	30.0	140
Transport via railways	38.0	30.7	124
Other land transport	30.0	26.0	120
Water transport	110.0	--	270
Air transport	70.0	60.0	120
Transport via pipelines	374.8	42.1	890
Auxiliary transport activities	60.4	34.1	177
Activities of travel agencies	43.0	25.9	166

Source: Eurostat (2007)

3.5 Industrial relations

The findings of a recent study on industrial relations in the road transport sector in the EU (Impact of the working time directive on collective bargaining in the road transport sector, IES 2007) are summarized below.

Social dialogue

Depending on the national social dialogue process, tripartism plays a role in elaborating working time regulations in some EU countries. For example, in the Czech Republic, the regulation which transposes the Working Time Directive was discussed at national tripartite level in the Council of Economic and Social Agreement of the Czech Republic. During these tripartite discussions, employers and trade unions expressed a number of criticisms both in relation to the consultation process – which was too short according to the employers – and the content of the proposed regulation. The government examined the objections put forward by the social partners in this tripartite forum and incorporated their proposals into the final wording of the regulation. In Latvia, the social partners and government signed a sectoral-

level tripartite agreement on socioeconomic partnership in the road transport sector in June 2006, stipulating the creation of a cooperation council to provide technical assistance in implementing a cooperation agreement for the sector and in preparing a sectoral agreement. Tripartite social dialogue in the road transport sector is also evident in Slovakia, where meetings are held three to four times a year.

Some countries have encountered problems with the social dialogue process in the road transport sector specifically. For example, in Luxembourg, social dialogue is reported to have deteriorated and the sector's collective agreement, which expired on 31 December 2006, has not yet been renewed, although it has been automatically extended for one year. Trade unions highlight that the Working Time Directive has not yet been transposed in this country and is blocking the conclusion of new lower-level collective agreements in the sector. In some of the New Member States, where social dialogue is not as firmly established as it is in the EU15, a lack of social dialogue is evident in the road transport sector. This is the case in Lithuania, for instance, where collective bargaining only takes place in companies in which strong trade unions are present, as a legacy of the former Soviet rule. In Bulgaria, social dialogue is weak in the road transport sector due to low trade union density and few employer representatives.

By contrast, social dialogue is comparatively stronger in the Latvian road transport sector; this is because the sector is covered by the country's fourth largest trade union and one of the country's biggest employer organisations.

Collective bargaining

Collective bargaining in the road transport sector takes a number of forms, depending on the country and usually in line with the dominant method in the particular country. In some countries bargaining takes place at the level of the sector, in others at the level of the company, and in again other countries it is a mixture of the two.

Sectoral-level bargaining: In many countries, bargaining at sectoral level is the predominant form in the road transport sector. In Belgium, for example, where separate joint committees exist for blue-collar and white-collar workers, urban and local public bus drivers are covered by a separate local public transport joint committee. However, the Belgian government has indicated that it wants to create one joint committee for all companies involved in logistics. Sectoral bargaining takes place in Estonia, where two collective agreements are in place, while in Finland three collective agreements exist in the sector, covering truck drivers, bus drivers and oil and tanker drivers. In Luxembourg, two separate sectoral-level agreements are in place, covering the passenger transport sector and the goods transport sector. In Portugal, three separate sectoral agreements exist in the transport of goods sector and a further three in the passenger transport sector. Bargaining is also conducted at sectoral level in Bulgaria, where a sector-wide agreement sets out a framework within which company bargaining can take place, and in Greece, where five separate branch agreements are in place. In Denmark, bargaining takes place predominantly at sectoral level, mostly resulting in multi-employer sectoral agreements with subsequent agreements at sub-sector level. Special mention should be made of Malta, where collective bargaining in the road transport sector is non-existent, as the majority of operators are self employed and own their own vehicle.

Company-level bargaining: Bargaining at company level takes place in the road transport sector – as in other sectors – in Ireland and the UK. However, in Ireland, bargaining occurs within the framework of national social partnership agreements in the case of unionised companies. In the UK, although bargaining in the road transport sector takes place at company level, a minimum amount of pay setting occurs through regional Joint Industrial

Councils. In Latvia, bargaining in road transport takes place at company level, although a sectoral cooperation agreement is also in place in relation to the social dialogue process. In Lithuania, collective bargaining occurs at company level only; this is largely due to the low trade union density in the sector and a mismatch among the social partners, whereby the employers operate mainly in freight transport while the majority of trade union members work in passenger transport. In Cyprus, bargaining is decentralised to company level, although coverage is low, as a significant number of people in the sector are self employed, usually as workers or owners. In Slovakia, company-level agreements predominate, and these are usually concluded every two or three years.

Mixture of bargaining levels: In some countries, bargaining takes place at a number of levels. This is the case in the Czech Republic, for instance, where multi-company level agreements set out a framework, including a minimum rate of pay and social standards, while individual company-level agreements stipulate more detailed provisions. Multi-company agreements usually cover a number of years, whereas individual company-level agreements are generally concluded for a one-year term. In Italy, as is standard practice in the country, a national sectoral-level collective agreement is in place for the road transport sector, and this sets a framework for collective bargaining at company level. In Germany, bargaining takes place at regional and company level in the road transport sector, resulting in over 1,000 agreements covering different sections of freight and passenger transport. Similarly, in the Netherlands and Norway, bargaining takes place at both sectoral and company level, although it should be noted that bargaining predominantly takes place at sectoral level in Norway; nonetheless, company-level agreements sometimes improve on sectoral-level provisions, notably in areas such as pay, or exist where companies are not members of an employer organisation. In Poland, a sectoral agreement is in place in road transport, in addition to a range of single-employer agreements. A similar scenario is evident in Spain, where regional sectoral agreements exist and company agreements are concluded within the framework of these agreements. In Hungary, two sectoral agreements are in place, along with seven multi-employer agreements and 39 single-employer agreements. In Romania, a sectoral agreement is in place, within the framework of which multi-company agreements are bargained. In Slovakia, both sectoral and enterprise-level agreements exist. Once again, Malta proves to be an exception in this instance, with no evidence of collective bargaining taking place in the road transport sector, as the majority of operators are self employed and own their own vehicle.

Length of collective agreements

The length of collective agreements varies according to country. In some countries, the length is influenced by the national bargaining framework. In Belgium, for instance, two-year collective agreements are the norm in the sector, within the framework of the national multi-sector bargaining programme, while one-year agreements are customary in Slovenia. Similarly, in Finland, the renewal of collective agreements in the road transport sector follows the cycle of the country's national incomes policy agreements and the normal duration is two years. The Estonian and Bulgarian road transport sectors are also covered by two-year agreements. Spanish agreements tend to last for two to three years, although one-year agreements or those lasting more than three years also exist. In Cyprus, agreements last between one and three years, while in the Netherlands the typical duration is between one and two years, in keeping with the tradition in the country.

In certain countries, the pay issue leads to a specific timetable. Collective agreements in Norway, for example, are reviewed every two years but the pay element is updated every

year. In Denmark, the road transport sector follows the tradition of the so-called ‘normal wage area’, with agreements set to be renewed every two years; however, the previous two agreements have been of a three-year duration, and thus transport follows the trend set by the country’s industry sector. In Italy, as is customary in this country’s collective bargaining, the normative part of the national sector-level agreement for the road transport sector is renewed every four years, while the pay provisions of the agreement are renewed every two years. In other countries, the duration of collective agreements tends to vary depending, for example, on the types of subsectors. In Hungary, for instance, one-year agreements are the norm in the public bus transport sector, while agreements concluded in freight transport cover a period of between three and five years. In Germany, some agreements may be of a one-year duration, while others may last a number of years; moreover, by law, if an agreement comes to an end, and as long as no new agreement has been signed, the so-called ‘after-effect’ (Nachwirkung) clause means that the agreement will remain in force.

In Luxembourg, the relevant collective agreement expired on 31 December 2006, but has not been renewed and has been automatically extended for one year. Nevertheless, the trade unions fear that there could be a period during which there is no collective agreement, as it will be impossible to secure new collective agreements without first transposing into law the Working Time Directive for drivers in the transport sector.

3.6 Partnerships for innovation, skills and jobs

One of the central tenets of the renewed Lisbon Strategy is the partnership concept; by building a European partnership for growth and employment, the reforms needed to boost growth and employment will be facilitated and speeded up (European Commission, 2005). Partnership in this view “mobilises support” (mobilisation) and “gets the different players at work together” (collective effort), as well as “makes sure that the(se) objectives and reforms are taken on board by all the various players” thus spreading ownership (ibidem, page 14). In the implementation of the European Cohesion Policy, the partnership principle is fundamental as well. The EU recognises the importance of involving local and regional actors, in particular in areas where greater proximity is essential such as innovation, the knowledge economy and new information and communication technologies, employment, human capital, entrepreneurship, support for SMEs and access to capital financing. Beyond that public-private partnerships and further improvement of governance in the fields of entrepreneurial innovation, cluster management, innovation financing are promoted at all levels – from the local to the regional, the national and the EU level as well as across sectors. Partnerships for innovation, skills and jobs, in connection with technology platforms, industrial high level groups, as well as lead market and cluster initiatives are being promoted at both European and national level.

Existing partnerships for innovation, skills and jobs generally show a number of characteristics, which include:

- *Involvement of all relevant actors*, ranging from companies, research organisations, education and training institutes to public administration and others.
- *Cross-sectoral approach*: even though partnerships may be assigned to a specific sector, they often work across different business sectors.
- *Cross-thematic approach*, i.e. linking innovation, skills and jobs.
- *Inclusion of general human needs into the partnership strategy*: human needs, such as housing, health or mobility can be part of the formulated partnership vision or strategy
- *Long term commitment of actors (members)*.

- *Joint problem solving*, i.e. working on problems that cannot be met by one member alone
- *European dimension*, i.e. being established at the European level.

Partnerships for innovation, skills and jobs can create a leverage effect for innovation, especially if broader *general human needs* are taken into consideration.⁴ For instance, partnerships in the tourism sector aiming at developing ‘leisure’ should combine knowledge in tourism with, e.g., culture, sports and environment. A partnership aiming at developing the quality of habitat consequently should combine knowledge on at least construction, furniture, electronics and urban management. Partnerships for innovation, skills and jobs integrating general human needs on European level are still very rare.⁵ It is likely to find more inclusive partnerships on the national and regional level.

Whereas the potential benefits of partnerships are clear, finding strong examples that fit the above characteristics at EU level are still difficult to find. There are, however, good examples in various sectors at the national and the regional level. Some of these stand out in terms of partnership approach, innovation capacity, approach for skills development, or their job maintaining and job creating capacity. Examples include the City Fringe Partnership for developing regional job opportunities in the printing sector and the ERRAC and EURNEX network in the rail sector where a European approach is combined with a strong effort to integrate latest research results in an virtual European training curriculum.

Partnerships, networks and clusters on innovation, jobs and skills often face similar barriers and obstacles, whatever sector is at stake. These include:

- *Restricted scope*: Partnerships often are set up in order to solve problems which can not be met by one partner on its own. The problems, thereby, are either defined bottom-up or articulated by the politics in a top-down process. In the latter case, the scope of partnership is limited to their given geographical scope and/or their thematic focus (If partnerships are established top-down as instrument to address specific problems they are usually restricted to the policy represented by the awarding authority, e.g. a particular Ministry). Similarly, partnerships and networks established at the European level, such as e.g. networks of excellence, technology platforms, etc. have a specific thematic focus (in this case innovation in research and development).
- *Short-term nature*: Partnerships which are built up by means of public funding are often project driven, feature a short term nature and, generally, are not sustainable due to their dependence of a single fund.
- *Weak direct links between skills, jobs and innovation processes*: Skills upgrading and job opportunities are a result of innovation processes. Therefore, partnerships which focus on innovation do seldom focus on skills and jobs with the same strong interest.
- *Sectoral restrictions*: In general partnerships working on international or European level seem to be more likely to occur in strongly internationalised economic sectors with a common universal challenge (e.g. pollution or sustainable development). Then they are mostly limited to the problems they want to address.

Partnerships in the transport sector

⁴ An argument put forward by professor Rodrigues at the workshop “Innovation policies for a knowledge intensive economy – assessing the European experience” in 2005 in Brussels.

⁵ Outside the scope of the current series of studies, there is at least there is one good example, the European Construction technology platform (see <http://www.ectp.org/default.asp>).

The European Rail Research Advisory Council (ERRAC) was set up in 2001 with the ambitious goal of creating a single European body with the competence and capability to assist in revitalising the European rail sector and to make it more competitive, by fostering increased innovation and guiding research efforts at European level alongside its Strategic Rail Research Agenda (SRRA).

ERRAC (www.errac.org) is an European Technology Platform funded by the sixth European Research Framework Programme. ERRAC wants to pave the way for new innovative forms of collaborative European rail research and implements joint technology initiatives. The platform consists of a broad range of stakeholders comprising enterprises of the sector, associations, research institutions and public administration. In its strategic agenda, ERRAC formulated a joint vision on future transport in Europe combining several means of transport and defined future research areas, such as intelligent mobility, energy and environment, personal security, test, homologation and security, competitiveness and enabling technologies, strategy and economics infrastructure, benchmarking as well as training and education.

The European Rail Research Network of Excellence (EURNEX) includes more than 60 universities from 18 EU countries (www.eurnex.net). This network of excellence has jointly defined guidelines for future training and education in the railway sector in accordance to the ERRAC training and education plan. The aims include to create a pool of short training courses, to support the running of short training courses, to implement international PhD and Master programs, to launch a virtual European University of Railway, to promote interdisciplinary contacts (collaboration across modules), to establish a permanent forum for prospective studies, to promote the exchange of knowledge ((e)-learning material, publications, etc.), to promote the dissemination of knowledge gained from research projects via publications, and, finally, to use research results in education programs and short training courses. The virtual European Rail University is part of a project proposal of EURNEX in the current seventh European Research Framework Programme.

The main focus of ERRAC is to jointly define research in the rail transportation sector whilst both ERRAC and EURNEX are focussing on gaining new knowledge about rail transport. The approach taken, which is to integrate the knowledge gained by projects into education and training, with the ambitious goal to set up a European virtual University, is remarkable.

Training in the transport sector

Training and certification in the transport sector is mostly conducted on a national level. (New) training courses need to become more flexible in order to adapt to technological changes and attract new entrants. In almost all areas in the transport sector, new technologies, especially simulations, are contributing much to skill improvements, skill-updating, re-skilling and a reduction in training time. Due to the aging workforce in the transport sector, the recruitment of younger people is essential, which according to the statements of experts during the workshop is not easy, partly due to the unfavourable image of the sector. Re-training, life-long-learning (LLL) and upskilling will become increasingly important as technology progresses and the workforce will age. Life-long-learning will become unavoidable, which is currently not being widely practiced, as well as the ability to cope with more complex technologies and organizational structures. It has been observed by some sector experts (during the expert workshop) that it might be difficult to get middle-aged and lower skilled people to educate themselves, engage in life-long-learning or take the initiative for skills improvement.

Aging as well as a lack of higher qualified people are a considerable problem for Europe's transport sector, which is experiencing a general "upskilling" process as the data that relates educational levels with occupations (chapter 3.4) has shown. Especially the European rail sector, but also others are already experiencing a shortage of skilled workers according to the sector experts. Since many will enter retirement in the near future, there is not only the concern over recruiting enough young people, but also over losing important skills due to experienced people leaving the sector. Recruiting is especially difficult because certain standards in quality, skills and sense of responsibility have to be fulfilled. Therefore employing insufficiently qualified people represents no option.

Too much one-sided focus on competitiveness, efficiency and cost reductions holds the danger of making the sector less attractive and less safe. The best strategy should be rather the other way around: to improve growth and competitiveness by providing attractive working conditions and emphasize safety and with this generate trust. Potential job candidates should also get better information about career prospects in the transport sector, should be provided with career path mappings and be better informed about the advantages transport careers have to offer. For example insurance companies may find it to be of added value if an employee has working experience as ship captain or rail/truck driver. Also the air transport sector faces the problem that many stewards only stay in the job for a rather short time. According to the experts, one reason for this is that many young people enter the job after finishing (high) school and before entering university. The other reasons has is that many entrants picture the job as steward/stewardess as highly attractive and come with great expectations which get disappointed by the harder-than-expected job reality. Sector experts have attested that initiatives pointing towards this direction have already proven successful.

There are several European tools to support EU-wide training, e.g. the European Qualification Framework which might also become more extended in regard to the transport sector. The quality and capabilities of trainers and teachers also have also become improved and life-long learning applies to both sides. Training facilities are also increasingly applying latest didactic and technological developments to improve the quality and attractiveness of training programs.

Box 1: Example of modern bus training program

„Combus Taining was founded to deveop and implement a computer based training program for transportation enterprises. The goal of this specific approach is to increase the safety and quality of public transportation by bus. The Mnistry of the Environment and Traffic as well as the European Union participated in this initiative. Compus training GmbH was the first entity to develop new training technologies for the bus industry and to integrate them into the existing education system for bus drivers. This innovative training model has been widely adopted throughout Germany. [...]

A growing number of bus enterprises are using computer-based training (CBT) in both entry-level and advanced training courses for bus drivers. [...] CBT is an interactive multimedia tool. The user-friendly software combines video sequences with games, animations and portions of theoretical content which is frequently tested to assess the user's progress. Driving situations are simulated with the help of 3D animation to enable bus drivers to practice fuel efficient and environmentally friendly driving skills.”

From German Combus Training GmbH

According to a survey about future skill needs in rail transport, conducted by the UK Sector Skills Council (SSC) for passenger transport in 2006, so-called “soft skills” like leadership skills, people management and customer service have been named as most important (GoSkills, 2006):

Table 3.23: Future Skill Needs – Train Operating Companies

Leadership	70%
People management	70%
Customer service	60%
Communication	40%
Basic IT	40%
Specialist industry knowledge	30%

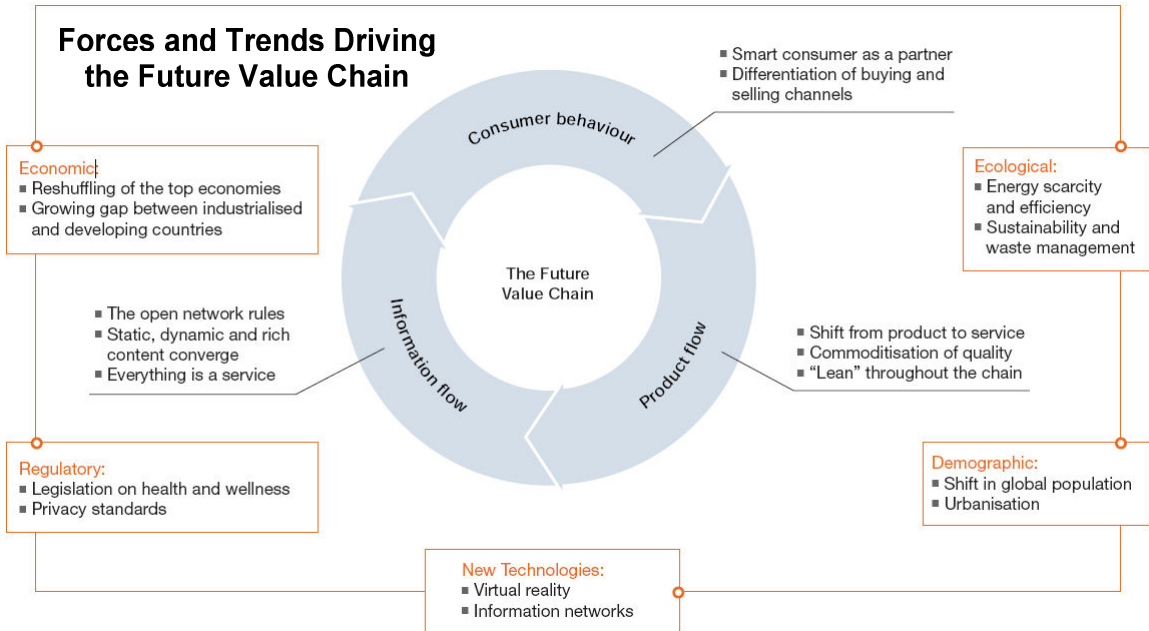
Source: GoSkills Survey of Train Operating Companies, Spring 2006

4 Value chains, networks and actors

4.1 Analysis of the value chain

Economic development, regulatory issues, new technologies, ecology, demography, and other social issues affect value chains in general, as illustrated in Figure 4.1: Forces and trends driving the future value chain

Figure 4.1: Forces and trends driving the future value chain



Source: The future value chain 2016, Global Commerce Initiative, Caggemini, Intel, 2006

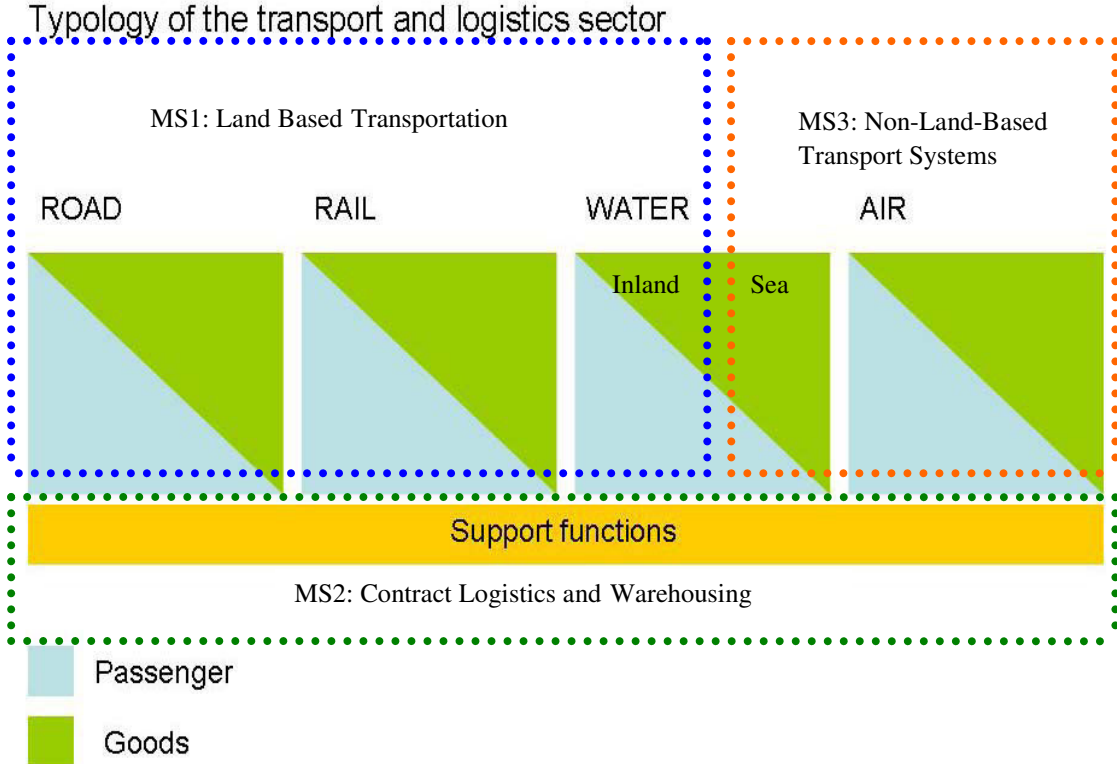
In this chapter we give some structure to the major transport logistics market segments, as well as matching the segments with a typical supply chain. In this way we consider market segments and their applicability for satisfaction of transportation needs. This approach builds a framework that can be applied in ever-changing transportation market.

As illustrated by Figure 4.2, the transport and logistics sector comprises four types of transportation, namely: road, rail, water, and air. A further distinction can be made between transporting goods and passengers. In addition, these transport activities are supported by activities such as contract logistics, warehousing, and terminal operations.

Most freight transport is completed by road (NACE 60). Demand for land transport of goods in the EU27 added up to 2,463 billion metric tons kilometres (tkm) in 2006. Of these, road transport accounts for 76.6% and rail transport for 17.7%. Inland water transport (NACE 61) is estimated at about 138.4 billion tkm, or 5.6% of total freight transport. Only 0.1% of freight transport was done by air (NACE 62), corresponding to 2.5 billion tkm.

Demand for passenger transport (NACE 60), such as cars, buses, railways, trams, and metro, amounted to 5,443 billion passenger kilometres (pkm) in 2004. Intra-EU air transport (NACE 62) amounted to 449 billion pkm and water transport (NACE 61) to 35 billion pkm. In 2006, consumers spent on average 13.3% of their income on transport. About one sixth of this sum was spent on purchasing passenger transport services and the remainder (€ 616 billion) was spent on private transport.

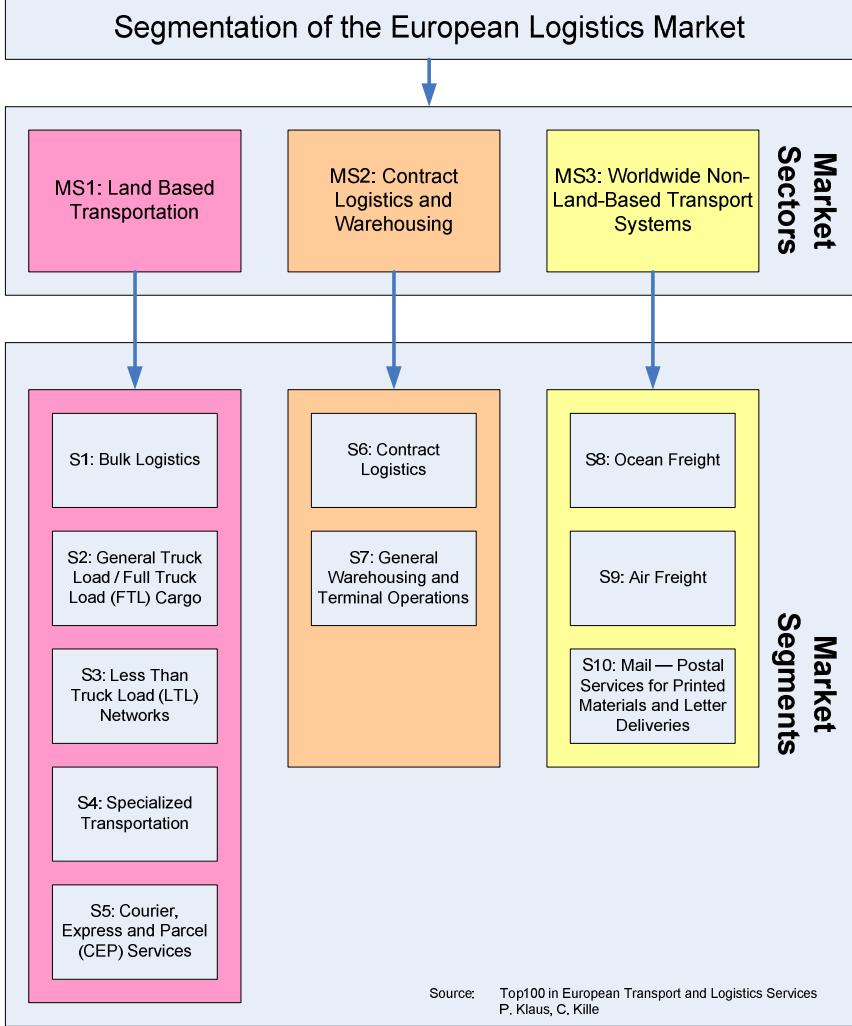
Figure 4.2: Typology of the transport and logistics sector



Source: Sørensen S.Y. & Moltesen J., Mapping report for the Transport and Logistics sector, SURFgroepen, 2008

The logistics market can be divided into three broad market sectors: Land-Based Transportation, Contract Logistics and Warehousing, Non-Land-Based Transport Systems. These three market sectors can be divided into 10 market segments, which on their turn can be split into even more specialized sub-segments.⁶

Error! Reference source not found.: **Overview of the segmentation of the European logistics market.**



⁶ Klaus, P., and C. Kille. Top 100 in European Transport and Logistics Services 2007. Hamburg: Deutscher Verkehrs-Verlag, 2007.

Bulk Logistics (S1) includes transport and logistics operations related to bulk cargoes, especially from the raw materials and waste disposal industries. Cargoes are considered to be “bulk” if typical shipments are significantly bigger than Full Truck Load (FTL), which is usually more than 25 ton. Bulk loads are mainly carried in the form of gases, liquids and unpackaged dry materials. Bulk cargoes normally have low value density (cost / price of one kg of cargo is low), thus transportation costs present a significant portion of the total transport cost. Therefore, less expensive transport modes such as pipelines, boats and train are preferable.

General Truck Load / Full Truck Load (FTL) Cargo (S2) includes the carriage of dry and staple goods by road and rail. The loads weight from 2 to 25 tons and are transported directly from shipper to consignee.

Less Than Truck Load (LTL) Networks (S3) transport individually labelled dry or staple goods from the industrial or consumer goods sectors in consignments weighting from 30 to 3000 kg. The consignments are not shipped directly, but consolidated via a network of distribution centers, sometimes involving intermediary sorting hubs. Cargo is carried in non-specialized trucks and containers; often it is put on pallets.

Specialized Transportation (S4) covers those forms of land transport that cannot be attributed to the TL- and FTL- segments. It includes heavy haulage with cranes, the specialized transport of hanging garments, transport of dangerous materials, transport of valuables, etc. In other words, in this category belong all transportation methods that fall out of the standard transportation scope and require special provisions.

Courier, Express, and Parcel Services (S5) are focused on small, time-critical shipments, normally weighting less than 31 kg. These services often involve dense networks of highly automated sorting hubs.

Contract Logistics (S6) services are provided through individually configured, specialized systems for customers in industrial or consumer goods manufacturing and the wholesale and retail trades. Transportation and warehousing services are often bundled, as well as potentially broad range of value added services.

General Warehousing and Terminal Operations (S7) include general “standard” warehousing services (not part of contract logistics). This segment also includes storage and terminal operations of inland ports, sea and airports, rail terminals, etc.

Ocean Freight (S8) includes worldwide water-based outbound transport and forwarding services, including overseas container, bulk shipping and other specialized shipping.

Air Freight (S9) includes worldwide outbound transport and forwarding services with an emphasis on air freight, including air cargo carriers, air freight agencies and freight forwarding services.

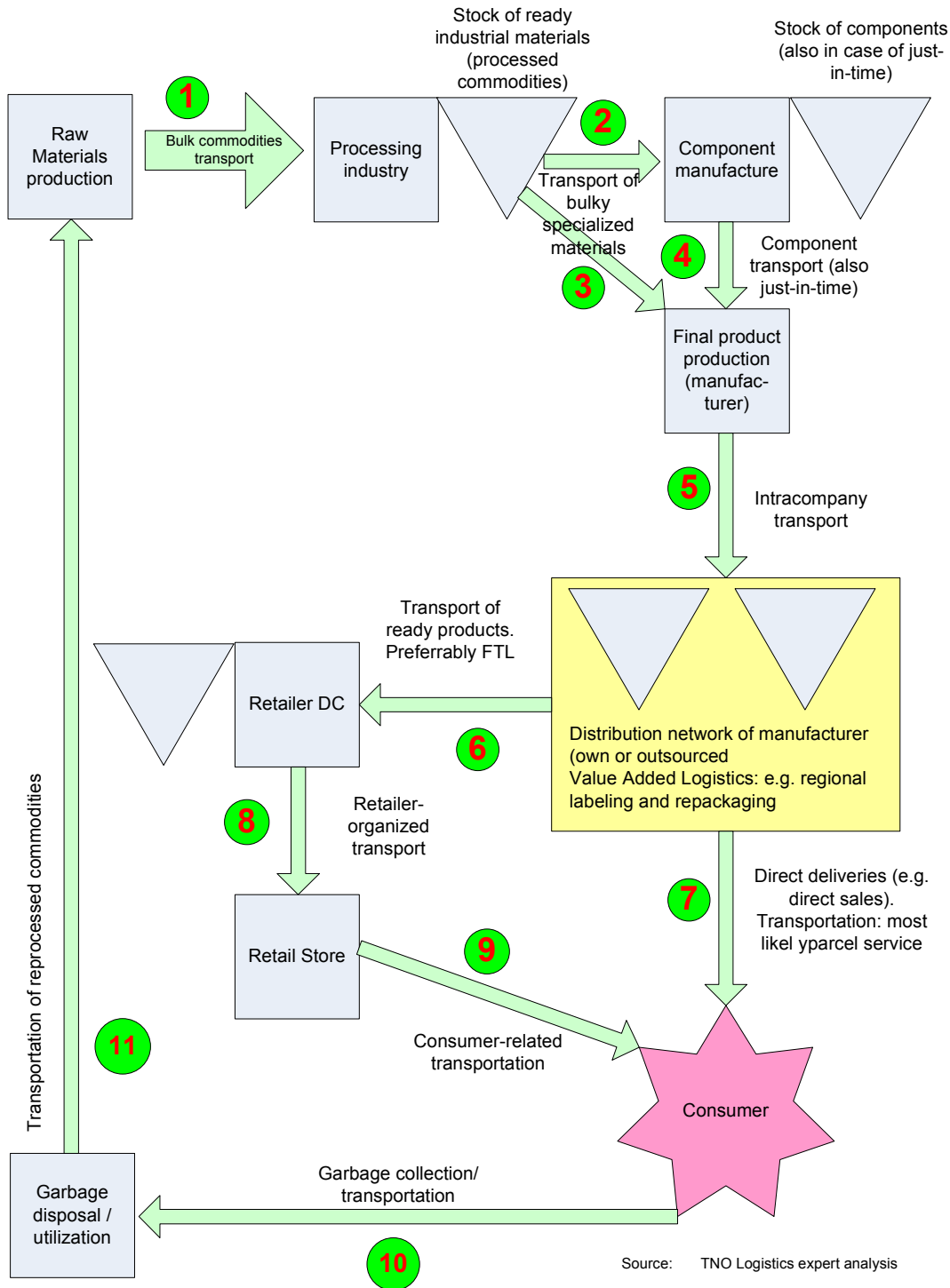
Mail (S10) mainly includes transport of postal dispatches weighting less than 2 kg, including collections, sorting, and local distribution. To this segment belong mail services, especially those of state-run postal organizations, as well as direct mail and express services provided by private companies.

The segmentation of the logistics services market should be taken together with typical users of the services: supply chains. The main purpose of the logistics market is to service supply chains of various types, covering the whole production process: from transportation of raw commodities to reprocessing of municipal waste, possibly returning some commodities back to the early stages of supply chains.

Figure 4.4 represents a typical supply chain. It is intentionally made rather general in order to cover the most often used configurations. The schema covers the whole production cycle: from extraction of raw materials, to final distribution and waste disposal. These various production stages (and indeed production locations) are linked by transportation chains and distribution facilities. On the basis of above described taxonomy of logistics services, we match supply chains' transportation needs with specific logistics market segments. This match facilitates discussion on developments in each of the transportation segments, given current and future trends in Europe, global economy and other factors that influence transportation needs. In other words, looking at supply chains as main consumers of logistics services, it is possible to conclude what changes the logistics market segments will experience.

The supply chain of almost any product starts with production of raw materials. To this category belongs extraction of coal, ore, oil, gravel; agricultural products such as grain, milk, etc. These products are brought (1) to processing industry, where, for instance, ore is turned into usable metals, oil is refined into usable fuels and polymers are produced. Normally, processing industry, as a continuous process, need to maintain stocks of ready products: processed commodities and industrial materials. These goods are used for component manufacture (transportation link (2) and for production of final products (transportation link (3). Component manufacturers do not produce final products, but supply downstream production facilities (4). They often need to have stocks of components; sometimes close to their customers, especially if final assembly employs a just-in-time philosophy. When the final products are made, they are often shipped by intra-company transport (5) to the manufacturers' distribution network, which might be multi-echelon. Often manufacturers keep stock of their products to guaranty a high availability rate for downstream processes.

Figure 4.3: Supply chain illustration



The final products are sold either via retail sector (transportation link (6) or via direct sales (transportation link (7)). Direct sales make take form of B2B and B2C sales, which does not change supply chain structure. If the goods are sold via a retail chain, then products are transported to the retailers' distribution centre (DC) (6), from which retailers replenish their retail stores (transportation link (8)). Final consumers buy products from retail stores and bring them (link (9) to the consumption places, which are often homes. When product is consumed, it (or its remains) often disposed to (municipal) garbage collection system. The garbage is

transported (10) to the garbage utilization places, where garbage is utilized. If garbage remains extractable value, it is extracted and sent back to the beginning of the supply chain (11). This last link makes the supply chain a closed-loop supply chain. The following list matches the numbered supply chain links with the numbered logistics market segments, where the list's index represent supply chain link number.

1. **Bulk commodities transport.** This type of transportation belongs to S1 (bulk logistics) and to S8 (sea transport), as bulk commodities may be transported over big distances.
2. **Transport of bulky specialized materials to component manufacturers.** This type of transport can also be carried out by S1 and S8, however, in many instances S2 (FTL transport), S4 (Specialized transport) can be used. These products are stored in warehouses S7.
3. **Transport of bulky specialized materials to final production.** The same as point 2.
4. **Component transport.** This type of transportation is mainly carried out by FTL (S2) and LTL (S3) transport, depending on volumes, size of components, production philosophy. In some instances specialized transport is necessary (S4), while some supply chains (especially in electronics sector), may require air transport S9. Thus, components can be transported by almost all types of transportation; however, S2, S3 and S9 dominate this market.
5. **Intra-company transport of ready products.** These shipments are often done as FTL (S2), less frequently by LTL (S3). The special transport (S4), sea (S8) and air (S9) transportation modes can also be used.
6. **Transport of ready products to retailers' distribution centre (DC).** This is predominantly FTL (S2) and LTL (S3) transport, depending on volumes and retailers' requirements. Contract logistics and warehousing may also be used (S6 and S7)
7. **Direct deliveries to consumer.** Parcel services (S5) and postal services (S10) are used.
8. **Replenishment of retail stores.** This is mostly done by retailers themselves. The LTL (S3) is predominant.
9. **Consumer takes goods from retail stores.** This is mostly done by consumers themselves, or (in case of bulky goods), by LTL shipments (S3).
10. **Garbage collection.** This is done by specialized transport (S4), which is dedicated to collection of household waste. In some cases (especially cases under the WEEE directive that governs disposal of electronics waste), this is done by LTL (S3) transport.
11. **Transport of reprocessed commodities.** This is mostly FTL shipments (S2), in some instances it could be LTL (S3). Some reprocessed commodities are shipped overseas (S8).

4.2 Restructuring and change

Transport is essential for the competitiveness of European industries and is also seen as an essential citizen right. A larger and more efficient European transport network is boosted by the requirements of European unification and enlargement. A logistics network consists of stages (e.g. factories, distribution centres, and points of sale) and the flow of goods among these stages. The stages perform the warehousing/storage function of the network and while various modes of transport perform the transport function of the network.

Transport mode

European transport keeps on growing steadily. Among the different modes of transport, road transport stands out as the most important mode of transport in terms of volume, but also in terms of growth. Alternatives like rail and water transport show substantially slower growth rates due to: (i) Shortage of rail transport capacity; and (ii) Lack of quality and flexibility when it comes to transport over water. In Europe (and also in other parts of the world), the structure of a transport network can vary considerably. In Table 4.1, the five modes of transportation (road, rail, water, air, and pipeline) have been ranked for seven different transport quality criteria.

Table 4.1: Ranking of the Modes of Transportation

	NACE	NACE	NACE	NACE	NACE
Quality characteristic	60.2	60.1	61	62	60.3
	Road	Rail	Water	Air	Pipeline
Speed	2	3	4	1	5
Accessibility	1	2	4	3	5
Reliability	2	3	4	5	1
Versatility	3	2	1	4	5
Frequency	2	4	5	3	1
Risk of damage	4	5	2	3	1
Cost	4	3	1	5	2

Source: Goor, A. van, M. Ploos van Amstel, and W. Ploos van Amstel. *European Distribution and Supply Chain Logistics*. Leiden: Stenfert Kroese, 2003.

Note: 1 = best alternative; and 5 = worst alternative.

The relative importance of the various modes of transport has changed dramatically over the past decades. The use of road transport has almost tripled between 1970 and 1998, while rail transport stagnated. As result, the share of goods carried by rail in Europe fell from 21.1% in 1970 to 8.4% in 1998. In 2001, road transport accounted for 44% of the goods transport market in Europe compared with 41% for short sea shipping, 8% for rail, and 4% for inland waterways.

Each transport mode has its advantages and disadvantages. A suitable combination of these modes (intermodal transport) is the strategy to achieve a maximum of advantages and a minimum of disadvantages. However, there are not all but only five possible combinations of modes of transport that are commonly present in Europe and are depicted in Figure 4.4.

The rapid expansion of road transport is causing a major pressure on the European road network in the form of congestion and harmful effects on the environment (e.g. CO₂ emission) and public health. While most of the congestion affects urban areas, the trans-European transport network itself is suffering increasingly from congestion as well (7,500 kilometres - 10% of the road network - is affected daily by traffic jams). Combining other modes of transport (rail, air, and inland shipping) with road transport can be a strategy to moderate the pressure of the road transport network. The three combinations have the following characteristics:

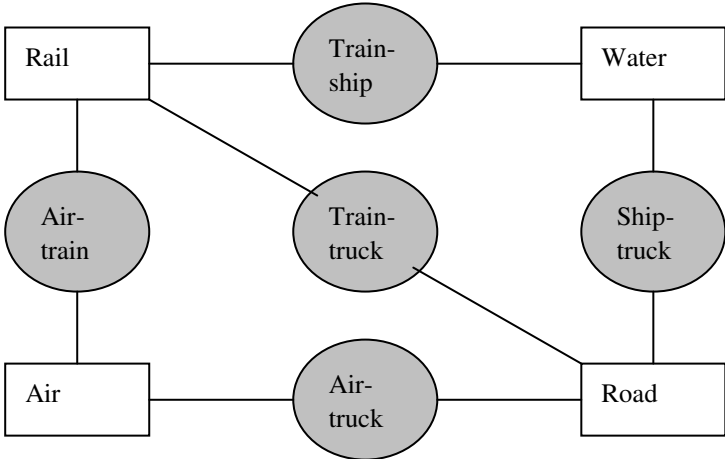
Road-rail: Within the European Community, combined road-rail transport still accounts for a marginal portion of the total freight traffic. There are, however, ample opportunities for such combinations such as the transport flow between Germany and its southern neighbours.

Combined road-rail transport uses large-scale rail transport to cover the principal distance and small-scale road transport for the further distribution and collection of goods.

Road-air: Road-air transport scores high on speed, but low on costs. Thus, this combination is most suitable for small and fast shipments of high-value cargo over more than 500 kilometres. The European transport network is changing by the growth of road-air transport: more distribution centres are built not only at the major airport, but also at the smaller, regional airports.

Road-inland shipping: Inland shipping can play an important part as a link between intermodal transport regions. Inland shipping is not hindered by capacity problems and is also environment-friendly. The use of this combination helps to reduce the growth of CO2 emissions caused by the increasing of overall transport volume within Europe.

Figure 4.4: Possible combinations of modes of transport



Source: Goor, A. van, M. Ploos van Amstel, and W. Ploos van Amstel. European distribution and supply chain logistics. Leiden: Stenfert Kroese, 2003.

In Europe, rail, road, air, sea and support functions are commonly integrated at the main gateways of transport and various support functions are found around these gateways. The main clusters in Europe are connected through the so-called trans-European transport network. This network consists of 30 main European transport routes. It includes all modes of transport and carries about half of all freight and passengers. This network is continuously expanding, and by 2020 it will include 89,500 kilometres of road and 94,000 kilometres of railways, including around 20,000 kilometres of high-speed rail lines suitable for speed of at least 200 kilometres per hour. The inland waterway system will amount to 11,250 kilometres, including 210 inland ports, whilst there are a further 294 seaports and some 366 airports in Europe.

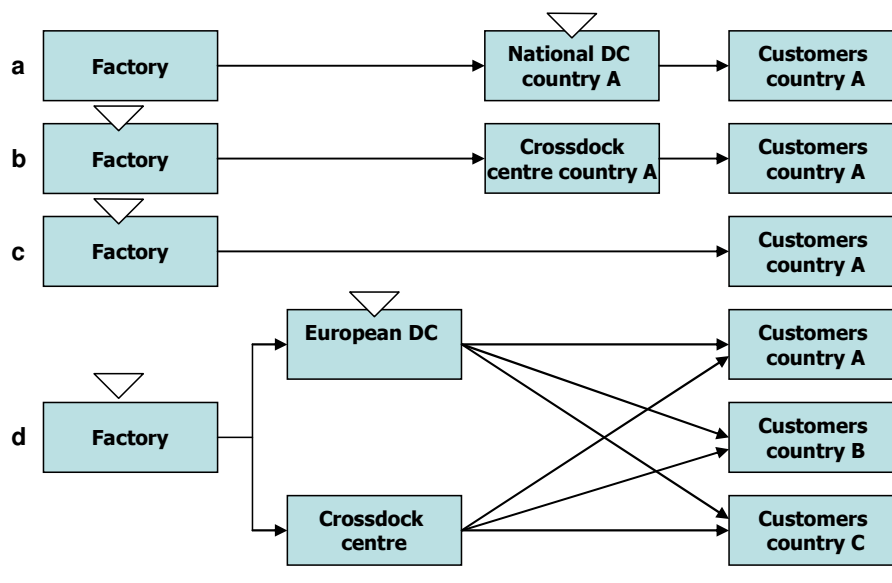
Distribution Centres

There are four common types of distribution centres in Europe, namely: (i) National distribution centres; (ii) National cross-dock centres; (iii) European distribution centres; and (iv) European cross-dock centres. The difference between distribution centres and cross-dock centres is that the latter do not keep large inventories (these are kept at the factory) but focus on unloading goods and redistribute them to the customers. Distribution and cross-dock centres can be either national or European, depending on the customers they are servicing.

As Figure 4.5 shows, four different types of logistics structures can be distinguished in the European context:

1. **National distribution centre:** Inventory is kept in the country where the products are sold.
2. **Cross-dock centre:** Inventory is centralized at the factory. To provide customers with high service levels, they are frequently replenished via a cross-dock centre, where products are regrouped for the correct customer.
3. **Direct delivery:** Products are directly delivered from the factory. No handling occurs at distribution or cross-dock centres.
4. **European distribution or cross-dock centre:** An European distribution or cross-dock centre supplies customers in various countries.

Figure 4.5: Four types of possible European Logistics structures



Source: Goor, A. van, M. Ploos van Amstel, and W. Ploos van Amstel. European distribution and supply chain logistics. Leiden: Stenfert Kroese, 2003.

Network players

There are five common types of transport and distribution companies in Europe, namely:

1. **Distribution companies:** Focus on providing specific industries in a narrow geographical market with specialized services;

2. **Large European networks/freight forwarders:** Focus is on geographical coverage and offering a wide range of services including forwarding, distribution, warehousing and sea/air freight;
3. **Logistics service provider:** Focus on specific industries where logistical solutions covering a wide range of services are offered for a specific region that is either regional or pan-European;
4. **Lead logistics provider:** Focus on the management and optimization of shippers supply chain; and
5. **Integrator:** Wide geographical coverage but offer only limited services, generally related to express operations.

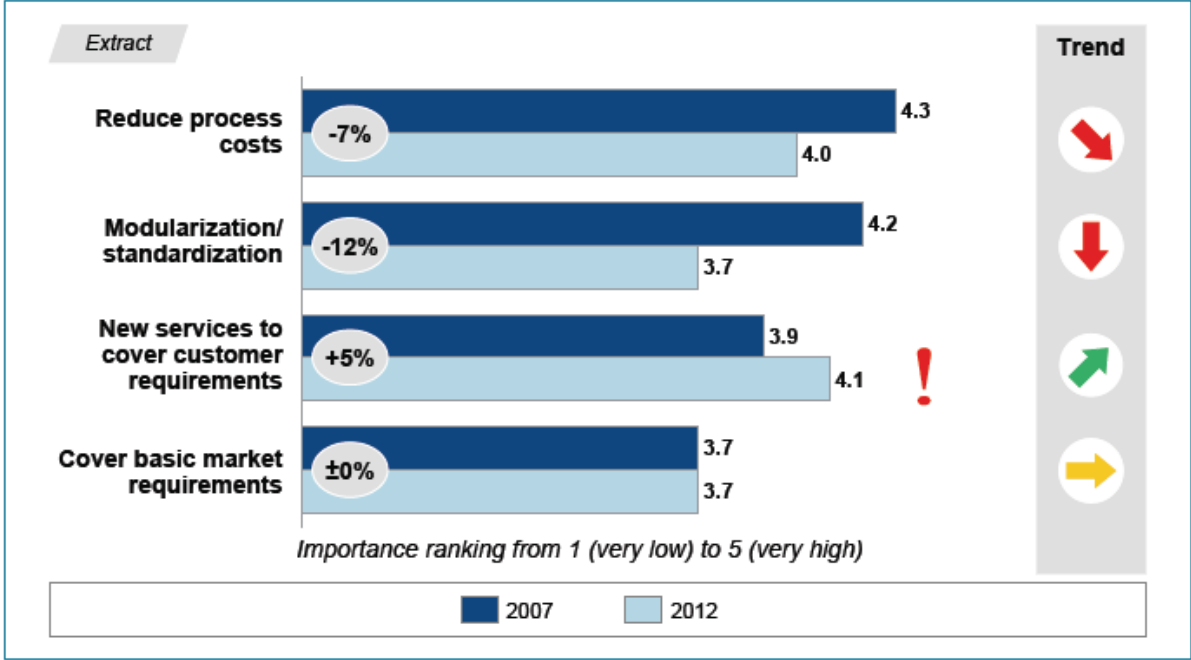
5 Sector dynamics and the role of technological change, R&D and innovation

New technologies will play an important role in regard to future skills. The sector is getting increasingly impacted by new technologies and technological changes and especially ICT applications are getting more and more important. Some examples are modern navigation systems, GPS, driver assistance, driver augmentation, and the cockpits of high-speed trains begin to look more and more like those of airplanes. These developments lead to changes in skills requirements, also to ensure a safe interaction between humans and their assisting technology. Also fully automated metro/subway systems are already in service, for example in Great Britain, Germany and Japan, China, Singapore and the US. Fully automated cars are also under development, but are unlikely to be implemented in regular traffic any time soon. In the area of logistics, also alternative to road and rail transport are being thought of like the concept of so-called Cargo Caps. This concept that basically consists of autonomous “container capsules” that can run underground and autonomously, could represent a fifth alternative to road, rail, waterway and air transport.

Intermodality and co-modality are also important issues that should get more attention in regard to efficiency and environmental sustainability. This concept makes use of the advantages of different transport modes (e.g. between rail and road) that are neatly tuned to each other, thus keeping transfer time and cost (for passengers and freight) between the different modes at a minimum. Modern inter-modal systems already allow for fully automated cargo inter-modality. Automation becomes generally more important, especially in logistics and freight handling. Some of the largest cargo ports already operate mostly autonomously with humans mainly serving in planning, controlling and programming.

European companies continually explore logistic technology, R&D and innovation in order to achieve their logistics objectives. These explorations are oriented and led by logistics objectives such as increasing customer service levels or currently even more important, reducing process costs. The relative importance of this objective, however, is expected to decline if customer satisfaction (and hence customer-oriented innovations) will become more important. Also in logistics, technological innovations like advanced computer systems, Artificial Intelligence, ICT and RFID technology plays a great role for improving speed, efficiency and logistics planning and to utilize the highest capacities. Figure 5.1 shows the trend in logistics objectives by European logistics/transport companies.

Figure 5.1: Innovation Objectives



Source: A.D. Little, Innovation Excellence in Logistics Value Creation by Innovation, ELA European Logistics Association/Innovation Excellence in Logistics, 2007

Responding to the changing logistics objective (from cost-oriented to customer-oriented); the focus of technological innovation is also switching from effectiveness and efficiency to adaptability and flexibility. In the sector of logistics, full-truck-load (FTL) transport and zero inventory are used to gain economies of scale and thus reduce transport/inventory costs. Due to the higher customer requirements and increasing competition, European companies are trying to add more value to their products/services in order to survive. Transport companies are switching from FTL to less-than-truck-load (LTL) because customers require more on-time delivery with a short lead time. Buffering stocks (completed products/spare parts) are set up in order to maintain a high level of (after sales) customer service. In response to these changes in the European logistics environment, adaptable and flexible logistics systems and networks represent an important area for innovation within the European logistics sector. The supporting technologies include automated control (such as RFID, agent system etc.) and virtual reality (such as digital plant planning).

5.1 Emerging technologies and innovation in the sector

Based on the trend in the change of innovation objectives, the following technologies and innovations (as representatives) are being developed in Europe:

RFID. Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders: a wireless bar code. The RFID technology has many perspectives and holds promises of advanced supply chain management and logistics. RFID is already applied in passports and identity cards, for payment of transportation, and product tracing in the automotive industry. RFID tags are often envisioned as a replacement for UPC or EAN barcodes. However, RFID is still associated with higher costs and it could very well take several years until the technology is advanced and cheap enough that it will have fundamental effects on transport and logistics.

GALILEO is a satellite navigation system built under authority of the EU and enhances precision in navigation in comparison with the existing GPS-system. GALILEO was originally expected to be in use by 2010 but is now subject to delays. Nevertheless, the GALILEO system will offer numerous transport applications in controlling, monitoring, signalling and passenger information services. GALILEO could also boost the competitiveness of railways vis-à-vis other modes of transports because it will be possible to reduce distances between trains and thus increase train frequency.

ERMTS. The European Rail Traffic Management System (ERMTS) is the European substitute for all national control-command systems and communication systems. ETCS is the new control command system and GSM-R is the new radio system for voice and data communication. ERTMS is intended to be the new signalling and management system for Europe, enabling interoperability throughout the European rail networks. ERMTS is expected to be in certain corridors in 2009, but a full implementation in Europe is probably not within reach the next 5-10 years. The introduction of a European system will ease cross border operations and evolve competition across borders in the sector in the longer run. Standardization of components implies that maintenance workers will have to be trained in replacing rather than repairing.

High-speed trains. The most prominent evolution in the new future is the development of high-speed trains running across Europe at speeds reaching 320 kph an hour. High-speed railways in France, Germany, Belgium, the Netherlands, Austria, and Switzerland have joined to form Railteam. A number of technical issues and language problems still have to be solved

– but the trains have the potential of taking some business from airlines and the road (Economist, Jul. 5, 2007). High-speed trains require that railway staff gain new skills.

Driver augmentation. Driver augmentation, i.e. computer assisted support of vehicle drivers (especially in cars and trucks) is also getting increasingly advanced and user-friendly. While GPS navigation and route calculation is already quite widespread other functions like lane departure warning (LDP), sleep detection devices, head-up displays (HUD), intelligent sensors, automatic street sign and obstacle recognition and car-to-car and car-to-infrastructure communication systems are already under development or even available on the market.

Smart cars. Proposals for vehicle automation have been around for decades. Automating guidance of cars is attractive for utilization of highway space and safety. Smart cars of the future will be using advanced technology to perform such functions as automatic cruise control, lane departure warnings and correction, hazardous object avoidance, driver alertness supervision, position and satellite monitoring, self-parking and driverless transportation (www.future-car.net). Emerging transport telematics technologies offer many possibilities for improving vehicle control, comfort and safety. New materials and nanotechnologies will reduce weight and energy use. Promoting the development of cars that are smarter, safer, and cleaner is part of the EU's 'European Information Society 2010' (i2010) strategy to boost growth and jobs in the digital economy.

Driverless trains. Automated metros/subways are already in operation in several countries, among them the UK, Germany and the US, Japan, China and Singapore. In contrast to the more unpredictable road system, automations can be much easier implemented on the rail system, especially in subways. Even many regular trains (especially in Asia) and subways are computer controlled or run on the push of a button. The function of the driver mostly lies in supervision and control.

Training simulation. Training simulations are common for aircraft pilots since a long time, but are now also getting more commonly used for training drivers of water, road and rail vehicles. The quality and versatility (e.g. simulation of different situations and scenarios) of simulators is improving constantly and the equipments is getting more affordable. Simulations can generally contribute to a reduction in training time, thus making the technology increasingly attractive. EADS, a leader in aircraft and defence technology, for example, also develops and sells simulators for road and rail training.

5.2 Green Transportation & Logistics

The transport sector is under a lot of pressure to reduce its emissions and become more environmentally friendly. Quite a number of initiatives are under way to make the transport and logistics sector greener. The industry is in particular interested in finding solutions that can create win-win situations, i.e. solutions that are not only good for the environment but also for the profitability of the industry. Government regulation, subsidies, and pricing policies help to steer the industry in the right direction, such as the adoption of filters and more fuel efficient trucks and cars. The EU is also promoting a widespread introduction and adoption of bio-fuels.

In a recent survey⁷ about specific initiatives in this area, the shift from road to rail transport scored as the most popular (and probably also the easiest to implement for some countries), followed by carbon off-setting. The latter is still an emerging area, but seems to have been

⁷ Eyefortransport. Green transportation & logistics, November 2007

widely embraced by European countries and more so than in other regions. In the third place came some ten initiatives, including: alternative fuel vehicles, carbon trading, creating a culture of change, data greening centre, driver training, encouraging public transport use, horizontal collaboration across supply chains, recycling materials, reduction in consumables, and inter-modal solutions.

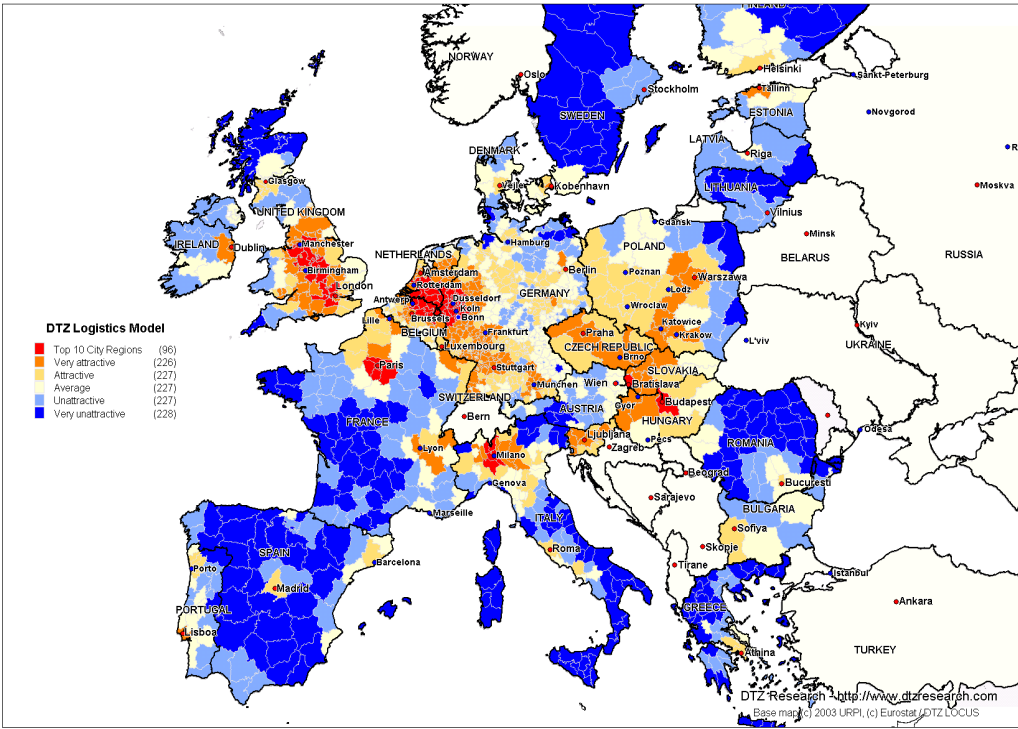
6 Trade, globalization and international competition

6.1 An overview of international competition

As argued in the previous chapter, the logistics sector provides services that are “consumed” locally. Therefore, the main international competition issue under consideration is location, namely attractiveness of the location to the sector.

Figure 6.1 presents attractiveness of European regions for logistics locations

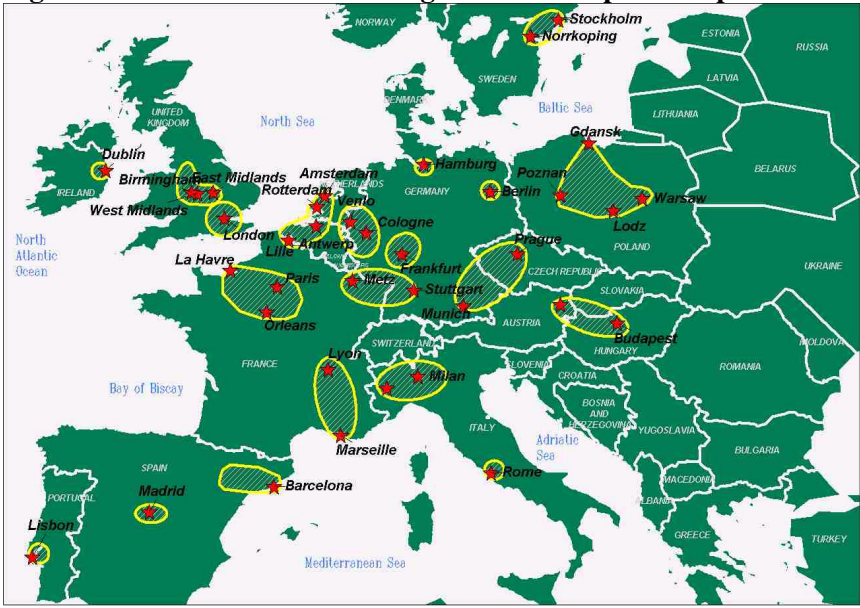
Figure 6.1: Intensity of economic activity and related demand for logistics services in Europe



Source: DTZ Research, EuroLogistics 2004

It is not difficult to notice that the most attractive regions are high-income regions, with excellent infrastructure and high population density. The Netherlands, Belgium and Western Germany is the most attractive cluster for location of distribution facilities. In line with the logistics attractiveness of the region, Figure 6.2 presents the most attractive (but often also the most competitive) distribution activity regions in Europe.

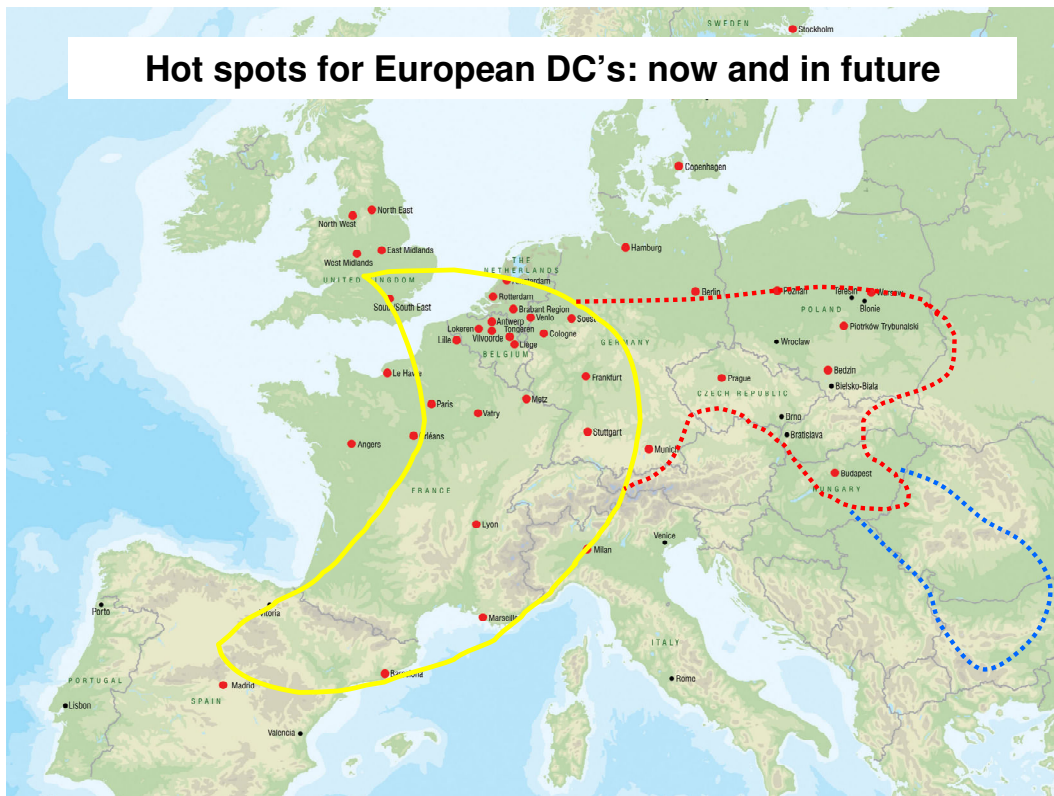
Figure 6.2: Most attractive EU regions for transport companies



Source: DTZ Research, EuroLogistics.

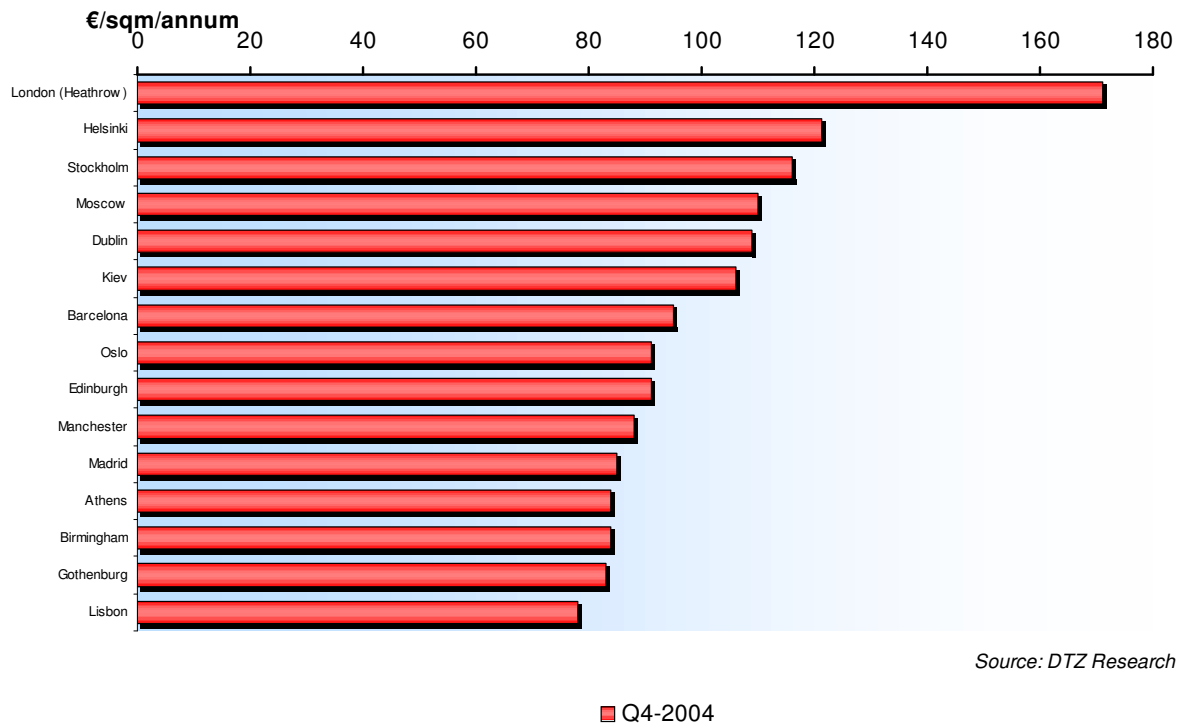
Accession of new countries to the European Union has given a new impetus to the logistics sector. As the old distribution axis (depicted in Figure 6.2 by the yellow line) represents the EU15 logistics hot-spot, the red dotted line shows the region of distribution and transport activity as 10 new member countries joined the EU in 2004. And finally, the blue dotted line shows a future hot-spot as Bulgaria and Romania integrate further into the EU. Indeed in the future, if Serbia and other Ex-Yugoslav countries join, there will be a change in attractiveness of the regions.

Figure 6.3: Future expansion of the transport corridors in Europe



Source: DTZ Research, EuroLogistics.

Figure 6.4: Warehouse costs per square meter per year



Source: DTZ Research

Source: DTZ 2005

Another important factor that influences regional competitiveness in logistics and transport is the operational costs of distribution facilities – Figure 5.4. High warehouse costs usually reflect high economic activity and overcrowding, while low warehouse costs usually reflect economic stagnation and poor infrastructure. Therefore low warehouse costs alone will not attract logistics businesses. Being close to where the economic activity takes place is far more important. Nevertheless, some shift of the logistics activities to low-cost European countries (i.e., the new EU member states) is quite likely. At the same time, rapid economic growth in the new EU member states will fuel rapid growth in their logistics and transport industry as well.

Another important factor regarding the competitiveness of regions / countries in the logistics sector is how well national transportation companies perform in a Europe-wide environment. Transportation is often carried out by small trucking companies, thus it is difficult to compare them. However, Table 6.1 shows the percentage of goods flowing in or out the country that is carried out by national and foreign companies which suggests that West-European long distance haulage companies experience substantial competitive pressure from Central / East European companies. Nevertheless, the degree of this pressure is difficult to measure due to rapid growth of road transport in general. A quick look at the data suggests that Slovenian, Estonian, and Lithuanian transport companies at least dominate their national markets. Interesting is also the position of France and Germany, which are the two biggest importers and exporters of goods in Europe, but depend heavily on foreign transport companies for their transport.

Table 6.1: Goods leaving or entering a country by nationality of hauliers, 2005 – million tonnes (NACE 6024, road transport)

Goods leaving or entering a country (international transport loaded or unloaded and cross-trade), by nationality of hauliers, 2005 - million tonnes

	Goods leaving the country				Goods entering the country			
	Total (million tonnes)	Share in %			Total (million tonnes)	Share in %		
		National hauliers	Other EU-15 hauliers	Other new MS hauliers		National hauliers	Other EU-15 hauliers	Other new MS hauliers
BE	88.5	40	57	3	78.2	32	65	2
CZ	24.1	73	12	14	19.9	71	11	18
DK	14.0	58	36	5	16.5	46	46	6
DE	183.1	44	44	11	161.2	36	50	14
EE	2.3	76	3	20	2.2	61	8	30
IE	6.9	56	44	1	11.9	39	60	1
EL	1.9	68	24	7	2.3	61	33	5
ES	48.6	58	38	3	49.1	58	39	3
FR	104.7	29	67	3	113.5	25	71	3
IT	55.7	41	48	9	55.4	37	51	11
CY	0.0	78	0	0	0.0	100	0	0
LV	3.3	62	11	25	3.1	56	9	34
LT	4.5	74	1	23	4.1	64	8	27
LU	9.0	55	43	2	11.3	52	47	1
HU	11.0	52	18	28	10.9	45	22	32
NL	89.9	68	29	3	81.3	61	36	3
AT	29.5	53	33	13	34.7	46	41	13
PL	25.6	83	6	9	24.1	81	9	9
PT	12.8	75	24	0	15.3	68	31	1
SI	6.1	80	12	7	6.3	80	13	7
SK	13.0	68	7	23	10.3	64	9	27
FI	4.2	72	12	13	5.0	81	8	10
SE	13.3	25	51	12	12.6	17	61	11
UK	27.7	46	50	4	32.8	32	62	5
LI	0.2	64	34	1	0.2	45	54	1
NO	4.3	44	49	6	6.3	32	62	6

Source: PASI S., Flows in international road freight transport – 2005, Statistics in focus, Eurostat 83/2007

6.2 Analysis of trade issues and their importance to the logistics sector

One of the intrinsic properties of the logistics market is that it is a service market, where consumption cannot be decoupled from production activities. It means that the logistics services are quite local and need to be integrated into local markets. Therefore, there are no direct issues and consequences of the trade barriers in the logistics industry itself. Moreover, within European Union there is free movement of labour and capital thus any logistics company may extend its services within the Union.

In principle any company may work in the European logistics market. The usual way of penetration to the market is to buy a local operator or to create a local subsidiary using investment funds. At the local level there indeed could be preferences of the local authorities and population on the origins of the business, however this does not have an institutional character, e.g. there are no discrimination laws that favour one company over another.

On the other hand, there could be some local laws and regulations that favour incumbents, making acquisition of local markets more difficult for outsiders. However, in this case local knowledge could be acquired by different means, like partnerships with local service providers or seeking help from consultants.

Nevertheless there are big trade-related issues that do not belong to the logistics market, but have a big influence on them. First are the customs services, when the industry deals with export / import operations. These present a challenge on the one hand, as well as an opportunity for the sector on the other. The opportunities are mainly located in added value that customs-related services and bonded warehouses bring. The other issue is trade barriers

and annual quotas (for instance for Chinese textiles), which make the subject of logistics operations (moving goods) more difficult.

The ability to deal with the trade-related issues is one of the important factors that influence the logistics segment. The World Bank has published a ranked list of countries on the logistics performance index 2007 (see Table 6.2). The index includes not only a general logistics score, but also an assessment of the countries' customs, infrastructure, and international shipments. In the top-25 there are 15 European countries, including 13 EU countries and Norway and Switzerland. Interestingly, the Netherlands lags behind Singapore in LPI rank (2nd place), while it scores best in the three other indicators are the world's best.

Table 6.2: Logistics Performance Index, 2007

Country	Logistics Performance Index			Customs		Infrastructure		International shipments	
	LPI rank	Score	Confidence interval	Rank	Score	Rank	Score	Rank	Score
Singapore	1	4.19	0.05	3	3.90	2	4.27	2	4.04
Netherlands	2	4.18	0.04	1	3.99	1	4.29	1	4.05
Germany	3	4.10	0.03	4	3.88	3	4.19	4	3.91
Sweden	4	4.08	0.08	5	3.85	5	4.11	5	3.90
Austria	5	4.06	0.11	8	3.83	9	4.06	3	3.97
Japan	6	4.02	0.03	11	3.79	6	4.11	9	3.77
Switzerland	7	4.02	0.08	6	3.85	4	4.13	14	3.67
Hong Kong, China	8	4.00	0.04	7	3.84	8	4.06	7	3.78
United Kingdom	9	3.99	0.03	13	3.74	10	4.05	6	3.85
Canada	10	3.92	0.05	9	3.82	12	3.95	8	3.78
Ireland	11	3.91	0.11	10	3.82	19	3.72	11	3.76
Belgium	12	3.89	0.05	16	3.61	11	4.00	16	3.65
Denmark	13	3.86	0.10	2	3.97	14	3.82	15	3.67
United States	14	3.84	0.03	19	3.52	7	4.07	20	3.58
Finland	15	3.82	0.13	14	3.68	17	3.81	30	3.30
Norway	16	3.81	0.09	12	3.76	15	3.82	19	3.62
Australia	17	3.79	0.09	17	3.58	20	3.65	12	3.72
France	18	3.76	0.05	21	3.51	16	3.82	18	3.63
New Zealand	19	3.75	0.12	18	3.57	22	3.61	10	3.77
United Arab Emirates	20	3.73	0.08	20	3.52	18	3.80	13	3.68
Taiwan, China	21	3.64	0.09	25	3.25	21	3.62	17	3.65
Italy	22	3.58	0.05	29	3.19	23	3.52	21	3.57
Luxembourg	23	3.54	0.30	15	3.67	13	3.86	45	3.00
South Africa	24	3.53	0.10	27	3.22	26	3.42	22	3.56
Korea, Rep.	25	3.52	0.07	28	3.22	25	3.44	24	3.44

Source: Worldbank (2007).

Capgemini (in collaboration with ProLogis) summarizes its findings on the attractiveness of West-European regions in terms of logistics in its "Europe's Most Wanted Distribution Center Locations 2006" report. The major findings of this report are summarized in the following list of statements.

- Most of the distribution centres in Europe are concentrated in The Netherlands, France, UK and Germany, with Belgium not too far behind.
- The three types of distribution centres (European, Regional, and National) enable companies to adapt their networks to suit their strategic needs.
- The country of choice for European Distribution Centres is The Netherlands, with neighbours Belgium and Germany also attractive.

- The UK is the largest employer in the distribution network, with Belgium, The Netherlands, and Poland also employing significant numbers of full-time equivalents (FTEs).
- Distribution centres with few FTEs per site are by far the most common, while centres with 500+ FTEs are rare.
- The Netherlands, UK, France, and Germany hosted two-thirds of the total surface area of distribution centres.

6.3 Role of externalization strategies

Chapter 3 presented a taxonomy of the logistics market, divided into 10 broad segments. For each of the segments, the level to which the segment's logistics operations are outsourced was presented. The general trend is that more and more logistics operations are outsourced, while businesses concentrate on their core activities. For instance, it is a norm now to conclude so-called SLA (service level agreement) with transport companies to perform transportation. The most important forces driving the outsourcing of logistics operations are presented below.

Concentration on core business. Logistics activities often do not belong to the core activities of a company, although being an important and necessary auxiliary operation. This factor drives outsourcing of logistics to companies that can do it better, while not distracting attention from the core activities

Variability in demand of logistics operations. Many companies experience uncertainties in the supply chains (e.g. seasonal pattern, randomness in customer demand, etc). In this case it is a good idea to outsource "variable" load at least, while possibly executing stable load by own means. For instance, if a company produces ice cream, then it might be reasonable to have warehouse space and transportation capacity to cover autumn-winter-spring load, while extra demand surge in summer months can be executed by third parties

Impossibility to perform some logistics themselves. To a large extent, air transport, sea cargo, rail transport, terminal logistics, and parcel and letter services fall into this category. It is impossible to imagine a company that is active in production or service activities that are not related to logistics, at the same time running a world-wide distribution network (including transport and facilities). The immensity of such a task is better left to specialists like TNT, UPS, DHL and others.

Technological advances. There are many technological advances like VMI (Vendor Managed Inventories) that allow and stimulate outsourcing of logistics operations. In the case of VMI, a vendor guarantees that its customer has items in stock, thus taking care of the supply part. Advancements in IT make it easier to outsource, although often lock customers to the service providers at the same time.

Sophistication of the logistics industry and new services. Advancements in IT technology allow appearance of hitherto unknown services, for instance fourth party logistics (4PL). 4PL companies generally do not operate their own assets, but the ones of other companies. They employ a 'control tower' philosophy. These companies may seek the best utilization and performance of other companies, thus cutting costs per operation and at the same time improving services. These advanced methods allow achieving better operational performance and economies of scale that are not achievable by a single player. Such developments make outsourcing of logistics operations more attractive.

Avoidance of investments and obligations to improve flexibility. If a company is to execute logistics operations itself, it needs to invest in facilities and hire labour. Using logistics services of third parties, there is no need in investments and in hiring workers, which adds flexibility and reduces future obligations.

Box 2. Defining and measuring relocation and outsourcing

One of the biggest challenges when analysing and discussing offshoring and outsourcing is the definitional issue of what precisely is meant and - closely related – how to measure the phenomenon. Outsourcing covers activities previously carried out in-house sourced to third parties whether abroad or in the home country. Offshoring in its strictest sense relates to activities being discontinued in the home country and transferred to a location abroad managed within the same entity or by an affiliated legal entity (OECD, 2007). Frequently, the political debate mixes the above three and also discusses job losses due to restructuring unrelated to offshoring under the same label. Furthermore, the political debate is fuelled by estimates which are the main source of evidence in the absence of hard statistics. Two broad sources on job relocation have as a result emerged: private consulting estimates and press monitoring estimates (Van der Zee et al., 2007). While consulting estimates have severe limitations (*ibidem*), the estimates collected by press monitorings such as the ERM are more reliable. The most valid data, however, systematic official statistics on the employment impact of relocation, are not collected anywhere in the world today. As a result, academics who nevertheless want to use official statistical data resort to proxies of indicators of relocation activity, such as trade data, FDI flows and input–output tables (Van der Zee et al., 2007). However, these indicators only measure the indirect effects of relocation and are affected by a number of other factors making hard conclusions difficult to draw.

7 Regulation

7.1 Road transport: main labour regulation issues and problems⁸

The road transport sector (NACE 60.24) is a relatively diverse one when examined in a European context. In some countries, the sector is considered vital to the national economy, providing many jobs. In others, usually smaller countries that are not located in the centre of Europe, the sector is less economically important. In many Member States, road transport is male dominated and the workforce is relatively old compared to the rest of the country's workforce. Attracting young recruits and women to the sector is seen as one of the key challenges for the future.

Collective bargaining in the sector tends to follow national customs and practice, and in many countries a mixture of bargaining levels exists, such as company-level bargaining underpinned by sectoral or national-level bargaining.

Over the past decade, the road transport sector has undergone significant changes. One of the key instruments of change in terms of social regulation has been the implementation of the EU Working Time Directive for mobile workers in the sector, which has now been transposed into national legislation by the majority of EU Member States. However, the impact of this directive varies between countries. In the UK, for example, according to a survey conducted among road transport employers, the directive appears to have had 'limited benefits', its main effect being to oblige employers to reduce the average working time of their employees. Similarly, in Ireland, where a large proportion of drivers were reportedly working more than 48 hours a week prior to the directive's introduction, the main effect of the directive will be to force employers to reduce the average working time of their drivers. The implementation of the directive has had limited impact in the countries that implemented its provisions well

⁸ This section is based on: Institute for Employment Studies (IES). *Impact of the Working Time Directive on Collective Bargaining in the Road Transport Sector*. Brighton, UK: IES, December 2007.

ahead of the 23 March 2005 deadline – as seen in Latvia, for example. However, in Austria, its impact is being felt much more widely, as working time regulations were reportedly tighter before its implementation.

A key issue is enforcement of the directive. While most EU Member States have now implemented the directive's provisions, enforcement problems are being reported in many countries and are essentially related to the provisions on working time – as seen in Slovenia, Portugal, Poland, and Denmark. Calls on the social partners to deal with these issues through collective bargaining aimed at improving regulation, or enforced on a tripartite basis, are widespread in Slovenia and Portugal. The same issue is proving to be a serious problem in Poland, where road transport plays a significant role in the national economy and competition is therefore fierce. As a result, calls are being made for an efficient regulatory mechanism that would curb contravention of the law and ensure fair competition. Enforcement is also a major issue in Hungary, Greece, and Germany. Due to a lack of enforcement of maximum working time provisions, some drivers are working up to 80 hours a week. Enforcement is particularly difficult to control in SMEs.⁹

Among the other problems being faced by the road transport sector is an apparent ongoing recruitment and retention shortage in many countries. This is partly due to the perceived negative image of the sector linked to the relatively low pay levels and long working hours. Improving low pay and poor working conditions is therefore deemed an important priority by trade unions. In the majority of EU countries, the road transport sector is male dominated and problems in attracting women and young workers to the sector are allegedly frequent. At the same time, while considerable numbers of drivers from the new EU member states are emigrating to the old EU member states and thus alleviating recruitment problems in the old member states, it is nevertheless exacerbating the recruitment problems in their own countries. Furthermore, problems with unregulated migrant labour constitute a difficulty in some countries. In Greece, for example, many drivers from the Balkan countries are reportedly operating on an uninsured basis.

Improving health and safety in the sector is seen as a priority in many countries and is linked to the issue of enforcement of the working time regulation. In Spain, where the accident rate is relatively high by international standards, the social partners are focusing on improving safety conditions and ensuring that proper rest breaks are taken by drivers. Linked to the issue of health and safety is the problem of the road infrastructure in some countries. In Romania, for instance, the quality of the roads is often poor, thus increasing journey times and contributing to driver fatigue.

The issue of self-employed drivers has generated considerable debate in some countries and is a key area of interest for the European Commission – as reflected by its report on the exclusion of self-employed drivers from the Working Time Directive, issued on 23 May 2007. At this point, the Commission does not believe that there is a strong case for including self-employed drivers in the directive. National views and practices vary on this subject across the EU: in only a few countries, self-employed drivers will be covered by the national implementing legislation from 2009 and therefore there is no significant debate on this issue. However, in other countries, self-employment has emerged as a greater issue for discussion. In Finland, for instance, the inclusion of self-employed workers in the legislation has

⁹ Lange, J., and J. Groth. *The Shortcomings of Safety and Health Protection in the Haulage Industry*. Bremerhaven: Wirtschaftsverlag NW Verlag für neue Wissenschaft GmbH, 2005.

generated considerable debate, with the government and employer representatives arguing against their inclusion and the trade unions arguing in their favour. In Spain, the number of self-employed drivers is high and therefore represents an issue of concern for the trade unions, although there are no plans to include self-employed drivers within the scope of the country's national implementing legislation. Similarly, in Bulgaria, the high number of self-employed drivers who are reportedly working in the informal economy represents a particular cause for concern.

Social dialogue and collective bargaining are relatively weak in some of the new EU Member States; as a result, significant emphasis has been placed on the legislation in terms of social regulation of the road transport sector. In Lithuania, for example, there is no collective bargaining on working time, although bargaining on pay issues does take place; moreover, collective agreements are only concluded in companies where trade unions maintained a presence during Soviet rule and continue to operate. In Latvia, bargaining also predominantly takes place in the large and former state-owned companies.

In terms of the future, further changes are expected in the road transport sector in many countries. In Hungary, for example, the bus sector is due to be liberalised over the coming years; this is set to be accompanied by a reduction in state subsidies and potential privatisation of road transport services. Depending on the Commission's view regarding the inclusion of self-employed drivers within the scope of the Working Time Directive from 2009, many countries that have not already made provisions for these drivers' inclusion in the legislation from that date may have to change their laws. The inclusion of self-employed drivers would be welcomed by those who have been advocating such a move for some time. However, the key issue for the future is likely to be that of enforcement. Although the directive has been successfully implemented in most countries, violations are reported to be widespread and undoubtedly represent one of the decisive challenges for the future.

7.2 Road transport: specific regulation issues and problems

The road transport sector is currently facing a range of issues and problems. Some of these are country specific, whereas others are similar across countries. The main issues are explored in this section and concern the areas of recruitment and retention, pay, and health and safety.

Recruitment and retention

The implementation of the Working Time Directive has, in some cases, fuelled a debate on the problem of the limited number of professional drivers. In the Czech Republic, for instance, employers believe that the new working time limits will result in a severe shortage of drivers and exacerbate existing workforce shortages in the sector. In the UK, recruitment and retention difficulties are ongoing, due to issues such as a perceived 'long hours culture' and a high incidence of having to work away from home. In Norway, it is proving difficult to recruit workers in this sector; the trade unions claim that this is due to the fact that bus companies operate on the basis of fixed-term tenders, which leads to job insecurity, as well as the fact that pay is relatively low in this sector. The sector's image is also problematic in Belgium, where attracting new recruits to the sector also appears to be difficult. The problem of labour shortages in the road transport sector is also becoming increasingly evident in Lithuania. Furthermore, in Finland, a lack of workers with the right skills appears to be a growing problem in the road transport sector and a labour shortage is predicted for the future. In the Czech Republic, the road transport sector is allegedly suffering from a constant shortage of professional drivers, particularly truck drivers. Partly due to the strong growth

evident in the Czech economy, it is estimated that there is a shortage of almost 20,000 drivers a year. This situation is being exacerbated by the fact that some Czech drivers are moving to the UK or other countries to work.

Pay

The general issue of pay in the road transport sector is emerging as a particular problem in various countries. In Ireland, for instance, drivers' pay is deemed to be relatively low and trade unions are lobbying for an increase in remuneration. In Hungary, the trade unions are protesting against a practice among employers of using daily allowances and other payments to make up between 70% and 80% of drivers' pay, rather than the normal pensionable salary. While this practice is more advantageous for drivers in the short term – as these payments are not subject to social security contributions and are more favourable from a tax perspective – in the longer term, it is feared that it will create social instability due to the fact that the payments do not contribute to the employee's pension. The problem of low pay is also reportedly an issue in the Bulgarian road transport sector, and is cited by the trade unions as one of the reasons why legislation on working time and rest breaks is being violated. In some countries, the transposition of the directive has had a direct impact on pay. In Norway, for example, it is reported that employers are complaining about having to bear the burden of this impact: where the directive has reduced working hours, pay has remained the same, thus increasing costs for employers. Similarly, in the UK, the main effect of the directive has been to force employers to reduce average working time for their mobile workers. This has been achieved largely through agreements at company level, which have shortened working time, often with no loss of pay by means of increasing holiday entitlements and/or increasing hourly rates of pay. Conversely, in Austria, high taxes and substantial non-wage labour costs are seen as the main problems for employers in the road transport sector, making it difficult for Austrian businesses in the sector to successfully compete with foreign companies.

Health and safety

The following health and safety issues play a role in the transport sector:

- **Working hours and fatigue:** In many countries, the social partners – especially the trade unions – are worried about the health and safety of drivers in the road haulage sector. In particular, many believe that this sector is being threatened by long working hours and fatigue, despite the implementation of the directive. Trade unions in Portugal are calling for specific legislation aimed at ensuring that drivers actually receive the breaks and holidays to which they are entitled. In the UK, the trade unions are also campaigning for a review of health and safety in the sector. In Ireland, preventing excessive working hours constitutes a priority for the trade unions, along with maintaining general health and safety standards. According to the Irish Business and Employers Confederation (IBEC), road transport companies should be able to operate flexibly, while still maintaining safety standards for drivers. In Germany, the trade union believes that excessive working hours and insufficient breaks remain a significant health and safety problem for drivers, despite the directive's implementation. Furthermore, the social partners are planning to address the issue of long working hours in the road transport sector over the coming five years. In Belgium, a government-led debate has emerged about increasing the level of night transport in the distribution sector as a way of alleviating traffic congestion. However, the government's proposals have met with negative reactions from all sides due to concerns that this would be detrimental to the safety of drivers and other road users. Health and safety is also an

issue of concern for trade unions in Italy, where the debate also centres on the fact that the directive has not yet been transposed into national law.

- **Work-Life Balance:** A large proportion of workers in the transport sector, especially drivers and ship crews are mobile workers. This poses especially problems to the work-life balance and family life and could also be a reason for the comparatively low share of women working in the sector. In the Netherlands, the debates centre around burnout and stress due to problems that occur in combining work and family life, especially in the road transport and the freight sector.
- **Rest facilities:** The subject of adequate rest facilities has emerged as an issue in some countries. In Finland, both the trade unions and employers recognise that there is a dearth of adequate facilities, particularly in eastern and northern Finland; due to the large distances involved, the organisation of rest stops can pose a particular challenge. In Germany, the quality and quantity of rest facilities is also an issue. In general there seems to be a lack of proper resting facilities, especially secure and safe resting facilities for female drivers working in the road freight transport sector.
- **Poor infrastructure and equipment:** In some countries, the quality of the infrastructure is perceived to be a greater health and safety risk for drivers. In Poland, for instance, heavy vehicle traffic on the roads is reported to be a particular problem, along with the alleged deterioration of the road network and dangerous driving conditions. In Greece, many vehicles are reportedly 30 years old or more, and the social partners are demanding subsidies and tax breaks to enable drivers to renew or replace their vehicles. Poor infrastructure is also reported to be a problem in Bulgaria, due to the bad condition of many roads, which in turn creates problems for public transport – particularly in the capital city of Sofia and other large towns. In Cyprus, concern is growing about the unsuitable road infrastructure in relation to urban transport, along with the presence of older vehicles and a lack of ticket validating machines on buses.
- **Accident prevention:** The issue of accident prevention has risen to the top of the health and safety agenda in Finland, ever since a severe road accident occurred between a truck and a bus in central Finland in 2004. After the accident, a steering group was established to research and assess the traffic safety situation in the country. Similarly, the social partners in Spain are committed to improving the rate of accidents in the country's road transport sector, which is deemed to be high by European standards.
- **Aggression against drivers:** Aggression against drivers is emerging as a growing problem in some countries. For instance, in Luxembourg, a significant increase in aggression against bus drivers has been reported in recent years. In Belgium, the problem of violence against drivers has become such a high-profile issue that, in July 2006, a collective agreement was concluded, providing for psychological counselling services for truck drivers who have been the victims of violence or theft. Under this agreement, drivers may request up to nine counselling sessions, which are to be financed by the sector's social fund.
- **Other issues:** In Norway, health and safety problems are related to a range of issues, including difficulties in implementing health and safety legislation for workers who do not have a permanent workstation; moreover, a range of lifestyle-related issues have begun to emerge, such as those concerning smoking, insufficient exercise and unhealthy eating. Weather conditions can pose a risk to drivers' health and safety in some countries. In Norway, for example, it is reported that foreign drivers are often unprepared for the country's winter weather conditions, thus leading to accidents as well as traffic jams.

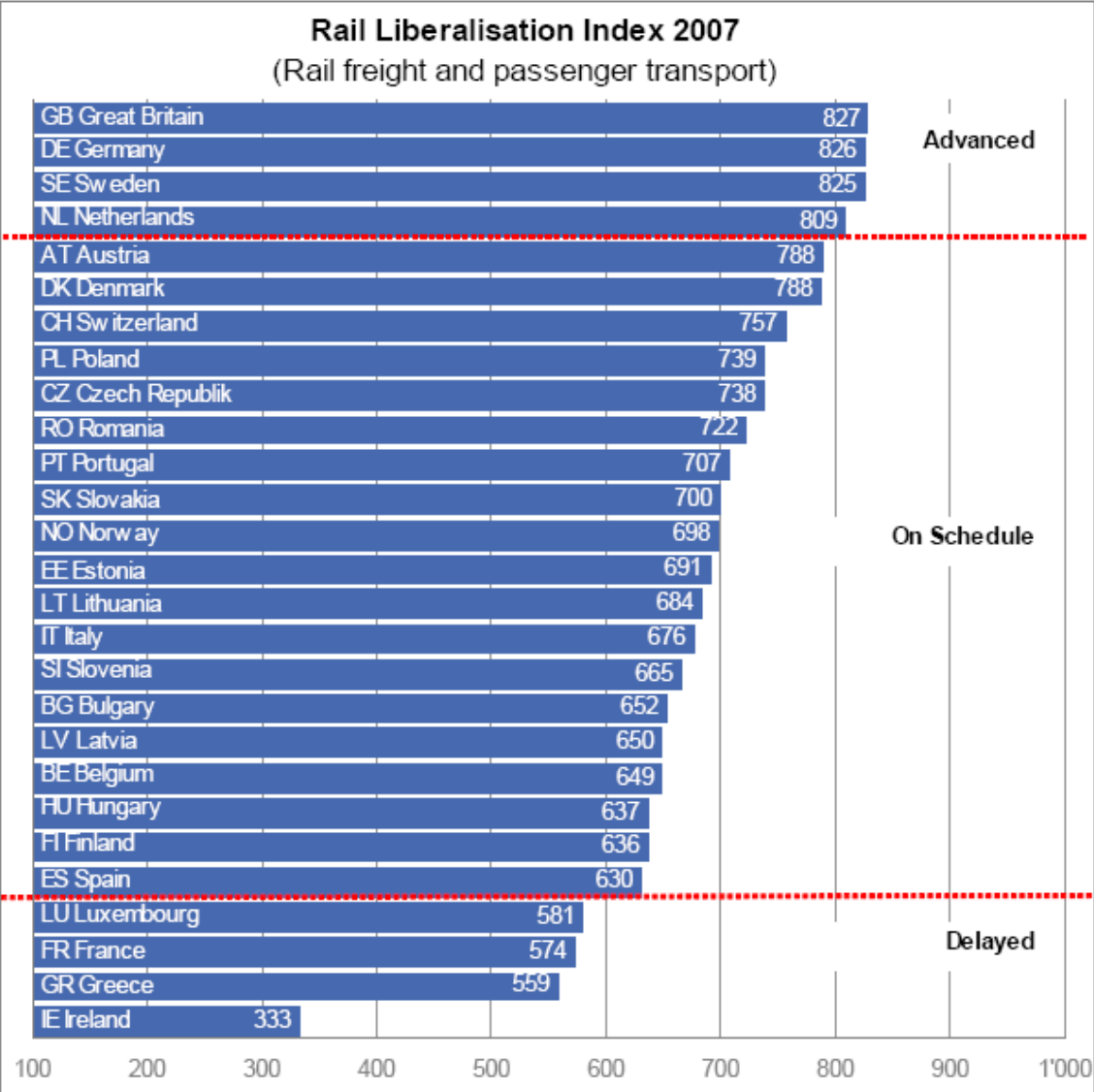
7.3 Rail transport: main labour regulation issues and problems

The Rail (NACE 601) Liberalisation Index (LIB Index) presents information on the relative degree of market opening in the European rail transport markets within an enlarged EU, including Norway and Switzerland, as observed in May 2007. The study is a benchmark for the legal and practical market access barriers seen from the viewpoint of an external railway undertaking seeking access.¹⁰

As in 2002 and 2004, three groups can be identified for the degree of market opening achieved. The countries in the advanced group, which is the top group in the LIB Index, consisting of Great Britain (827), Germany (826), Sweden (825), and the Netherlands (809), have made considerable progress in terms of the degree of market opening achieved compared with the other European states (see Figure 7.1). These four countries for the first time achieved over 800 points. All four countries in the advanced group have regulatory authorities with wide-ranging powers and competencies, and also with experience in dealing with complaints from external railway companies. Despite the features they have in common and the fact that they belong to the same group, the four countries have chosen different approaches to liberalisation and as a result differ in particular in terms of the practical and legal access regime for public service contracts and purely commercial transport in passenger transport, infrastructure charging system, the powers of the regulatory authority and the organizational structure of the incumbents.

¹⁰ IBM Global Business Services. *Summary of the Study Rail Liberation Index 2007*. Berlin: IBM Global Business Services, 2007.

Figure 7.1: Rail Liberalisation Index 2007



Source: IBM Global Business Services (2007).

Summarising, the following five points can be identified:

1. All the countries examined have continued to open their rail markets since 2004 and the gaps between them are now much smaller overall. However, there are still no uniform access conditions, as high market entry barriers still exist in some countries. The countries can be classified into three groups of market opening, which characterise the status quo of liberalisation: I. *Advanced*, II. *On Schedule*, and III. *Delayed*.
2. In principle, market entry is now possible for national and foreign rail freight transport companies in each of the countries examined. However, a railway company seeking access will still encounter in some cases very restrictive access conditions in some countries. In most countries, however, external railway companies are already licensed and actively involved in freight transport, although significant differences continue to exist between the countries in terms of passenger transport. There are countries, for example, in which external railway companies are refused access to the market altogether and countries in which numerous railway companies have been operating successfully for a long time.

3. Although EU law provides for open access for all EU rail freight transport companies as of 1 January 2007, there are still six countries that restrict the access of foreign rail freight companies to their network.
4. Rail regulation continues to vary quite considerably from country to country. There are still countries, for example, which have implemented EU directives on paper only and/or have only provided their regulatory authorities with weak competencies. Very few countries in fact have regulatory authorities that are actually capable of providing non-discriminatory network access. In this respect, the countries in the Advanced group are an exception.
5. As a result of the relatively short period of time available for the practical implementation of the regulatory framework, the practical market access processes in most cases are not as well understood and developed as the legal requirements. There are other countries, however, in which the legal requirements are hardly developed at all by comparison, while the practical market access conditions have already reached an advanced stage of development, and vice versa. Interestingly, Romania and Bulgaria, which had introduced rail reforms prior to EU accession on 1 January 2007, are now in the On Schedule group. They have liberalised their rail markets more than some the founder members of the EU.

7.4 Air transport: main labour regulation issues and problems

The aviation sector (NACE 62) in Europe has been quite turbulent during the past 10-20 years due to various issues, such as:

1. The privatization of national carriers;
2. The opening up of the aviation market to price fighters;
3. The emergence of airline alliances and trans-national mergers (e.g., Air France and KLM);
4. A significant dip in the market due to 09/11 in 2001; and
5. Exceptionally high oil prices in recent years.

Together this has led to a highly competitive market with relatively low margins. Moreover, national governments can no longer bail out loss-making national companies without being scrutinized by the European Commission for illegal subsidization. This is best illustrated by the bankruptcy of SABENA (the Belgian national carrier) and SwissAir in recent years.

The precarious financial situation of many European airline companies during the past decade has forced them to cut costs wherever possible, including that of salaries and related costs. In quite a number of cases salaries have been frozen or staff has been laid off. Also working conditions have tended to worsen. More flexibility is expected from staff, while compensation for irregular hours has been under pressure.

The level of organization of airline company staff seems to be quite high and strikes are quite common in the sector.

8 SWOT

SWOT analysis is a tool in management and strategy formulation, used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project, business venture or – as in this case – a sector, the latter being defined within a well-described geographical entity. The aim of a SWOT analysis is to identify the key internal and external factors that are important to achieving a particular objective or set of objectives. Strengths and weaknesses are internal factors that create or destroy value. For a company these can include assets, skills or resources that a company has at its disposal, compared to competitors. Opportunities and threats are external factors that create or destroy value. They emerge from either the company dynamics of the industry/market or from demographic, economic, political, technical, social, legal or cultural factors (STEPP or DESTEP, see also chapter 9). When applied to the sector level, SWOT has a similar meaning, albeit on a higher, more aggregated level.

The SWOT analysis presented in tables 8.1 to 8.4 is the result of an intensive workshop discussion which was subsequently validated and amended in two external workshops, including the final workshop in Brussels (step 10 in the methodological framework).

8.1 SWOT road transport sector

Table 8.1 summarizes the strengths, weaknesses, opportunities, and threats (SWOT) of the road transport sector (NACE 6024).

Strengths: The road transport mode is a backbone of the contemporary economy. Road transport is highly flexible and the “last mile” is (almost) always done by trucks and road transport. There are lots of companies that provide road transportation service, which vary in size from one truck driver to big multinationals operating fleets of thousands vehicles. Micro-companies with less than 9 employees dominate this sector. Low entry barriers make this type of business very “democratic”, at the same time ensuring a breakneck competition level. This leads to excellence in performance, flexibility and general customer-friendliness. Coupled with extensive road networks, the road mode is the mode of choice for majority transportation assignments. The mode enjoys stable demand which is certain to continue growing in the future.

Weaknesses: Road transport mode is resource-intensive and highly dependent on oil prices.. Also the profit margins of road transport are very low. Technological progress, especially in regard to energy-efficiency, fuel usage and environmental sustainability is (still) limited and its deployment is expensive, especially for micro companies. Resource intensity not only leads to huge expenses on fuels and other commodities, it also leads to emissions and pollution. Taken together with other external effects such as congestion and noise, there is a substantial public resistance and legislative attack on road transportation. Low entry barriers lead to generally low profitability of the sub-sector. Above this, the image of the sector is rather negative and associated with stress, long working hours, a bad work-life balance, accidents and below-average skills requirements, although the skills needed by drivers are often underestimated.

Opportunities: If the economic conditions are favourable, the demand for road transport is expected to grow noticeably, in some instances even faster than GDP of many economies. Recent enlargements of the EU and fast growth of international trade support growth in road transportation demand. The paradigm shift towards outsourcing of transport (e.g. by producers of goods) also presents an opportunity for this sub-sector. Advancements in IT technology bring a range of benefits such as direct internet sales (often requiring dedicated deliveries) and efficiency gains through optimization of operations.

Threats: Currently high oil and other commodities prices bring a substantial risk of a further price increases. Given the fact that commodities are a very substantial cost factor for road transport, this is a major threat. There is a significant probability of introduction of CO2 policy such that road transport will be obliged to pay emission costs; also congestion fighting and road pricing policies would add to the costs of road transportation and make it less attractive and / or eat up already small profit margins. Current shortage of labour can be worsened by stricter working time regulations. From the demand side, customers become more environmentally aware and may shift their transportation behaviour towards intermodal transport. Also the general perceptions of citizens and polity makers towards road transport is rather negative due to the emphasis on environmental concerns. This leads to a general view of “dirty road transport” while possibly ignoring the importance of the sector and assisting in its improvement. The Eurovignette is regarded by many actors in road transport, especially heavy freight transporters and SMEs, as a threat, because it induces additional costs without

actually assisting with solving the problem of promoting cleaner road vehicles or improving co-modality/inter-modality.

Table 8.1: SWOT analysis road transport

Strengths	Weaknesses
<ul style="list-style-type: none"> • Competitive: existence of many road haulage companies results in competitive prices. • Flexibility: door to door services. • Responsiveness: road service can often be carried out the same day. • Low entry barriers: investments/legal barriers for starting a road haulage company are low. • Demand, certainty of growth: road transport has experienced steady growth in the past 20 years • Of road transport: the last mile is always on the road (flexibility) 	<ul style="list-style-type: none"> • Sustainability: negative external effects of noise, emissions, and congestion. • Resource intensity: road haulage requires a high degree of employees and fuel to transport 1 ton of freight. • Low profitability: road haulage has between 0 and 5% profitability on average. • Low innovation potential: road haulage is lacking in innovative power. • Standard average skills level of employees: Drivers are getting more skilled, but road haulage is still a low skilled sector.
Opportunities	Threats
<ul style="list-style-type: none"> • Very good market prospects/demand: road transport will remain a fast growing EU market in the coming 10 years. • Increased outsourcing: Shippers will continue to outsource transport and related activities in order to stay competitive. • Increasing Internet sales / distribution: the use of internet as a sales channel will increase, and road haulage will be used for distribution. • Increasing efficiency through use of ICT in operations: ICT will penetrate the sector and increase productivity. • Increasing market: Integration of New Member States and Eastern European countries will extend the market possibilities. 	<ul style="list-style-type: none"> • Rising oil prices: the cost of road haulage will increase in comparison with other transport modes. • Cost of CO2 policies: possible introduction of CO2 taxation in Europe. • Labour shortages: the availability of skilled and experienced drivers in Europe. • Congestion, road pricing: increasing congestion will make efficient road haulage services more difficult, and road pricing will increase cost. • Focus on inter-modal transport by clients: More and more, inter-modal transport is becoming a viable alternative to road haulage. • Long working hours and cost reductions • High competition • Eurovignette • Citizen’s perception of “dirty road” transport

8.2 SWOT Air transport sector

Table 8.2 summarises the strengths, weaknesses, opportunities, and threats (SWOT) of the air transport sector (NACE 62).

Strengths: Air transport is the fastest transportation mode intrinsically. It enjoys high safety levels and has well established networks that can reach otherwise hardly accessible places. The sub-sector is technologically intensive and advanced; the industry innovates in business models. The latest business models include low cost carriers and yield management systems. It also provides shippers with low price transportation in certain markets.

Weaknesses: In addition to existing taxes, the governments acknowledge external effects of air transport and start taxing it more heavily. The mode is the most energy intensive measured on ton-kilometer basis. There is an increasing congestion at many busy airports and some areas, making it unreliable (sometimes to the point of collapse). As a consequence of energy intensity, the mode has high emission levels of CO₂ and NO_x, as well as other negative external effects as noise. Air transport is the most expensive transportation mode. Also pilot training is very expensive and pilots have to finance their training themselves. If employed at an airline they will get back their training fees through salary, but through this they are also highly bound to their airline.

Opportunities: There is an ongoing process of liberalization, for instance open skies: more destinations can be reached against lower costs. Recent agreements between the EU and US make it easier to operate international flights between the two continents. Globalization speeds up demand growth of air transport, as well as structurally improves the position of air transport through more people and goods carried on international routes. There is big room for consolidations and acquisitions, therefore achieving better economies of scale is possible. There is high potential for technical and institutional innovation, making cargo transport more efficient. The fuel efficiency of new equipment is also much better. IT advancements on the ground, in booking and in management make flights cheaper, e.g. through flight path optimization and cargo allocation optimization (airplanes are fully loaded).

Threats: The fuel price is the most important component of air transport costs, further growth of it can be destructive. As governments acknowledge emissions from the mode, there is a threat of introduction of fuel and ecological taxes. Air cargo market is very sensitive to economic changes and volatile: changes in economy have an amplified effect on performance. There are strong limits on airport growth: this is a global threat, which is applicable not only in Europe. Terrorist attack threats led to increased security and hence delays, making air transport less reliable or inconvenient for passengers. A possible terrorist attack – as well as other major accidents - may damage the sector substantially. The necessity for further cost reductions could also have negative effects on safety

Table 8.2: SWOT analysis air transport

Strengths	Weaknesses
<ul style="list-style-type: none"> • Quickest transportation mode: maximum travel time 24 hours globally. • Low prices in certain markets: Air transport can be good value for “fresh” products/spare parts. • High safety levels: risk of accidents per travelled kilometre is very low. • Well-established networks / hubs: hub and spoke system can deliver globally. • Excellent yield management: charging every customer according to value delivered. 	<ul style="list-style-type: none"> • Increasing taxes: amount of taxes makes air transport more expensive. • Airport congestion: this makes cargo transport less reliable. • Resource intensive: much fuel used per km transported. • High CO2 emissions / noise: high negative external cost of transport. • Relatively expensive form of transport. • Costly training
Opportunities	Threats
<ul style="list-style-type: none"> • Liberalisation (open skies): more destinations can be reached against lower cost. • Globalisation: increasing growth in demand, especially air freight. • Consolidations, M&A, economies of scale bring lower cost. • High potential for technical and institutional innovation: making cargo transport more efficient. • Increasing equipment efficiency, e.g. more full freighters. 	<ul style="list-style-type: none"> • Increased sensitivity to high oil prices: making air transport less competitiveness. • Airport growth restrictions: global threat, not only European. • Increased delays due to security issues. • Increased possibility of Fuel and CO2 taxes. • Vulnerability to economic changes: air cargo market is volatile. • Increased competition from high speed rail at short to medium distances. • Competitive pressures may affect quality and safety

8.3 SWOT rail transport sector

Table 8.3 summarizes the strengths, weaknesses, opportunities, and threats (SWOT) of the rail transport sector (NACE 601).

Strengths: Rail transport is environmentally friendly and less energy intensive and accident prone than road transport. Rail has a strong position in commodity transport market. The mode is strongly supported by public opinion and governments due to its clean image. There is an extensive existing infrastructure present (in the form of a broad rail network) and rail technology gets much support for future innovations.

Weaknesses: The mode is inflexible (fixed time schedules, fixed origins / destinations) and is often unreliable, especially for cargo services. To transport goods by rail, terminals are required as door-to-door transportation is often impossible: this creates additional complexity of the services as inter-/co-modal transportation arrangements are often required. There are frequent congestions at the terminals. There is limited capacity of rail infrastructure, as rail lanes have fundamentally smaller capacity than road lanes. There is a general decline in the (market) share of the rail transport. National railways have different regulations and standards, thus border crossing is a big problem.

Opportunities: National governments and EC stimulate the rail sector through policies and programs as it is considered a more environmental friendly mode of transportation. Existing problems with road transport (congestion, fuel costs, pollution) present an advantage for the rail transport. Depending on organisation and planning, rail can be faster than road due to road driving time regulation and traffic jams, especially for certain parts of the transport way and long haulage. If the service level is improved, the rail is well positioned to take some cargo from road and to increase its share in transportation segment.

Threats: Road mode innovations (e.g. introduction of long and heavy vehicles or intelligent traffic management) can make lead to substitution effects and higher competition between rail and road. Despite supporting government policies, there is a chronic underinvestment (mainly) into infrastructure, which may persist in the future. Railways are highly unionized and strikes are frequent, which makes them less reliable and more expensive and rigid. There was a wave of poorly designed privatizations (e.g. privatization of the UK rail system): effects of these could be felt in the future. Sophistication of contemporary supply chains demand fast and reliable transport; moreover rail brings more complexity into them (as additional operations are required), which is a problem for rail cargo transport.

Table 8.3: SWOT analysis rail transport

Strengths	Weaknesses
<ul style="list-style-type: none"> • Environmentally friendly, less energy intensive than road. • Somewhat cheaper than road transport. • Strong position in commodities transport market. • Strongly supported by public opinion due to clean image. • Extensive existing infrastructure. • Technological developments 	<ul style="list-style-type: none"> • Inflexible and often unreliable freight services. • Terminals required, can be overcrowded. • Limited capacity of rail infrastructure. • Declining share of transportation market. • Not harmonized: crossing borders is the problem.
Opportunities	Threats
<ul style="list-style-type: none"> • Government and EC measures stimulating rail. • Environmentally friendly: green choice for transportation mode. • Problems with road transport: congestion, fuel costs. • Can be faster than road due to road driving time regulation. • Can improve service level and take some cargo from road. 	<ul style="list-style-type: none"> • Road innovation (e.g. Long and Heavy Vehicles). • Underinvestment. • Strong trade unions and strikes. • Poorly designed privatizations. • Sophistication of supply chains.

8.4 High sea and inland waterway transport sector

Table 8.4 summarizes the strengths, weaknesses, opportunities, and threats (SWOT) of the sea and inland waterway transport sector (NACE 61).

Strengths: This is the cheapest transport mode on the basis of ton-kilometers. It brings relatively low negative external effects for citizens; partly these effects occur at sea and thus “hidden”. It is not labor intensive, thus less dependent on scarce labour supply. This transport mode is able to cope with big quantities of goods at once: ships have vastly larger carrying capacity than other vehicles. Transit time is reliable and predictable; the mode is safe.

Weaknesses: With some exceptions, it is the slowest mode of transport. Weak regulation policies, especially of international transport, lead to many law infringements. It is capital intensive, with ships that are on average quite old. Chances of big calamities are low, but the impact of a catastrophe is big. Skill levels are declining due to outsourcing of labour to low cost countries.

Opportunities: Increased globalisation means more containers to be shipped each year. Increased ship size will improve economies of scale. Short sea shipping as a transport mode in Europe is becoming more important. Growing containerisation and standardisation is a continuing driving force for world trade and consequently for growth of the mode.

Threats: Ever increasing port congestion will result in more delays and decrease reliability of the mode. As a global trade, high sea transport is vulnerable to economic changes: they have an amplified effect on it. There is much more public demand for cleaner sea transport, while it is difficult for the mode to comply due to old equipment and growing prices for new equipment. This is true for vessels operating on inland waterways as well as transports on high sea/international waters. Intense price competition between shipping lines will result in economic difficulties and less investment in the sector, especially when new vessels’ prices are very high. There is an increase in piracy acts in different parts of the world (East and West-Africa, South-East Asia), affecting the security of vessels operating in high sea/international waters.

Table 8.4: SWOT analysis of the high sea and inland waterway transport sector

Strengths	Weaknesses
<ul style="list-style-type: none"> • Cheapest form of transport per ton km. • Relatively low negative external effects for citizens, partly these effects are at sea and thus “hidden”. • Not labour intensive: less dependence on scarce labour supply. • Ability to handle large volumes in one shipment. • High predictability and safety of transport. 	<ul style="list-style-type: none"> • Slowest form of transport. • Weak regulation policies lead to many law infringements. • Capital intensive, with ships that are on average quite old. • Chances are low, but the impact is big when accidents happen. • Skill levels declining due to outsourcing of labour to low cost countries.
Opportunities	Threats
<ul style="list-style-type: none"> • Increased globalisation means more containers to be shipped each year (489 million Teu in 2007). • Increased ship size will improve economies of scale. • Increased use of short sea shipping as a transport mode in Europe. • Growing containerisation and standardisation is a continuing driving force for world trade. • Lasting public support for port facilities globally will fuel growth. 	<ul style="list-style-type: none"> • Ever increasing port congestion will result in more delays. • As a global trade, sea transport is vulnerability to economic changes. • Much more public demand for cleaner sea transport, difficult to comply due to old equipment. • Intense price competition between shipping lines will result in economic difficulties and less investment. • Increased piracy acts in different parts of the world (West-Africa, South-East Asia) affecting the security on high sea/international waters.

9 Drivers

9.1 Identifying sectoral drivers: methodology and approach

The methodological framework as defined by Rodrigues (2007) serves as the starting point for the identification of drivers. Rodrigues identifies three main driver categories: economic, technological and organizational drivers, with the economic dimension representing the main trends in demand and supply, the technological dimension covering the main trends in process and product innovation (including services) and the organizational dimension representing main trends in job functions (conceptual, executive). The Rodrigues' approach in principle enables the identification of drivers, and especially so at the meso (sector) and micro (firm or company) level. The search and identification procedure of drivers itself is less well defined, however. Implicitly it is assumed that expert opinion and desk study are sufficient tools to come up with a relevant and plausible set of drivers at the sector level.

During the first stage of the project, a methodological tool (approach) has been developed to facilitate and help the identification and further delimitation of drivers, to arrive at a set of key drivers. Apart from expert opinion mobilised and managed as discussion panel (in a similar manner as a SWOT analysis is usually organised), this approach strongly builds on the findings of existing foresight and other future studies. By consistently linking the search for drivers with the findings in existing foresight and other future studies, a more coherent and all-embracing methodology to finding sector-specific drivers can be deployed.¹¹ This so-called 'meta-driver' approach of identifying main sectoral drivers starts from a more generic list of meta-drivers derived from a literature survey, and subsequently in a step-wise manner delimits the drivers to a set of most relevant and credible drivers. It does so by combining adequate expert (sector) knowledge in a panel setting. By subsequently asking the expert panel to score the different drivers on a range of characteristics, including relevance, uncertainty, and expected impact (similar to a SWOT procedure), a corroborated and conclusive list of sector-specific drivers can be derived. The meta-driver approach hence enables filtering out in a systematic and consistent way meso and possibly micro (sector-specific) as well as the macro (economy-wide) trends and developments judged relevant and important to the sector, directly and indirectly.

The meta-driver approach includes the following five steps:

Step 1. Drawing up of a list of relevant generic or meta-drivers based on literature review and expert knowledge (check-list: rows)

Step 2. Designing a list of key questions in order to identify the sector relevance and other properties of meta-drivers at sector level (check-list: columns)

Step 3. Filling in the check-list matrix: which meta-drivers do matter most for the sector?

Step 4. Which drivers do matter most for jobs and skills?

Step 5. Does the tailor-made list herewith cover all relevant sectoral drivers, i.e. are there any sector-specific drivers missing (check on completeness)

Arguments in favour of the use of the 'meta-driver' approach are:

¹¹ Common ways to rank trends and drivers are the DESTEP (Demographic-Economic-Social-Technological-Ecological-Political) and STEEP (Social-Technological-Economic-Ecological-Political) categorisations. For our purpose, slightly altered DESTEP definitions are used to reflect the embracing dimension of analysis.

- The ability and opportunity to use the rich potential of a multitude of already available studies on drivers, determinants of change and key trends
- Circumventing the risk of a too narrow focus on the sector per se while acknowledging sector-specificity, and avoiding the risk of analyzing sectors as if they were isolated (cf the difference between ‘general equilibrium’ and ‘partial equilibrium’ approaches)
- Guaranteeing overall consistency, coherence and completeness, as well as warranting a same point of departure important across lots/sectors – i.e. a way of integral assessment, making sure that all important factors are systematically taken on board.

An alternative and second way to arrive at a list of main sector-specific drivers of change is to start with a SWOT and subsequently translating the Opportunities and Threats part into sector-specific drivers. The SWOT is used as a tool to verify and check the resulting list of drivers. By combining the results of both the “from meta-drivers to sector-drivers” and the “from SWOT to sector-drivers” exercises a complete and consistent list of sector-specific drivers can be derived.

9.2 Identifying sectoral drivers: methodology and approach

The methodological framework as defined by Rodrigues (2007) serves as the starting point for the identification of drivers. Rodrigues identifies three main driver categories: economic, technological and organizational drivers, with the economic dimension representing the main trends in demand and supply, the technological dimension covering the main trends in process and product innovation (including services) and the organizational dimension representing main trends in job functions (conceptual, executive). The Rodrigues’ approach in principle enables the identification of drivers, and especially so at the meso (sector) and micro (firm or company) level. The search and identification procedure of drivers itself is less well defined, however. Implicitly it is assumed that expert opinion and desk study are sufficient tools to come up with a relevant and plausible set of drivers at the sector level.

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¹² Common ways to rank trends and drivers are the DESTEP (Demographic-Economic-Social-Technological-Ecological-Political) and STEEP (Social-Technological-Economic-Ecological-Political) categorisations. For our purpose, slightly altered DESTEP definitions are used to reflect the embracing dimension of analysis.

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Step 3. Filling in the check-list matrix: which meta-drivers do matter most for the sector?

Step 4. Which drivers do matter most for jobs and skills?

Step 5. Does the tailor-made list herewith cover all relevant sectoral drivers, i.e. are there any sector-specific drivers missing (check on completeness)

Arguments in favour of the use of the ‘meta-driver’ approach are:

- The ability and opportunity to use the rich potential of a multitude of already available studies on drivers, determinants of change and key trends
- Circumventing the risk of a too narrow focus on the sector per se while acknowledging sector-specificity, and avoiding the risk of analyzing sectors as if they were isolated (cf the difference between ‘general equilibrium’ and ‘partial equilibrium’ approaches)
- Guaranteeing overall consistency, coherence and completeness, as well as warranting a same point of departure important across lots/sectors – i.e. a way of integral assessment, making sure that all important factors are systematically taken on board.

An alternative and second way to arrive at a list of main sector-specific drivers of change is to start with a SWOT and subsequently translating the Opportunities and Threats part into sector-specific drivers. The SWOT is used as a tool to verify and check the resulting list of drivers. By combining the results of both the [meta-drivers → sector-drivers] and the [SWOT → sector-drivers] exercise a complete and consistent list of sector-specific drivers can be derived.

9.3 Identification and discussion of sectoral drivers

The following drivers score 7 or more in terms of relevance to the transport sector (table 11):

- *Demands of an ageing and more diversified society:* This driver is very relevant and predictable. It will lead to shifts in needs and behaviour of societies. It will also lead to a shrinking employable population size and increase of the age of the average worker. This trend will mainly manifest itself as a long-term change, increasing differences between countries. On the other hand, as it affects whole population, there is no clear difference between sub-sectors.
- *Declining labour force:* This driver is very similar to the previous one, however has a smaller impact on required skills and may manifest itself differently in various sub-sectors.
- *Income per capita and household:* Changes in income are important and are pretty predictable, affecting rather long-term developments of the sector. The current trend is that “Old Europe” is still much richer than NMS, however the NMS grow much faster. The growth will demand more transport, and perhaps different types of transport thus affecting the composition of the sector.
- *Outsourcing & off-shoring:* This driver is very important for the transport sector; it can be also seen as a paradigm shift, such that the transport function is more and more outsourced to specialized companies. It is pretty certain that this factor will continue

playing an important role during at least the medium term, bringing changes to skills required, employment composition and volume, stipulating different speeds and development among countries and sub-sectors.

- *Increasing global competition:* Globalization is likely to continue, manifesting itself in deeper integration of European economies as well as the EU economies with the outside world. It will influence the volume of workforce (both pushing it up and down), demanding new competences from the workforce. There will be substantial differences between countries and sub-sectors, as countries specialize and excel in certain areas. Transport is a service, thus it cannot be decoupled from the place of consumption. Local services will still be provided by companies with national presence, while international services will be more exposed to global competition.
- *Global / regional production networks (dispersed production locations, transport):* This driver is very similar to the increasing global competition; however, it will bring more changes to the employment composition due to more regional differentiation.
- *Increasing market segmentation (tailor made production, mass customization):* This driver is important and will stretch to at least medium-term perspective. The market segmentation usually increases employment, demands specialized skills and therefore brings new employment composition. The driver has different levels of importance in different countries; it also plays a different role in different sub-segments, because it is more profound closer to the final consumer and generally less important upstream.
- *Advances in IT impacting on organizational structures & new business models:* This is perhaps the most important driver, which influences development of the sector. It is expected that it will play a substantial role until 2020. It influences employment volume and structure: automation of operations releases workers from most routine operations, while demanding knowledge and sophistication in other areas. There are substantial differences in the level of IT sophistication between sub-sectors and countries. The main impact of this driver is that it decreases demand in low-skilled labour and highly increases demand in highly educated work force.
- *New/additional value-added services:* This driver is very important now and will continue to be important in medium-term perspective, however, is less certain than many other drivers. New services demand new employees and change structure of employment, as well as demanding new skills. For instance, some production-related activities now are done in the distribution sub-sector, closer to the final consumer. There are substantial differences in respect to this driver between countries and sectors, for instance they can be more often found in Western Europe than in the East, this driver less affects bulk transport sub-sector.
- *Availability and price of other natural resources:* The price of oil and other commodities has risen enormously during the past few years, eating up profits in resource-intensive transport sector. The prevailing thinking in the sector is that the oil price will continue increasing, however, from the historical perspective and economical logic the oil price should eventually start decreasing, thus there is an enormous uncertainty in respect to this driver. There is no direct impact on employment, as the economies in general cope well with high prices; however, there is a clear need in special skills that help decreasing fuel consumption. There is no difference between countries as oil prices are relatively the same everywhere; nevertheless there are differences between sub-sectors as some sectors are more energy-intensive (proportion of commodities costs in production process) than other sectors.

- *Quality of institutions (judiciary, transparency, lack of corruption, viable business climate, and structural rigidities):* This driver has mostly long-term effects on the performance of the economies as a whole and through it on the transport sector, influencing size of the sector and employment. There are substantial differences between countries, as their institutions have different levels of quality and integrity. Also this driver is sector-specific, as various sub-sectors have different levels of regulation burden.
- *Labour market regulation:* This driver is very important for the sector as regulations directly influence the size of employment and its cost (e.g. driving time regulations require more drivers in comparison to a situation without such a regulation). They also influence how easy is to hire / fire workers. These types of regulations are normally applied Europe-wide, so there are no substantial differences between EU countries (only the degree of implementation / enforcement may differ). Non-EU countries (may) have different approaches to the regulation.

Table 9.1: From Meta-Drivers to Sector-Specific Drivers for the Transport Sector

Category	Driver	Is this driver relevant for the sector?	How relevant is this driver for the sector?	How uncertain is this driver for the sector?	Are substantial impacts expected on the volume of employment?	Are substantial impacts expected on employment composition?	Are substantial impacts expected on new skills?	Short, medium or long run impact? ¹³			Are substantial differences expected between countries?	Are substantial differences expected between subsectors?
		Y / N	Scale 0-10	Scale 0-10	Y/N	Y/N	Y/N	S	M	L	Y / N ¹⁴	Y / N ²
Ageing / demographics	Ageing: Adapt to the market demands of an ageing and more diversified society	Y	9	0	Y	N	Y		X	X	Y	N
	Ageing: Declining labour force	Y	9	0	Y	Y	N		X	X	Y	Y
	Population growth (birth and migration)	Y	3	2	N	Y	Y			X	Y	Y

¹³ Short = 0-3 years; medium = 3-7 years; long = > 7 years. All three categories may apply

¹⁴ If necessary include footnote in cell with more precise info what differences are.

Category	Driver	Is this driver relevant for the sector?	How relevant is this driver for the sector?	How uncertain is this driver for the sector?	Are substantial impacts expected on the volume of employment?	Are substantial impacts expected on employment composition?	Are substantial impacts expected on new skills?	Short, medium or long run impact? ¹³			Are substantial differences expected between countries?	Are substantial differences expected between subsectors?
		Y / N	Scale 0-10	Scale 0-10	Y/N	Y/N	Y/N	S	M	L	Y / N ¹⁴	Y / N ²
Economic	Income per capita and household	Y	8	2	Y	Y	Y			X	Y	N
	Income distribution	Y	3	4	Y	Y	N			X	Y	N
Globalisation	Outsourcing & offshoring	Y	8	3	Y	Y	Y	X	X	X	Y	Y
	Increasing global competition	Y	7	3	Y	N	Y	X	X	X	Y	Y
	Emerging economies driving global growth (new market demand, especially BRIC ¹⁵ countries)	Y	6	3	N	N	Y		X	X	Y	Y

¹⁵ BRIC countries: Brazil, Russia, India, China

Category	Driver	Is this driver relevant for the sector?	How relevant is this driver for the sector?	How uncertain is this driver for the sector?	Are substantial impacts expected on the volume of employment?	Are substantial impacts expected on employment composition?	Are substantial impacts expected on new skills?	Short, medium or long run impact? ¹³			Are substantial differences expected between countries?	Are substantial differences expected between subsectors?
		Y / N	Scale 0-10	Scale 0-10	Y/N	Y/N	Y/N	S	M	L	Y / N ¹⁴	Y / N ²
	Global / regional production networks (dispersed production locations, transport)	Y	8	2	Y	Y	Y		X	X	Y	Y
	Counter-trend regionalism / protectionism	Y	2	6	N	N	N	X			N	N
Cultural values	Increasing market segmentation (tailor made production, mass customization)	Y	8	2	Y	Y	Y	X	X		Y	Y
	Lifestyle changes	N										

Category	Driver	Is this driver relevant for the sector?	How relevant is this driver for the sector?	How uncertain is this driver for the sector?	Are substantial impacts expected on the volume of employment?	Are substantial impacts expected on employment composition?	Are substantial impacts expected on new skills?	Short, medium or long run impact? ¹³			Are substantial differences expected between countries?	Are substantial differences expected between subsectors?
		Y / N	Scale 0-10	Scale 0-10	Y/N	Y/N	Y/N	S	M	L	Y / N ¹⁴	Y / N ²
	Increasing demand for environmentally friendly / organic products	Y	5	7	N	N	Y	X	X		Y	N
Technology, R&D and product and process innovation	Advances in IT impacting on organizational structures & new business models	Y	10	3	Y	Y	Y	X	X	X	Y	Y
	Internet changing production and consumption patterns (e-business; etc.)	Y	5	7	N	N	Y	X	X		Y	Y
	New types of work organisation (teams-based, sociotechnique, etc.)	N										

Category	Driver	Is this driver relevant for the sector?	How relevant is this driver for the sector?	How uncertain is this driver for the sector?	Are substantial impacts expected on the volume of employment?	Are substantial impacts expected on employment composition?	Are substantial impacts expected on new skills?	Short, medium or long run impact? ¹³			Are substantial differences expected between countries?	Are substantial differences expected between subsectors?
		Y / N	Scale 0-10	Scale 0-10	Y/N	Y/N	Y/N	S	M	L	Y / N ¹⁴	Y / N ²
	New/additional value-added services	Y	8	5	Y	N	Y	X	X		Y	Y
	Other (sector specific)	N										
Natural resources	Availability (and price developments) of oil and energy	Y	9	7	N	N	Y	X	X	X	N	Y
	Availability and price of other natural resources	N										
Institutional / Political	Trade and market liberalization (national level)	Y	4	5	N	N	N	X	X		Y	Y
	EU integration –	Y	6	5	Y	N	Y	X	X		Y	Y

Category	Driver	Is this driver relevant for the sector?	How relevant is this driver for the sector?	How uncertain is this driver for the sector?	Are substantial impacts expected on the volume of employment?	Are substantial impacts expected on employment composition?	Are substantial impacts expected on new skills?	Short, medium or long run impact? ¹³			Are substantial differences expected between countries?	Are substantial differences expected between subsectors?
		Y / N	Scale 0-10	Scale 0-10	Y/N	Y/N	Y/N	S	M	L	Y / N ¹⁴	Y / N ²
	deepening (single European market etc.)											
	EU integration – broadening (bigger domestic market)	N										
	Quality of institutions (judiciary, transparency, lack of corruption, viable business climate, structural rigidities)	Y	8	5	Y	N	N		X	X	Y	Y
	Labour market regulation	Y	8	4	Y	Y	N		X	X	Y/N	Y
	Environmental	Y	6	6	Y	N	N	X	X	X	Y	N

Category	Driver	Is this driver relevant for the sector?	How relevant is this driver for the sector?	How uncertain is this driver for the sector?	Are substantial impacts expected on the volume of employment?	Are substantial impacts expected on employment composition?	Are substantial impacts expected on new skills?	Short, medium or long run impact? ¹³			Are substantial differences expected between countries?	Are substantial differences expected between subsectors?
		Y / N	Scale 0-10	Scale 0-10	Y/N	Y/N	Y/N	S	M	L	Y / N ¹⁴	Y / N ²
	regulation											
	Security and safety regulation	Y	4	4	N	N	N	X	X	X	Y	Y

Part II.

Future Scenarios and Implications for Jobs, Skills and Knowledge

Part II. Future Scenarios and Implications for Jobs, Skills and Knowledge - Guide to the reader

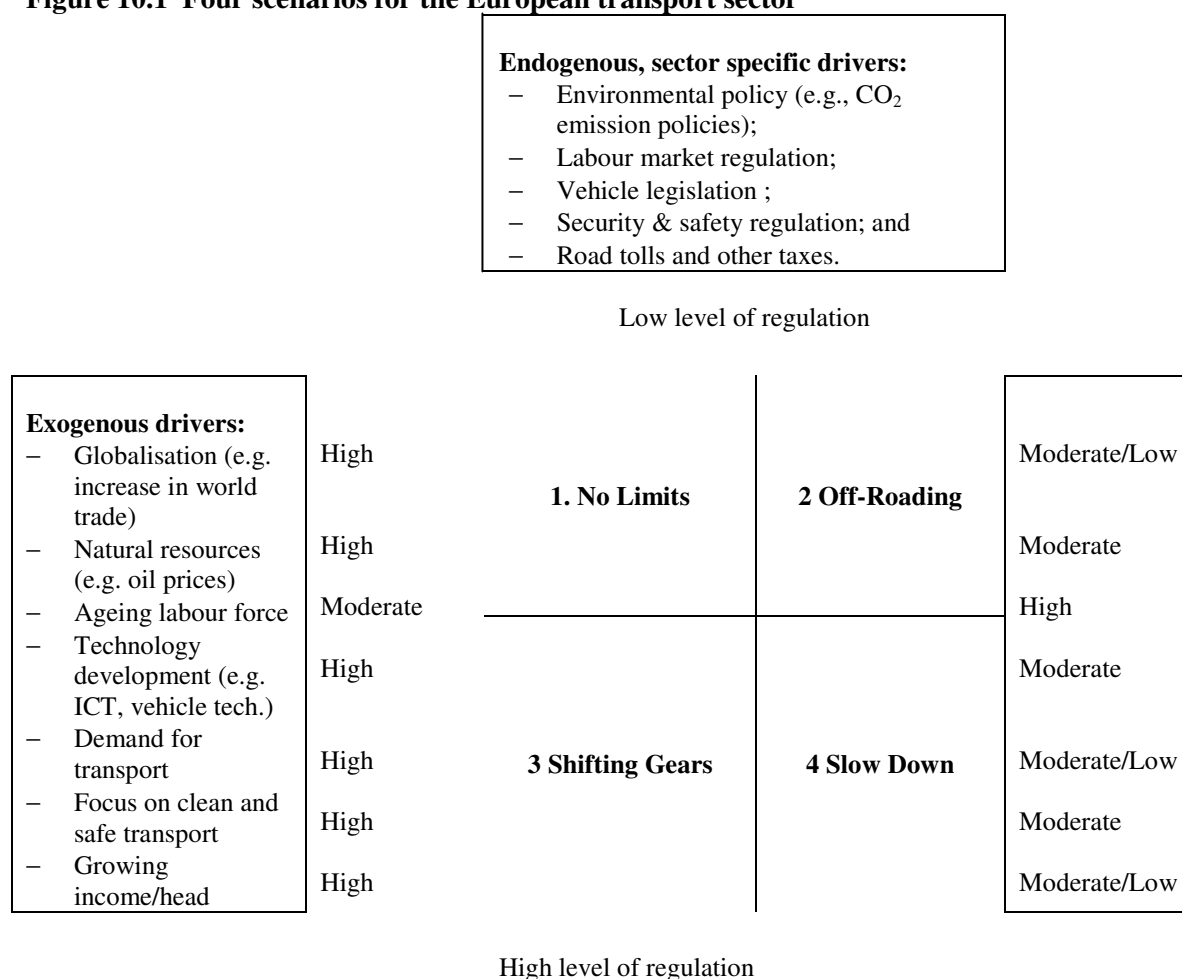
Part II presents the scenarios and their implications for jobs, skills and knowledge. It reflects steps 4, 5 and 6 of the common methodology. The contents of part II are as follows: Chapter 10 describes the structure and highlights the content of the four main scenarios (step 4). For each of these scenarios plausible yet different assumptions have been made as to how the main drivers of change will develop and add up to different states of the future. In subsequent steps the implications of the scenarios for jobs and skills are analysed. In order to facilitate a translation of these implications to the job function level, first a workable job function structure is proposed. This structure is based on the functions as they appear in Eurostat's Labour Force Survey and further elaborated. Chapter 10 discusses the main implications of the scenarios in terms of future employment volumes by job function (step 5). Chapter 11 assesses the implications of scenarios for future skills and knowledge needs by job function. It translates the implications of the scenarios for skills and knowledge by function (step 6).

10 Scenarios

10.1 Overview of scenarios and main underlying drivers

Figure 10.1 presents four different scenarios and their underlying drivers for the Transport and Logistics Sector. The scenarios which were specifically constructed for and used in this study are based on a clustering of relevant drivers identified in part I.

Figure 10.1 Four scenarios for the European transport sector



The scenarios are construed to ‘scan’ the future, and are for the purpose of this study used to assess the impact of future developments on jobs, skills and knowledge. It is important to understand what scenarios can deliver and what not. Scenarios depict plausible futures and might reveal possible paths of development towards these futures. They are neither predictions or forecasts, nor wishful pictures (‘dreams’, ‘crystal ball gazing’) of the future. Grounded in existing data and trends, scenarios are derived in a logical and deductive way, with different and sometimes opposing presumptions about how key drivers might develop, resulting in inferences about plausible, i.e. credible and imaginable, futures.

In drafting the scenarios, a clear distinction has been made between exogenous and endogenous drivers; the horizontal axis in the figure represents the relevant exogenous drivers, whereas the vertical axis represents the relevant endogenous drivers. The main difference between the two categories of drivers is the scope and ability for direct influence. Exogenous drivers are drivers that form a “given” for the sector without much room for influence for/by individual actors drivers. Endogenous drivers are drivers that can be influenced at the sector level, for instance by national or European policy-making. Only those drivers that received the highest ranking - a score between 8 to 10 on a scale of 0 to 10 (see chapter 9) - have been taken into consideration.

10.2 The drivers – building blocks for scenarios

The drivers form the main fundament and can be regarded as the key building blocks for the construction of the scenarios. One of the central tenets of the scenarios identified here is a clear distinction between exogenous and endogenous drivers.

The *exogenous drivers* that make up the four scenarios in Figure 10.1 are those drivers that influence the characteristics of the scenarios but which come from “outside the system” and are difficult to influence by policy-making.

The *endogenous drivers* are defined as those drivers that can be directly influenced by governmental actors; in other words where there is the scope and ability to change the course of action by policy-making, either at the regional/national or the European level. Two sets of drivers - which *a priori* might also be labelled endogenous factors - are not included in the scenarios. These factors concern possible actions to be taken at the industry or company level itself and measures directed towards the education and training system. The reason for excluding these drivers in the formulation of the scenarios is that these factors can be regarded as solutions, so-called strategic options that logically follow from the scenarios as implications rather than as building bricks for the scenarios. These strategic options represent the degrees of freedom for policy and other action (see further section 7: strategic choices to meet emerging skill needs).

Overview and description of exogenous drivers

The exogenous drivers in each of the four transport scenarios are the following:

1. *Globalisation and world trade*: Globalisation can be characterised as a development whereby world trade is growing more rapidly than the world economy due to a more intensive exchange of goods and services between countries. Due to the financial crisis that began to show its global impact in 2008, global trade began to experience stagnation. Since our time frame is 2020, however, it is expected that the situation normalises until then. The question is, how fast and to what extent this recovery will materialise. On the extreme ends of the spectrum there are two alternatives: a fast and full recovery or a rather slow one with a generally moderate to low pace of further globalisation.
2. *Prices of natural resources*: The price of oil and other natural resources is highly relevant for developments in the transport sector, because oil prices amount to about 30% of transport cost. Since most natural resources are finite and especially fossil fuels will become increasingly scarce, it is likely that their prices will remain rather high or even increase drastically. It is however difficult to exactly predict the development of oil-prices, because their formation is also policy dependent. Also new

developments in alternative fuels and energy technology are conceivable. Therefore the scenarios will deal with one medium and one high increase variant.

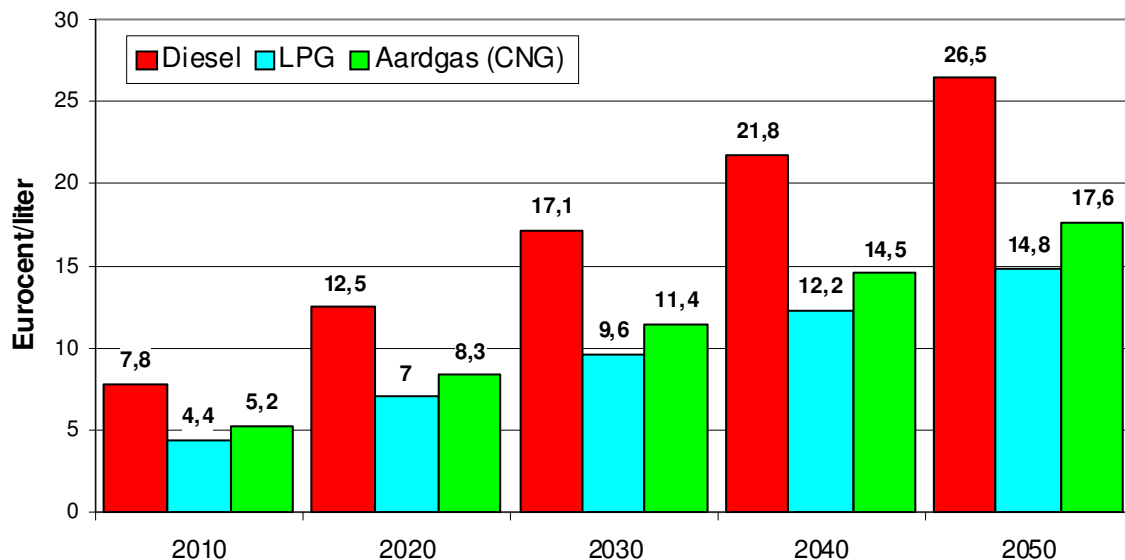
3. *An ageing and declining workforce:* Due to declining birth rates within most European countries, population growth in Europe is expected to slow down or even decline in the coming decades. At the same time, life expectancy is rising, which in combination with declining birth rates results in an aging of European society and may lead to labour shortages and rising social insurance and medical expenditures. The effects of this development can either be high or moderate, e.g. compensated through the immigration of qualified foreigners, later retirement age or automation.
4. *Technology development:* Several new and innovative technological developments in ICT and vehicle technology will have large impacts on the transport sector. These new and innovative technology developments include: (1) ICT and technology for vehicles (e.g., board computer, GPS, lane warning systems); (2) ICT and technology for the infrastructure (e.g., dynamic route information panels, satellite navigation); and (3) ICT and technology at the home base of transporters (e.g., advanced planning and routing systems). If and how fast these potentials materialise into products also depends on the overall economic situation (e.g. in regard to R&D investments) and the financial situation of firms that develop the products, research policy and the possibility of transport firms to purchase new and innovative products. But even in times of the financial crisis, the investment in and demand of eco-technology remained rather stable. Because science and technology are likely to progress in any case, the variants of this variable is either high or moderate.
5. *Demand for transport:* The financial crisis that has reached global dimension since 2008 also had negative effects on the transport sector, because less trade and less income means less transport. Especially the shipping and road freight industries are hit hard. However, a fast recovery is not unimaginable. Many countries are currently investing in the modernisation of the public infrastructure to create new jobs and stimulate the economy. Therefore the values for the variable can either be high or moderate to low.
6. *Demand for clean and safe transport:* The level of demand for cleaner and safer transport could clearly influence major developments in the transport sector. More and more, manufacturers and retailers are asking transport companies to show that their transport is done safely and with a low CO₂-footprint. But the implementation is costly and as long companies, especially SMEs, are struggling for survival, investing in eco-friendly technologies may not be a top priority. It is expected, however, clean and safe transport will generally remain an important topic. Energy-efficiency can save costs on the long run and a negligence of safety issues can come very expensive. Therefore the values of the variable will either be high or moderate.
7. *Growing income per capita:* The growth in the income per capita in the different EU countries will have an indirect effect on transport demand, because with a higher income the EU citizens will spend more on imported articles for which more vehicle kilometres are made. Particularly, in the New-Member States there is considerable potential for growth in income per capita. Also here the overall situation depends on the further development of the economy after the crisis and how fast the job-markets can recover. Therefore the values for per capita income growth can either be high or moderate to low.

Overview and description of endogenous drivers

The endogenous drivers in each of these four transport scenarios are the following:

1. *Environmental regulation.* The EU environmental policies are aimed at reducing CO₂ emissions and other negative effects of transport in Europe. The level of these policies is highly relevant for further developments and modernisation in the transport sector. This becomes clear in Figure 10.2, where the potential CO₂ tax for the road transport sector in Europe is calculated. The degree of environmental regulation and requirements can vary from stricter policies to less stricter ones, which could have different impacts on different transport modes due to different technological possibilities (e.g. in air transports vs. rail transport) and costs.

Figure 10.2 Proposed CO₂ tax on fuel in road haulage in Europe in Eurocent/liter



Bron: CE, "Handbook on estimation of external cost in transport sector", december 2007

2. *Labour market regulation:* Although within EU member states, employers are allowed to work in any other member state, the regulations and requirements for non-EU citizens can take different paths or be different within single EU countries. The same applies for the harmonization of training programs and job certifications. Therefore labour and labour market regulations can either be more flexible or stricter, thus influencing the availability of employees and working conditions.
3. *Vehicle legislation:* The national vehicle legislation, especially on the use of trucks and heavy vehicles, can differ. An example is the ongoing discussion about the use of long and heavy vehicles in Europe, which are currently only allowed in the Netherlands, Finland and Sweden. Vehicle legislation could either become stricter and mandatory on EU-level or remain less strict and optional in many respects.
4. *Safety policies:* Although transport safety plays an important role in national and EU-policy, some are demanding even stricter regulation. Examples are regulations about large and heavy trucks, busses, speed limits and the supervision and enforcement of laws about maximum working and resting hours for drivers. These could become even much stricter, also on EU-basis or basically remain at current levels.

5. *Road tolls*: Some EU member states have road tolls and fees are often dependent on vehicle type and environmental performance. Road tolls especially affect (cross-border) transport by trucks. The scenarios are being based on either high increases in road tolls or stagnant or low increases.

10.3 The scenarios – detailed discussion

Based on the combination of endogenous and exogenous drivers the following four scenarios for the transport and logistics sector are distinguished:

- Scenario I : *No Limits*
- Scenario II : *Off-Roading*
- Scenario III : *Shifting Gears*
- Scenario IV : *Slow Down*

Scenario 1: *No Limits*

This scenario is a combination of a world economy that recovers fast from the crisis and continues to grow (e.g. with a steady growth of trade with China and India). A rather high growth in EU income per capita and increasing prosperity of Eastern European countries, but also in Southeast Asia and Latin America will fuel the EU and global demand (e.g. imports and exports as well as tourism) for transport. Governmental regulations are less strict, pose little restrictions on the transport sector and allow for much flexibility, but the oil prices are rather high. This and rather less strict environmental regulations provide much incentives for efficiency-related technologies, while also much attention is paid to intelligent logistics, traffic management, driver assistance systems and high-speed trains. Since aging employees live longer in good health, many of them opt for later retirement. Also the labour market regulation is loose so companies have opportunities to also hire people throughout and even outside the EU to cover for growing demand in workforce. Therefore the problems with the declining workforce are only moderate.

Scenario 2: *Off-Roading*

This scenario is like steering through difficult terrain by trying to use all available means to move. It takes place in a setting with a stagnant or only slowly growing world economy, low income growth, rather high unemployment, but relatively low oil and energy prices and low levels of regulation. The generally unfavourable economic situation also has a negative effect on the demand for transport. Especially SMEs in the road transport sector, are facing financial difficulties. The combination of financial constraints, a weak and unpredictable regulatory environment together with rather low energy prices slows down investments in new technologies, improved safety and a general modernisation of the transport sector. Cost reduction is the most important credo and low budget offers are popular. Due to limited regulations, this trend could lead to less favourable impacts on environmental sustainability, safety and working conditions. The aging of European populations has a negative impact due to generally declining health conditions. Due to low labour market regulations, people from low-wage countries are employed, which however often lack good qualifications. Money for solid and certified training and re-training programs is also insufficient.

Scenario 3: *Shifting Gears*

This scenario implies regulated modernisation of the transport sector within favourable economic settings. Like in scenario 1, the world economy is recovering fast from the crisis, experiences growth and per capita income is high and unemployment is low and the overall demand for transport is growing.

In contrast to scenario 1, however, this setting is also characterised by a large amount of governmental regulations and legislations for the transport sector. Especially environmental issues and safety stand in the focus of attention and lead to a “green growth” strategy. Investments in ecology-related innovations, energy efficiency and alternatives to conventional fossil fuel are large. Although the prices for fossil fuels are relatively high, improved energy efficiency and alternative fuel- and energy technologies are compensating for this trend. Also much effort is being put into intermodality, thus re-designing the whole transport sector in a way that the strengths of different transport modes are being used optimally without compromising efficiency and comfort. For long inter-European distances, rail transport is likely to rise at the expense of road and air transport. The final mile, however is being covered by trucks, which are much improving in regard to environmental friendliness and safety (for drivers as well as pedestrians). Labour and labour market regulations are rather strict, but also ensure controlled working conditions, optimal training, harmonised certifications and mandatory skills updating programs.

Scenario 4: *Slow Down*

This scenario depicts limitations and slow downs on many dimensions. The world economy is stagnating. There are many regulations on issues dealing with the environment, safety and the labour market and environmental taxes lead to increases in fuel and energy prices which would otherwise have been much lower. Although stricter environmental legislation has been intended to stimulate investments and innovativeness in this area, the financial means for their initiation are lacking. The costs for transport are generally high and the demand is low due to generally low economic performance. Those trends in exogenous and endogenous drivers lead to very slow growth or even stagnation and limited development of the transport sector.

11 Job functions – towards a workable structure

In order to determine the quantitative and qualitative implications of the scenarios for jobs and skills, a workable job classification is needed. The occupational classification of the available sector data derived from the Eurostat Labour Force Survey (LFS) is used as a starting point (see Box 3). The advantage of using this classification is that developments in the past as observed in the LFS can help to foresee likely trends for the future. For example, it might be expected that future developments in new Member States in some cases will follow similar paths as old Member States in the recent past. Moreover, where strong growth of certain job functions appeared in most recent years, one might have a reason to cautiously weigh and re-assess any further increases in future years, as the situation (markets and other factors) might have stabilised in the mean time. The share of job functions in total sector employment is not unimportant either; sizeable shares call for adequate attention. This does not imply that job functions with only very minor shares of the total should be ignored altogether. It might well be that occupations

that have small shares now will face strong growth in the oncoming years, or are strategic and vital for growth of the sector as a whole, even if small in size.

However, the LFS job classification cannot be taken over one to one. First, the given LFS definitions of the job function groups are highly aggregated and cover therefore highly heterogeneous but not always comparable job functions. Reporting on this most aggregate level therefore would not be very illuminating. Second, some functions which may be strategic for the sector when looking at the future can be ‘hidden’ in a broader statistical category. This also includes ‘new’ emergent job functions. For both reasons some of the aggregated categories have been split up into separate job function categories, which have been given a more in-depth treatment. The opposite case, where certain job functions may be closely related, but do not fall within the same statistical LFS class, may also apply. Here it would be logical to combine them.

Box 3. The European Labour Force Survey

The European Union Labour Force Survey (LFS) is conducted in the 27 Member States of the European Union and two countries of the European Free Trade Association (EFTA) in accordance with Council Regulation (EEC) No. 577/98 of 9 March 1998. The data collection covers the years 1983 to 2006 and covers all industries and occupations. The national statistical institutes are responsible for selecting the sample, preparing the questionnaires, and conducting the direct interviews among households. The Labour Force Surveys are centrally processed by Eurostat, using the same concepts and definition, based on the International Labour Organisations guidelines and common classifications: (NACE (rev 1), ISCO-88 (COM), ISCED, NUTS).

Although the LFS can be used for comparative purposes, the relative small sample size (in 2002 the sample size was about 1.5 million of individuals, which represents 0.3% of the EU population) means that error margins can be high, especially when the industry itself is rather small.

Source: Eurostat (2008)

Third, in the trend analysis it was already observed that whereas in some countries employment shares of a particular (production) job function were extremely large, similar shares in other countries appeared extremely low, often with another closely related job function being much higher. A very likely explanation for this phenomenon is that in some countries workers are reported as job function x while in others they are reported as job function y, where basically similar tasks on the job are performed. By taking aggregates for these function types, this sort of reporting bias can be avoided. Fourth, the job functions that appear from statistical data analysis might not always be similar to what a person in or familiar with that sector would rank as the job functions that matter “in reality”, i.e. from a work floor perspective. On the basis of discussions with experts and national sector skills studies, an attempt was made to provide a job classification that is both workable and recognisable by the sector in practice. This classification is shown as Table 11.1 below.

In order to establish a meaningful and appropriate classification, the existing LFS occupational classification for the transport and logistics sector was adapted by either aggregating and/or selecting further differentiating some professions out of the original LFS statistical classification. This exercise was based on four criteria:

- employment shares (aggregating);
- closely related job functions (aggregating);

- strategic role in sector (disaggregating by further selecting among the occupational groups identified in the statistical classification);
- emergent job functions not yet covered and/or brought fully to light by current statistics.

Table 11.1 Adaptation of the original job classification

Classification in Labour Force Survey (LFS)	Specific jobs of high relevance to sector in the LFS classification	Job function categories applied in chapters 12-14
Managers	Managers	Managers
Ship aircraft control/ Technicians	Selection: Ships' deck officers, Pilots, Ship and aircraft controllers and technicians	Pilots Ship officers (sea) Ship officers (inland)
Professionals/technicians	Selection: Finance, sales and marketing professionals Logistic professionals, including IT related to logistics	Business professionals Logistics professionals
Clerks	Selection Planners and administrative support	Administrative workers
Service workers	Selection: Stewards and Conductors (Air and Railway)	Stewards
Machinery mechanics	} Aggregation: mechanics and technical workers	Mechanics
Craft trade workers		
Other plant/machine operators		
Drivers/mobile plant operators	Selection: Locomotive engine drivers, tram drivers Bus and heavy truck and lorry drivers Ships' deck crews and related workers	Rail vehicle drivers Road vehicle drivers Ship crew
Elementary occupations	Transport labourers, Warehousing staff, Freight handlers	Freight handlers

The job functions used in this analysis are as follows:

- *Managers*: top management and company owners/ entrepreneurs, but also including different specialist managers, such as HRM, finance, production, sales, and R&D management.
- *Pilots*: Airplane pilots, co-pilots and navigators
- *Ship officers (high sea and inland)*: ship captains and higher ranked officers on inland and sea-faring vessels.
- *Business professionals*: Business professionals include accountants, financial controllers and finance professionals, but also sales professionals.
- *Logistics professionals*: logistical specialists, but also ICT and other engineers specialised in managing and streamlining operations
- *Administrative workers*: includes general administrative functions, such as bookkeeping, administrative support, secretaries
- *Stewards*: conductors, stewards, both in planes, trains and other forms of transport, who attend to the passengers.
- *Mechanics*: contain the technical staff, responsible for maintaining and repairing machinery and other equipment.
- *Rail drivers*: Drivers of railway equipment
- *Road drivers*: Drivers of road transport vehicles
- *Ship crew*: Lower ranked crew on vessel, not being the mechanics.
- *Freight handlers*: Workers responsible for handling freight.

12 Implications of scenarios by job function - volume effects

Different futures will have different implications for jobs, both in quantitative and in qualitative terms. In this chapter the implications of the four scenarios in terms of volume effects for each of the identified job functions are assessed. Trends and developments of the recent past provide an important starting point in forming an idea about these future developments. This quantitative trend information has been combined with expert opinions of a core expert team and supplemented with insights from invited sector experts in a dedicated workshop to assess which volume effects would be likely to occur for which job functions. It should be emphasized that the referred expected changes are qualitative in nature, reflecting the outcome of expert judgements and expert discussion as well as desk research taking into account the results of other studies. The results of the following chapter should therefore be used as a supplement and an independent expert assessment in addition to other more formal analyses, e.g. based on mathematical and/or econometric modelling and simulation.

12.1 Volume of the scenarios for the transport and logistics sector

Verweij et al. (2008) report on the growth of specific job functions for the period from 2000 to 2006, but these figures are not specific for each sub-sector. During the period 2000 to 2006, the value added of the transport sector grew on average with 3.3% per annum and total employment with 2.0% per annum. There are, however, major differences in employment growth between the transport sub-sectors. During the period 2000 to 2006, road transport employment grew with 1.8% per annum, sea transport employment with 3.1%, inland waterway transport employment with -0.8%, rail transport employment with -6.6%, and air transport employment with -0.2%. The report also shows that a few function types did not see a change in employment share. Among these are the managers and the higher officers such as the Pilots, Ship Officers (high sea) and Ship Officers (inland waterways). Also the share of Stewards did not change. The share of business and logistics professionals increased as did the share of the combined function drivers/ship crew. Finally employment of freight handlers grew. The only functions that saw a relative decline during the period 2000 to 2006 were the administrative functions and the mechanics.

Table 12.1 presents the *relative* expected changes in employment volume by job function in the transport sector for each of the four scenarios within the time frame of 2008 to 2020. Each cell translates the impact of a particular scenario to possible future developments by job function and the estimations have been validated by experts that have been invited to a dedicated workshop to assess which volume effects would be likely to occur for which job functions within the different scenarios. Given the nature of this analysis it should be kept in mind that all estimated changes are the consensus judgement of the expert team only. This means that it can be used as a supplement and independent expert assessment to more formal analysis to be carried out in possible future research, for example based on econometric or model analysis.

The scenarios imply differences between sub-sectors as both the exogenous and endogenous drivers have different effects in each sub-sector. The scenario with high growth in globalisation, income, technology and high demand for transport services combined with little restrictions in terms of regulations has similar effects on most sub-sectors, namely an increase in demand for most functions, whereas the amount of regulation plays an important role, e.g. either due to substitutions effects or the requirement of more personnel due to stricter safety regulations.

The scenarios where growth in demand for transport services stagnates see a decrease in demand in most function types, although the decrease is different depending on the amount of restrictions and the substitution effects. The differences between unrestricted and restricted scenarios are the largest for the road and air transport. Restrictions lead to extra costs and substitution in the modal split in their disadvantage.

Table 12.1 Scenarios: relative volume changes by job function ,2008-2020

Sub-sector	Function	No Limits	Off-Roading	Shifting Gears	Slow Down
<i>Road transport</i>	Managers	I	M	M	D
	Business professionals	I	M	I	M
	Logistics professionals	I	M	I	M
	Administrative workers	I	D	M	D
	Mechanics	I	D	I	D
	Road drivers	I	M	M	D
<i>High sSea transport</i>	Freight handlers	I	M	I	D
	Managers	I	M	I	M
	Ship officers (sea)	I	M	I	M
	Business professionals	I	I	I	I
	Logistics professionals	I	I	I	I
	Administrative workers	M	D	M	D
	Mechanics	I	M	I	M
	Ship crew	I	M	I	M
	Freight handlers	I	M	I	M
	<i>Inland waterways</i>	Ship officers (inland)	M	D	I
Ship crew		M	D	I	M
Freight handlers		M	D	I	M
<i>Train transport</i>	Managers	M	D	M	D
	Business professionals	I	M	I	I
	Logistics professionals	I	M	I	I
	Administrative workers	M	D	M	D
	Stewards	M	D	I	M
	Mechanics	M	D	I	M
	Rail drivers	M	D	I	M
	Freight handlers	M	D	I	M
<i>Air transport</i>	Managers	I	M	M	D
	Pilots	I	M	I	M
	Business professionals	I	I	I	I
	Logistics professionals	I	I	I	I
	Administrative workers	M	D	D	D
	Stewards	M	D	I	M
	Mechanics	M	D	I	M
	Freight handlers	M	D	M	D

Note: D=decrease, I=increase, II-strong increase, M=maintain

12.2 Road transport

In the "No Limits" scenario all function types increase in demand, as overall conditions are favourable. In the "Shifting Gears" scenario, however, substitution effects play a role, which means that demand for some functions is lower compared to the "No Limits" scenario (e.g. in regard to road and train drivers). In the "Slow Down" scenario, demand for almost all functions declines, because of low growth and substitution effects. Regulation in the scenarios with more legal restrictions adds to the competitive pressure, as compliance is costly, especially when improved technology is not available or too costly. The "Off Roding" is slightly more positive for some functions since substitution is limited.

The number of managers will increase only in the high growth scenario. Substitution in the scenarios with high economic growth and more regulation means demand for managers will maintain. Since in the "Off Roding" scenario, companies need to cut costs, also the number of managers is expected to decrease. The same applies for the "Slow Down" scenario, where the number of managers also decreases because of substitution effects due to growing regulation and limited possibilities to comply with these regulations because of limitations in technological growth, which means that margins are under increasing pressure. This can result in consolidations and the decrease in the number of managers.

The demand for both business and logistic professionals is expected to increase in both high growth scenarios ("No Limits" and "Shifting Gears"), because demand and technological growth are high. In the scenarios with lower economic growth rates and less globalisation ("Off-Roding" and "Slow Down") demand for transport services is low, but the number of business and logistic professionals will maintain. The professionals are important for increasing efficiency, which is needed in both economically unfavourable scenarios.

Administrative workers, mechanics, road drivers and freight handlers are expected to increase in the "No Limits" scenario, due to increase in demand for transport services and increased use of new technologies (mechanics). In the "Shifting Gears" scenario with high economic growth and globalisation, but a higher degree in regulations their numbers are expected to maintain, except for mechanics, due to substitution effects through new balances between different transport modes (e.g. more emphasis on rail transport) and intermodality. The number of mechanics is expected to follow demand for services and technological growth, which means that in both growth scenarios the services of mechanics are required to solve problems, or to implement new technologies.

In the "Slow Down" scenario administrative workers, freight handlers mechanics and road drivers might become too costly for companies, which means that these functions will be decreased. In both scenarios depicting a high economic growth and more globalisation, the number of freight handlers could also grow due to the higher demand in transport and goods. It has to be noted, however that a further extension in intermodal freight transport that does not require manual freight handling and automation might compensate for human labour, this not necessitating more freight workers.

12.3 High sea transport (international)

Compared to the previous sector, differences between the scenarios with higher regulations (“Shifting Gears” and “Slow Down”) and those with less regulatory restrictions (“No Limits” and “Off-Road”) are more limited, because the influence of regulation does not have such a strong impact on (high) sea transport as it does on road transport. The demand for most functions follows the pattern that is determined by the general demand for transport services. There are two important exceptions to this pattern. First, the number of logistics and business professionals is increasing in all scenarios, however for different reasons. In the growth scenarios this will be due to the necessity to cope with the higher demand. In the scenarios with high degrees of regulations, more and new legal issues have to be tackled which also requires business-related restructurings. In the scenarios with low economic growth business professionals are needed to optimise efficiency and business processes during difficult times. Administrative workers are subject to cost savings in all scenarios, which reduces their demand.

12.4 Inland waterways

The largest component in the inland waterways sub-sector comprises of the ship officers, ship crew and freight handlers. Most vessels are operated by independent ship owners. Therefore we have limited the number of job functions to these three. Since some of the road transport is likely to be substituted by inland waterways in the scenario with high economic growth and transport demand as well as a high degree of regulation (e.g. in regard to environmental issues), all three job functions are expected to experience increases. In the other scenario with high regulations but low economic growth, some road transport is also likely to be substituted through inland water transport, but employment in the transport sector generally decreases, thus counterbalancing the effects. This would mean that the number of these three job functions will remain more or less the same. In the other growth scenario with less regulatory restraints, their number will also more likely maintain. There will be a clear decrease in employment on inland waterways in the “Off-Road” scenario, because neither road-to-waterway substitution effects nor increases in transport demand will materialise.

12.5 Rail transport

In most European countries railway companies have been formerly state-owned and are still quite overstaffed with administrative and back-office workers. Within the privatisation processes of most European rail companies and the reorganisation of business concepts, these job functions are especially targeted for reduction. Therefore the number of administrative will not increase in any scenario and will only maintain in those with increasing demand for transport.

In the recent past, employment in rail transport decreased. In the case of the “No Limits” scenario with high growth and less regulation, this trend is expected to change into a more stable one, because of the strong increase in the overall demand for transport. For the business and logistics professionals even an increase in employment is foreseen, because of privatisation, business restructuring, more need for marketing and service concepts, the necessity for improving efficiency and the implementation of new technologies.

Under the “Shifting Gears” scenario with high growth and more regulations, even higher growth in train transport is foreseen as environmental policies will favour rail transport over road and air transport because of lower pollution per ton/km transported. In this case,

an increase in most job functions is foreseen, except for managerial and administrative functions, which will maintain. Here also the number of stewards, mechanics and rail drivers will increase due to the converging factors of growing demand for rail transport and the call for safety improvement. Stewards, for example will not only add to on-board comfort but will also provide safety. Only in the “Off Roding” scenario where regulations are less strict and demand for transport declines, the number of stewards, mechanics and rail drivers will decline. In the other scenario with a decrease in overall transport demand but a much higher in regulations, rail transport will belong to the winners, thus maintaining the amount of mechanics and on-board train personnel due to counter balancing effects.

12.6 Air transport

Competitive pressure is high in all scenarios for the air transport sub-sector. Established companies are all under pressure from low cost operators, even in the high growth scenarios. Downwards pressure on prices will add to the demand for air transport, although in the scenarios with high regulations, prices fall little, especially due to taxation and environmental regulations. Therefore employment growth for a number of functions is smaller in the “Shifting Gears” scenario with high transport demand and high regulations than in the “No Limits” situation with high transport demand but less regulation. The largest decreases are expected in the “Off-Roding scenario with low transport demand and little regulation. The reasons for this are the general declining demand in transport combined with high pressures for cost reduction and less regulatory frameworks. This especially affects administrative workers, stewards, mechanics and freight handlers. In all scenarios, administrative workers will be on the losing side because companies have to save on overhead costs and also due to automation.

The number of stewards and mechanics will only increase in the scenario with high growth and high regulations because the two factors of growing demand for transport as well as stricter safety requirements are coming together.

The number of pilots is more likely to maintain in the scenarios with low economic growth and globalisation because in contrast to stewards they represent a much more essential part for aircraft operation.

The demand for business and logistics professionals will increase in all scenarios, although for different reasons. In the high growth scenarios, especially the less regulated “No Limits”, it is the greater demand for transport and the need for implementing technological innovations that leads to the increase, whereas in the scenarios with slow growth these occupations are needed to improve efficiency and survivability of the company.

13 Implications of scenarios - main emergent competences

13.1 Introduction

Determining emergent competences is at the very heart of this study. In order to identify the main emergent competences by occupational function, the Rodrigues (2007) methodology refers to three main competences: theoretical, technical and social competences. This distinction builds on the distinction between knowledge, skills and competences in the European Qualifications Framework (EQF) and the European Credit system for Vocational Education and Training (ECVET) (see Box 4 below). The term human capital broadly defined by the OECD as ‘the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being’ (OECD, 2001:18) captures all three. The use of the term ‘capital’ leads one to think in terms of investments in education and training which are often necessary in order to acquire skills and knowledge. However, skills and knowledge can also be acquired through work experience, informal on-the-job learning and a variety of other means.

In the actual identification of future competences, the EQF/ECVET definitions are used as indicative. It is noted that the difference between competences and skills is not always clear-cut, for instance where ‘soft skills’ come into play. A similar comment holds for what determines job or occupational qualifications.¹⁶ Partly because of these identification issues, adequate measurement of competences, knowledge and skills is notoriously difficult. In some of the literature, the problem of skills measurement is sometimes avoided by using indicators (proxies) focusing on qualifications (high-level, intermediate-level, low-level) as well as occupations. For the purpose of identifying *future* skill needs such approach will not deliver useful results. Instead it is the knowledge and skills behind that need to be identified.

Rather than producing a full and exhaustive list of all competences for each job function, the key focus in this chapter is on identifying and describing key and critical competences for the future. The description will be focused but also general enough to be meaningful across countries. A slight extension of the original Rodrigues methodology is that together with the identification of critical skills and knowledge needs, a differentiation by scenario is made. Skills and knowledge needs are operationalised as expected key changes in specific skills and knowledge categories by occupation.

¹⁶ ‘Qualification’ denotes the requirements for an individual to enter or progress within an occupation. It also denotes an official record (certificate, diploma) of achievement which recognises successful completion of education or training, or satisfactory performance in a test or examination. The concept of qualification varies from one country to another. It may express the ability – formally defined in work contracts or collective agreements – to perform a certain job or meet the requirements of the workplace. A qualification may give rise to a number of rights and prerogatives which determine the individual’s position within the hierarchy of his/her occupational context. (Tessaring, 2004: 235).

Box 4. Definition of competences, skills and knowledge in EQF and ECVET

Several definitions of knowledge, competences and skills are nationally as well as internationally under discussion. Moreover, Member States of the European Union still have different approaches in defining these terms. The European Union has set up a joint process to co-ordinate the different existing terminologies and to find a common basis. Aims of this process are for example to strengthen the mobility of the labour force within the European Union and to facilitate sectoral developments. In the following reference is made to the definition used by the European Qualification Framework (EQF) and the European Credit System on Vocational Education and Training (ECVET).

The EQF links national qualification systems and tries to make vocational training and lifelong learning more transparent and understandable. Therefore a common terminology was developed. The following descriptors are taken from the EQF (European Commission, 2008e; see also European Commission, 2008f):

- *Knowledge* refers to the outcome of the accumulation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the European Qualifications Framework, knowledge is described as theoretical and/or factual;
- *Skills* refers to the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the European Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments);
- *Competence* refers to the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. In the context of the European Qualifications Framework, competence is described in terms of responsibility and autonomy;
- *Qualification* refers to a formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards;
- *Learning outcomes* refer to statements of what a learner knows, understands and is able to do on completion of a learning process, which are defined in terms of knowledge, skills and competence.

Box 5. Skills needs, skills shortages and skills gaps defined

- *Emergent skills needs* are defined here as the change in skills that is needed to adequately fulfil a certain job function in the future. Addressing emergent skills is needed in order to avoid skills shortages and/or skills gaps in the future.
- *Skills shortages* exist where there is a genuine lack of adequately skilled individuals available in the accessible labour market. A skill shortage arises when an employer has a vacancy that is hard-to-fill because applicants lack the necessary skills, qualifications or experience.
- *Skills gaps* arise where an employee does not fully meet the skills requirements for a specific job function but is nevertheless hired. This skills gap needs to be closed through training. Skills gaps can arise where new entrants to the labour market are hired and although apparently trained and qualified for occupations still lack some of the skills required.

Throughout this report the term *competences* is defined as the “proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development.” (see Box 4 for definitions). In the practical elaboration of competence needs hereafter the focus is predominantly on knowledge and skills needs, with a further distinction to what is usually described as ‘soft skills’ such as team working skills, and planning and organising. Note that the ‘personal, social and/or methodological abilities’ included in the definition of competences (see Box 5) come very close to what is generally understood as ‘soft skills’.

Table 13.1 Overview of skills and knowledge clustered by category

Knowledge (‘hard skills’)
<ul style="list-style-type: none"> Legislative / regulatory knowledge (environmental / safety / labour / contracting); Language*; e-skills ; Marketing skills; Technical knowledge; Product knowledge; Product development
Social Skills
<ul style="list-style-type: none"> Team working skills; Social perceptiveness (listening / understanding); Communication; Networking; Language*; Intercultural
Problem-solving Skills
<ul style="list-style-type: none"> Analytical skills; Interdisciplinary; Initiative, Multi-skilling; Creativity
Self management
<ul style="list-style-type: none"> Planning; Stress and time management; Flexibility; Multi-tasking
Management skills
<ul style="list-style-type: none"> Strategic & visionary; Coaching and team building; Change management; Project management; Process optimizing; Quality management; people skills crucial for collegial management style
Entrepreneurial skills
<ul style="list-style-type: none"> Supplier and customer relationship / understanding; Business understanding; Trend setting / trend spotting

A number of different skills categories have been taken into account, including social skills, problem solving skills, (self) management skills, skills related to entrepreneurship, as well as knowledge requirements (sometimes labelled as ‘hard skills’). Table 13.1 provides an overview of the different skills and knowledge categories taken into consideration. Literacy and numeracy skills are not specifically mentioned in the tables. In practice these skills cannot be taken for granted.

For each job function key future skills and knowledge needs were identified. This was done in a workshop with a number of invited sector experts, and validated in two subsequent workshops, including the step 10 final workshop; the results therefore remain based on joint expert opinion. The analysis in Part I and the data tables formed a ‘levelling’ starting point for each of the discussants. Key ‘new’ skills and knowledge needs were thus identified for various job functions taking into account the different scenarios.

The emergent future competences – defined as skills and knowledge needs - are identified and clustered together with similar ones in a concise overview table per job function (see next sections 13.2 to 13.11). Only *substantive key changes* in skills and knowledge needs are taken into account, which means that only part of the cells in the table is ‘filled’. However, if a certain skill or knowledge type is highlighted in one scenario, but is not addressed in another, this does not mean that it is irrelevant. Rather it means that relative demand for this skill in the latter case will not increase within the time frame 2009-2020. The skills that have been marked black or grey in the tables have been identified as those that are clearly emerging within a particular scenario, whereas the black ones represent the highest importance. White cells indicate no substantial changes. Therefore the skills marked black are the most critical and should receive most attention in regard to training and retraining, while the grey ones are also considered to grow in importance.

13.2 Managers

Tables 13.2.1 and 13.2.2 summarize the emerging skills and competencies that managers in the transport sector will need under the different scenarios. Special attention has been paid to the road and rail transport sectors due to focussed input from the expert workshop. In general, the future – regardless of the scenario – will be most challenging for managers, requiring a wide variety of different and new, changing or more intensified skills.

13.2.1 Managers (Rail)

The most important emerging skill requirements for train managers are e-skills because most planning and managing activities will be more and more computer-based. Higher complexity of the system which represents a trend that is already being observed today will also call for better analytical capabilities. In all scenarios rail transport will become generally more important.

In the scenarios with higher regulation (“Shifting Gears” and “Slow Down”), legal and regulatory knowledge will become essential for managers.

The two scenarios that depict high economic growth and globalisation (“No Limits” and “Shifting Gears”) will demand future capabilities in nearly every skill with the exception of rather technical or service oriented ones.

In the low growth and low globalisation scenarios (“Off-Roadings” and “Slow Down”), social and intercultural skills are less important and the focus will be more on entrepreneurship to survive in difficult times.

Table 13.2.1 Emerging skills and knowledge needs: Managers (rail), 2009-2020

Skills category	Skills	No Limits	Off-Roading	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
	Technical knowledge				
Social	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
	Intercultural				
Problem solving	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
	Creativity				
Self management	Planning				
	Stress and time management				
	Flexibility				
	Multi-tasking				
Entrepreneurship	Understanding suppliers customers				
	Business development				
	Marketing skills				
	Trend setting / spotting				
Management	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
	Quality management				
Total emerging skills and competences		21	10	21	11

13.2.2 Managers (road)

The skills requirements for road managers will be even more demanding than for rail managers, since in all scenarios with the possible exception of “No Limits”, road transport may face more difficulties either due to stricter regulations (“Shifting Gears” and “Slow Down”), higher fuel prices or an unfavourable economic climate (“Off Roding” and “Slow Down”). It should also be mentioned that road transport is hugely dominated by SMEs, something that cannot be found in rail and air transport is also much less present in sea shipping. Due to these specific circumstances, strategic and visionary skills as well as initiative-taking are even more important for road managers (black shading) than for rail managers (grey shading) in all scenarios.

The most favourable scenario for road transport, “No Limits” - at least from the perspective of finances and demand – will put the most stress on road managers, requiring especially self-management skills.

As it is also the case in rail transport, legal and regulatory knowledge will become increasingly relevant in the scenarios that are based on high regulations (“Shifting Gears” and “Slow Down”).

Table 13.2.2 Emerging skills and knowledge needs: Managers (road), 2009-2020

Skills category	Skills	No Limits	Off-Road	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
	Technical knowledge *				
Social	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
	Intercultural				
Problem solving	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
	Creativity				
Self management	Planning				
	Stress and time management				
	Flexibility				
	Multi-tasking				
Entrepreneurship	Understanding suppliers customers				
	Business development				
	Marketing skills				
	Trend setting / spotting				
Management	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
	Quality management				
Total emerging skills and competences		22	13	21	13

* Most of the sector are SMEs and SME managers need to have technical skills, and all social skills

13.3 Pilots

Table 13.3 summarizes the emerging skills and competencies that pilots will need under the different scenarios.

In general, the job profile of pilots is already quite standardised with internationally uniform modes of operation and English as universal language as well as prescribed forms of communication (e.g., with other aircrafts, the tower/flight control, etc.). In this regard not much change is expected in the future.

New and increasingly complex technology, however, will require new technical and analytical skills. Cockpit technology may change and advance, especially in the growth scenarios and is likely to become even more computer-based with new ICT and assistance features (e.g., HUDs, navigational features), thus necessitating new e-skills. In the sector of smaller aircrafts, new technologies for engine and body design may be developed, thus requiring new or changing technical skills for pilots.

In both economic growth scenarios (“No Limits” and “Shift Gears”), intercultural competences will become more important as globalisation, international co-operations and multi-national crews will increase, although a pilot’s work will remain comparatively solitary. The necessity for better stress management skills and flexibility is also expected to increase in the setting of economic growth and increasing globalisation.

Pilot training is already highly regulated, but additional legal knowledge might be necessary in the scenarios with a high amount of regulation (“Shift Gears” and “Slow Down”).

The stagnation scenarios (“Off-Roading” and “Slow Down”) will require the least skills changes for pilots.

Table 13.3 Emerging skills and knowledge needs: Pilots, 2009-2020

Skills category	Skills	No Limits	Off-Roading	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
	Technical knowledge				
Social	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
	Intercultural				
Problem solving	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
	Creativity				
Self management	Planning				
	Stress and time management				
	Flexibility				
	Multi-tasking				
Entrepreneurship	Understanding suppliers customers				
	Business development				
	Marketing skills				
	Trend setting / spotting				
Management	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
	Quality management				
Total emerging skills and competences		7	4	7	4

13.4 Ship officers (high sea/international)

Table 13.4 summarizes the emerging skills and competencies that ship officers operating on international sea routes will need under the different scenarios.

In contrast to pilots, the work setting for ship officers is more collegial and team-oriented. Especially in the economic growth and globalisation scenarios (“No Limits” and “Shifting Gears”) this implies more international ship crews, worldwide customers and tourists and global destinations, thus requiring more communication, language and intercultural skills. In the growth scenarios, the demand for international sea transport will grow, and could lead to higher work-related stress for ship officers, requiring multi-skilling, multi-tasking, better stress- and time management and calling for increasing responsibility for larger ships on more crowded waters.

Ships will also become more technologically advanced, necessitating ship officers to master new e-skillsnew technologies and have sufficient technical know-how and analytical abilities.

Especially the scenarios with increased regulation, will require more knowledge about (international) laws, regulations and environmental requirements.

The scenarios that are based on slow economic growth and a low degree of globalisation will require the least skills changes for ship officers.

Table 13.4 Emerging skills and knowledge needs: Ship officers (high sea/international), 2009-2020

Skills category	Skills	No Limits	Off-Roading	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
	Technical knowledge				
Social	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
	Intercultural				
Problem solving	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
	Creativity				
Self management	Planning				
	Stress and time management				
	Flexibility				
	Multi-tasking				
Entrepreneurship	Understanding suppliers customers				
	Business development				
	Marketing skills				
	Trend setting / spotting				
Management	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
	Quality management				
Total emerging skills and competences		16	5	18	6

13.5 Ship officers (inland)

Table 5.5 summarizes the emerging skills and competencies that ship officers on inland waterways will need under the different scenarios. In contrast to ship officers on international sea routes, which operate on long and often intercontinental distances, the demands for ship officers operating on inland waterways are less demanding in regard to social and international competencies and aspects of time- and stress management.

Although the requirements for e-skills and technical knowledge will grow, the demands will be less extreme than for ship officers on international sea routes.

Especially in the scenarios with major environmental regulations (“Shifting Gears” and “Slow Down”), inland shipping is likely to generally increase as an alternative road transport that is regarded as more environmentally problematic by some policy makers. This is likely to lead to more demand for inland shipping, but also to a modernisation of ships, thus requiring new technical and e-skills

Table 13.5 Emerging skills and knowledge needs: Ship officers (inland), 2009-2020

Skills category	Skills	No Limits	Off-Roading	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
	Technical knowledge				
Social	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
	Intercultural				
Problem solving	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
	Creativity				
Self management	Planning				
	Stress and time management				
	Flexibility				
	Multi-tasking				
Entrepreneurship	Understanding suppliers customers				
	Business development				
	Marketing skills				
	Trend setting / spotting				
Management	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
	Quality management				
Total emerging skills and competences		5	3	6	2

13.6 Business professionals

Table 13.6 summarizes the emerging skills and competencies that business professionals within the transport sector will need under the different scenarios.

The economic growth and globalisation scenarios (“No Limits” and “Shifting Gears”) are the most challenging and require skill improvements in nearly every area, while the stagnation scenarios (“Off-Roading” and “Slow Down”) are generally less favourable for business professionals, but also require far less skills updates.

Especially in the scenarios with high regulations (“Shifting Gears” and “Slow Down”), knowledge about legal issues will be of major importance.

Table 13.6 Emerging skills and knowledge needs: Business Professionals, 2009-2020

Skills category	Skills	No Limits	Off-Roading	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
	Technical knowledge				
Social	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
	Intercultural				
Problem solving	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
	Creativity				
Self management	Planning				
	Stress and time management				
	Flexibility				
	Multi-tasking				
Entrepreneurship	Understanding suppliers customers				
	Business development				
	Marketing skills				
	Trend setting / spotting				
Management	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
	Quality management				
Total emerging skills and competences		21	5	20	6

13.7 Logistics professionals

Table 13.7 summarizes the emerging skills and competencies that logistics professionals within the transport sector will need under the different scenarios.

Transport is generally increasingly shifting towards logistics and more complex and systemic solutions. Here especially technical and e-skills are of major importance, e.g. in regard to ICT, RFID technology and automation. Some of the largest freight ports are already operating nearly automatically where humans mostly perform ICT-related operations, planning and controlling tasks.

Especially in the scenarios of economic growth and globalisation (“No Limits” and “Shifting Gears”), logistics becomes international and complex, requiring more social and management skills. In the scenarios with major legal restrictions, legislative and regulatory knowledge becomes especially important.

In general, logistics requires team working skills and high analytical capacities. As logistics becomes more complex in global scenarios, analytical skills will be a central capability for the profession.

Table 13.7 Emerging skills and knowledge needs: Logistics Professionals ,2009-2020

Skills category	Skills	No Limits	Off-Roading	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
	Technical knowledge				
Social	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
	Intercultural				
Problem solving	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
	Creativity				
Self management	Planning				
	Stress and time management				
	Flexibility				
	Multi-tasking				
Entrepreneurship	Understanding suppliers customers				
	Business development				
	Marketing skills				
	Trend setting / spotting				
Management	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
	Quality management				
Total emerging skills and competences		15	16	21	11

13.8 Administrative workers

Table 13.8 summarizes the emerging skills and competencies that administrative workers within the transport sector will need under the different scenarios.

Table 13.8 depicts a considerable number of emerging skills, which is for an important part due to the fact that part of this group is directly linked to the operational process. An important example are the planners in road transport who are responsible for the day-to-day planning and therefore have contacts with both customers and drivers and have to be analytical, creative, flexible and communicative. In many respects this subgroup is comparable to the logistic professionals, but only working on a lower (operational) level. In the growth scenarios, the demands on planners will increase, as the variety in clients and type of services will grow and new tools will become available. In the restricted transport stagnation scenario, they will be more involved in finding day-to-day solutions in the planning to comply with regulations.

Fewer changes are expected for administrative workers who are less directly linked to the operational process, such as bookkeepers. Moreover, such activities may become outsourced, off-shored or automated. In regard to the non-growth scenarios, not many changes relative to the status quo are expected.

Table 13.8 Emerging skills and knowledge needs: Administrative Workers 2009-2020

Skills category	Skills	No Limits	Off-Road	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
	Technical knowledge				
Social	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
	Intercultural				
Problem solving	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
	Creativity				
Self management	Planning				
	Stress and time management				
	Flexibility				
	Multi-tasking				
Entrepreneurship	Understanding suppliers customers				
	Business development				
	Marketing skills				
	Trend setting / spotting				
Management	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
	Quality management				
Total emerging skills and competences		16	1	17	8

13.9 (Air) Stewards

Table 13.9 summarizes the emerging skills and competencies that stewards within the transport sector will need under the different scenarios. Due to the input from the expert workshop, the focus is set on stewards in air transport, because this is most challenging.

Within the job classifications used in this analysis, stewards are the ones who interact most with passengers. In air transport, stewards or flight attendants have multiple functions and therefore need many different skills ranging from customer orientation and soft skills to technical knowledge and e-skills . Especially technical and e-skills will become more important and new ones are likely to emerge due to further technological progress.

It is expected that in the globalisation and economic growth scenarios (“No Limits” and “Shifting Gears”) new language skills and cultural competences will become even more important as new travel destinations will be added by airlines (and ships) and an increasing number of passengers from emerging and developing countries can afford air (and sea) travel. In these scenarios flexibility and stress management will become more important due to higher workloads. The understanding of customers and passengers plays also a very important role in this setting because of high competition and high expectancies.

Legal and regulatory knowledge and probably also novel safety competencies will become more important in the scenarios that are based on high regulation, whereas the requirements in the “Shifting Gears” scenario with high globalisation and economic growth will be greater than in the “Slow Down” scenario with unfavourable economic performance.

Table 13.9 Emerging skills and knowledge needs: (Air) Stewards, 2009-2020

Skills category	Skills	No Limits	Off-Roading	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
	Technical knowledge				
Social	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
	Intercultural				
Problem solving	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
	Creativity				
Self management	Planning				
	Stress and time management				
	Flexibility				
	Multi-tasking				
Entrepreneurship	Understanding suppliers customers				
	Business development				
	Marketing skills				
	Trend setting / spotting				
Management	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
	Quality management				
Total emerging skills and competences		14	5	15	9

13.10 Mechanics

Table 13.10 summarizes the emerging skills and competencies that mechanics within the transport sector will need under the different scenarios.

In general, mechanical systems will increasingly be transformed into electro-mechanical systems, making sophisticated e-skills an important requirement for mechanics. Mechanical systems will generally become more complex, calling for more analytical, interdisciplinary and technical abilities as well as multi-skilling. This will show especially strong in the scenarios that are based on economic growth and globalisation (“No Limits” and “Shifting Gears”) because here technological progress and innovations are expected to be particularly high here. In these scenarios language skills will also become more important, especially for mechanics working on internationally operating ships.

In the scenarios with limited regulation, creativity may also become a useful feature for mechanics. This applies even more for the economically unfavourable “Slow Down” scenario than for the “No Limits” growth scenario, because in the former one, the means for new equipment or costly repairs may be limited and mechanics may be confronted with less standardised technologies of different generations.

The requirement for legal and regulatory knowledge will generally increase since the trend is already felt today, but it will become especially relevant in the scenarios with high regulation (“Shifting Gears” and “Slow Down”) with a great emphasis on safety and environmental aspects.

Table 13.10 Emerging skills and knowledge needs: Mechanics, 2009-2020

Skills category	Skills	No Limits	Off-Roading	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
Social	Technical knowledge				
	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
Problem solving	Intercultural				
	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
Self management	Creativity				
	Planning				
	Stress and time management				
	Flexibility				
Entrepreneurship	Multi-tasking				
	Understanding suppliers customers				
	Business development				
	Marketing skills				
Management	Trend setting / spotting				
	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
Quality management					
Total emerging skills and competences		15	7	15	9

13.10.1 Mechanics (Rail)

The technical knowledge requirements for rail mechanics will increase much in every scenario. In the scenarios with increasing economic growth and globalisation (“No Limits” and “Shifting Gears”) this is due to technological advances, the modernisation of equipment and the introduction of innovations. Here also more emphasis is put on interdisciplinary abilities, since new technologies will be more convergent. In the scenarios with low economic growth and globalisation, other challenges like dealing with older equipment or finding cost-efficient ways to deal with repairs will be the reason for these skills requirements.

E-skill requirements will become more important in every scenario, but will be of special relevance in the growth and globalisation scenarios.

The “Unrestricted Growth” scenario will require most from rail mechanics since here flexibility and creativity may also be welcome to a much higher degree than in the scenarios with much legal restrictions (“Shifting Gears” and “Slow Down”).

Table 13.10.1 Emerging skills and knowledge needs: Mechanics (rail) 2009-2020

Skills category	Skills	No Limits	Off-Roading	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
	Technical knowledge				
Social	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
	Intercultural				
Problem solving	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
	Creativity				
Self management	Planning				
	Stress and time management				
	Flexibility				
	Multi-tasking				
Entrepreneurship	Understanding suppliers customers				
	Business development				
	Marketing skills				
	Trend setting / spotting				
Management	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
	Quality management				
Total emerging skills and competences		16	7	15	9

13.11 Road drivers

Table 13.11 summarizes the emerging skills and competencies that road drivers within the transport sector will need under the different scenarios.

In the case of road drivers, a distinction has to be made between passenger drivers (bus, taxi) and truck drivers. For bus and taxi drivers, social skills will be generally more important than for freight/cargo drivers.

Especially the “No Limits” scenario will demand higher degree of stress and self management from road drivers, because in this scenario the highest growth in road transport is expected, while at the same time regulations in regard to working hours and safety are less strict or not mandatory. In both scenarios that are based on economic growth and a stronger increase in globalisation, flexibility is also likely to become more necessary, either due to a generally higher degree of road traffic and congestion or due to intelligent traffic management systems that may suggest alternative routes and procedures rather short noticed due to real-time analysis and calculations and improved communication technology. In both growth scenarios, planning, either done by humans or with computer assistance will become a central element.

New technologies inside (e.g. driver assistance, on-board computers) and outside the vehicle (e.g., traffic management, car-to-infrastructure systems) will call for a higher degree of e-skills and technical competencies. This will become especially relevant in the “No Limits” scenario that puts high focus on vehicle ICT systems. In the “Shifting Gears” scenario, skills related to environmental and energy issues will become more important and may include energy-efficient driving, dealing with alternative fuels and motor systems, new vehicle designs and reacting to vehicles that produce less noise. On the other side, the technological systems are also likely to be improved in regard to user- and driver friendliness. Today, human factors research, for example is already developing means for improving the interaction between humans and technical systems and minimising the probability of human error. Both scenarios which are based on slow economic growth and less globalisation require little changes for road vehicle drivers.

Table 13.11 Emerging skills and knowledge needs: Road drivers, 2009-2020

Skills category	Skills	No Limits	Off-Roading	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
	Technical knowledge				
Social	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
	Intercultural				
Problem solving	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
	Creativity				
Self management	Planning				
	Stress and time management				
	Flexibility				
	Multi-tasking				
Entrepreneurship	Understanding suppliers customers				
	Business development				
	Marketing skills				
	Trend setting / spotting				
Management	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
	Quality management				
Total emerging skills and competences		9	3	9	4

13.12 Rail drivers

Table 13.12 summarizes the emerging skills and competencies that rail drivers within the transport sector will need under the different scenarios.

Especially in regard to technology, the differences between trams, subways, normal trains and high-speed trains (e.g. TGV or ICE) have to be made. As for intercultural and language skills, these are more relevant on international / trans-European train routes, which are expected to experience growth rates in the scenarios that are based on high economic growth and faster globalisation (“No Limits” and “Shifting Gears”). In these scenarios, technological advances will also be more prominent, requiring even more new technological knowledge as well as analytical and e-skills. Advanced high-speed trains may become increasingly similar to airplane cockpits. Also in regard to safety issues, airplanes and trains may become closer. This would also affect the skills requirements and training for high-speed train drivers. This trend is already reflected in the use of high-speed train simulators for training purposes, of which some like the EADS Very High Speed, Intercity and Suburban Train Simulators are even developed and manufactured by companies that mainly focus on aircraft and space technology¹⁷.

The general trend towards more ICT-use will continue in every scenario, even the less economically favourable ones, thus requiring according skills. The same applies for flexibility, due to an increasing workload for train drivers. In the high growth scenarios this is due to increasing demand, whereas in the low growth scenarios the reasons are due to decreases in personnel.

¹⁷ <http://www.railway-technology.com/contractors/professional/eads/>

Table 13.12 Emerging skills and knowledge needs: Rail Drivers, 2009-2020

Skills category	Skills	No Limits	Off-Road	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
	Technical knowledge				
Social	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
	Intercultural				
Problem solving	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
	Creativity				
Self management	Planning				
	Stress and time management				
	Flexibility				
	Multi-tasking				
Entrepreneurship	Understanding suppliers customers				
	Business development				
	Marketing skills				
	Trend setting / spotting				
Management	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
	Quality management				
Total emerging skills and competences		10	6	10	7

13.13 Ship crew

Table 13.13 summarizes the emerging skills and competencies that ship crew within the transport sector will need under the different scenarios.

The work on ships is generally more team-oriented than in other forms of transport. Therefore, especially for the economic growth and globalisation scenarios (“No Limits” and “Shifting Gears”), language and social skills will become more important as ship crews are likely to become more diverse in terms of nationality and culture. For the inland transport ship crews this is less relevant than for internationally operating vessels.

ICT related skills and competences (e-skills) are expected to become more important in all four scenarios since this will be a general technological trend which will be even more prominent in the “Shifting Gears”, but especially in the “No Limits” scenario.

More regulatory knowledge will be required in the “Slow Down” and especially in the “Shifting Gears” scenario.

In the low growth and low globalisation scenarios, not many changes in skill requirements are expected.

Table 13.13 Emerging skills and knowledge needs: Ship Crew, 2009-2020

Skills category	Skills	No Limits	Off-Roading	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
	Technical knowledge				
Social	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
	Intercultural				
Problem solving	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
	Creativity				
Self management	Planning				
	Stress and time management				
	Flexibility				
	Multi-tasking				
Entrepreneurship	Understanding suppliers customers				
	Business development				
	Marketing skills				
	Trend setting / spotting				
Management	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
	Quality management				
Total emerging skills and competences		13	3	12	3

13.14 Freight handlers

Table 13.14 summarizes the emerging skills and competencies that freight handlers within the transport sector will need under the different scenarios.

The category of freight handlers traditionally comprises large numbers of rather low-qualified or unskilled workers. Many of these jobs, however, are becoming increasingly automated as is already the case in most modern cargo ports, where most humans work as planners, controllers or ICT specialists and almost all kinds of formerly manual work is done by machines. Therefore, a very large portion of the job category “freight handlers” may disappear or transform into machine operators, controllers, planners or ICT specialists who require more cognitive and analytical than physical skills. In general, e-skills and technical knowledge will become more important for this job category as more machines will enter the work domain.

Nonetheless, in the scenarios that depict increasing economic growth and globalisation (“No Limits” and “Shift Gears”), language skills and intercultural aptness will become more important as supervisors and clients will become more international.

In scenarios with increased regulation, knowledge about legal and regulatory frameworks will also gain in relevance, especially in the “Shift Gears” scenario.

The overall requirements for skills changes are lowest for freight handlers. However the whole job category may require a general upskilling.

Table 13.14 Emerging skills and knowledge needs: Freight Handlers, 2009-2020

Skills category	Skills	No Limits	Off-Road	Shifting Gears	Slow Down
Knowledge	Legal / regulatory knowledge				
	e-skills				
	Technical knowledge				
Social	Team working skills				
	Social perceptiveness				
	Communication				
	Networking				
	Language				
	Intercultural				
Problem solving	Analytical skills				
	Interdisciplinary				
	Initiative				
	Multi-skilling				
	Creativity				
Self management	Planning				
	Stress and time management				
	Flexibility				
	Multi-tasking				
Entrepreneurship	Understanding suppliers customers				
	Business development				
	Marketing skills				
	Trend setting / spotting				
Management	Strategic and visionary				
	Coaching and team building				
	Collegial management style				
	Change management				
	Project management				
	Process optimizing				
	Quality management				
Total emerging skills and competences		7	3	8	4

Part III.

Available Options to Address Future Skills and Knowledge Needs, Conclusions and Recommendations

Part III. Available Options to Address Future Skills and Knowledge Needs and Recommendations - Guide to the reader

In the final third part of this report, a range of main strategic options ('choices') is reviewed, including possible actions in education and training. The report concludes with a number of conclusions and recommendations for the sector (individual firms, sector organizations, others) and policy-makers at various levels, ranging from the EU to the local level. Part III reflects steps 7 (Main strategic choices), 8 (Main implications for education and training) and 9 (Main recommendations) of the common methodology. Its contents are as follows: Chapter 14 highlights the various strategic choices in response to future skills and knowledge needs. Chapter 15 focuses on specific implications for education and training. Chapter 16 concludes by providing a number of key recommendations and conclusions.

14 Strategic choices to meet emergent skills and knowledge needs

14.1 Introduction

This chapter identifies the main strategic choices to meet the skills and knowledge needs identified (step 7). It provides a framework to pick and select the most relevant strategic choices – i.e. solutions to meet future skills and knowledge needs - available. Strategic choices refer and relate to the medium- and longer term, even though emerging skills needs in practice may also apply to the now and tomorrow. Essential in seeking appropriate solutions is to keep this longer time perspective in mind. Rather than focusing on one single solution, a set of linked strategic choices will in most cases be the best strategy to follow. Prioritising both in time (what first, where to follow up) and in allocation of resources (budgetary focus) followed by further fine-tuning is a clear necessity to guarantee that skills needs are targeted and solved. Skill needs can be identified at various levels, ranging from assessments at the national or even European sector level - which are by nature rather general - to more precise assessments at the regional and company level. Especially for large enterprises not only the identification of skills needs but also the search for adequate solutions will be an integral part of an overall longer-term business strategy. Some solutions will be found within the company itself, for instance by reorganising functions within or between plants, by offering (re)training trajectories and by active global sourcing of personnel. For SMEs and especially for micro-enterprises¹⁸ such longer-term, more strategic human resource management often will be more difficult to organise and operationalise. It should be emphasized that at all possible levels identified different actors need to act to address skills needs and offer solutions and preferably also in close concert. These can be individual firms, organised interests at the sector level (employers and employees), but also others. Local, regional and national governments have also a important role to play. This chapter offers first of all a better insight in the ‘menu’ of possible strategic choices (section 14.2). It also provides for a framework that can identify skills needs at the appropriate level and helps to decide which should be the actual choices to be made (see section 14.3). This framework is subsequently applied to the transport and logistics sector (section 14.4).

14.2 Possible strategic choices

The possible strategic choices contained in this chapter refer to the strategic choices originally proposed by Rodrigues (2007: 42) as well as a number of other, additional choices. Whereas *strategic* choices mostly refer to the medium and longer term, most of the choices mentioned can also be implemented in the short run, to ‘mend’ existing skills shortages and/or skills gaps. Each of the solutions at hand differs in whether or not it can resolve direct skills shortages and/or gaps. A longer term horizon, however, means that there is possibility of adapting, steering and fine-tuning the available solutions towards a more optimal allocation of skills supply and demand. In view of the time horizon, the period up to 2020, the strategic choices and instruments with a more long-term impact especially need to be addressed. Identification of possible solutions obviously is not enough. Concrete initiatives, policy and strategic decisions need to be taken at all

¹⁸ Defined as firms with less than 10 employees.

appropriate levels with each actor having a different responsibility and a different role to play.

Strategic choices to meet future skills needs need to be taken by a number of actors and at different levels (firm, local, regional, national, sectoral). For obvious reasons, firms are an important player in finding solutions for the skills needs – both in volume (skills shortages) and in matching any existing skills gaps. Companies avail of a number of options to meet their skills needs. These include:

- A. Recruiting workers from other sectors
- B. Recruiting workers from other Member States
- C. Recruiting workers from non-Member States
- D. Recruiting unemployed workers with or without re-training
- E. Recruiting young people coming from the education system, with or without re-training (first job recruits)
- F. Training employed workers
- G. Changing the work organisation (including network collaboration and mergers)
- H. Outsourcing and offshoring.

Sectoral organisations, educational institutions and governments also have a role to play. They will be the prime actors in addressing the following options:

- I. Changing general and vocational education
- J. Designing and offering new courses (continuing vocational education and training)
- K. Providing information about jobs and (emerging) skills: career guidance; updating job profiles regularly.
- L. Improve the image of the sector (joint action of companies together)
- M. Stronger cooperation with the industry (internships, company visits for participants in education, image improvement).

A more detailed description of these strategic options can be found in annex III. Whether these strategic options are feasible and viable depends on a number of factors. In order to discuss and select from the available list of strategic options, one should first - as described in the introduction - know whether and when skills needs are indeed likely to arise, both in quantitative (number of job functions) and in qualitative terms (what knowledge and skills). An important question that needs to be addressed first is at what level and to whom the skills needs question applies. Obviously for an individual firm different information is required for identifying these needs and taking the right action than for a national ministry or a training institute.

The identification of possible strategic choices would in principle require extensive and detailed future analysis at the Member State and preferably also the regional level of skills and knowledge demand and supply patterns by job function and sub-sector, in a similar way and along the steps provided by the methodology of this study so far. The methodology and step-wise approach followed are applicable at the national and regional level of analysis. Ideally, these results should be complemented by the results of labour market model forecasts to corroborate results. Such an analysis would also need to include an assessment of the numbers and skills composition of currently being educated,

i.e. an assessment of all cohorts of primary, secondary and tertiary pupils and students (and their skills potential) currently in the educational system and arriving at the labour market in the oncoming years. It would need a thorough assessment of the current educational and training system itself, including the already decided changes herein for the oncoming years, to see whether the system as it is now in place is able to satisfy the prevailing and future new skills demands both in terms of numbers of new potential recruits and in terms of skills and knowledge.

14.3 Matching future skills and knowledge needs by making the right choices

In order to address the identified future skills and knowledge needs in an encompassing and timely manner, appropriate joint action is needed by all stakeholders, including the industry (firms, sector organisations and social partners), training and education institutes, intermediary organisations and, last but not least, government at all levels (EU, national, regional and local). Collaboration and co-operation between stakeholders will be needed, at all decision-making levels, in order to agree on and implement a package of feasible solutions. In order to prepare for this, timely, targeted and reliable information is essential.

This section presents a targeted short-cut strategic options decision tool to enable and support decision-makers in making the right (mix of) choices, supported by appropriate and reliable information on actual needs, possible choices and stakeholders to be involved. The strategic options decision tool is aimed to provide answers and solutions at the job function level and consists of a shortlist of a number of key questions - a concise menu of choice -, with answers providing decision-relevant information about the need and viability of available options. The questions need to be answered at the national, and where relevant at the regional level so as to map and identify the specific sector needs. The decision tool can also be used at the level of the firm. New job function information (e.g. new upcoming functions) can be added where thought relevant.

The key question list – consisting of six ‘framing’ questions, followed by option-specific questions - should be filled in for each job function. The ‘framing’ questions constitute a summary of main expected quantitative and qualitative skills needs developments. The filling in of the list should, however, only be done on the basis of an informed discussion between several stakeholders involved, representing together an informed body of knowledge on the various aspects at stake, including labour market developments and prospects at the sub-sector level, skill and knowledge requirements at job function level and developments in and make up/orientation of the educational and training system.

Key questions for identifying skills and knowledge needs

Question 1. Is the demand for workers expected to decrease or increase between now and 2020? (both related to market prospects and replacement demand due to ageing)

If decreasing, there is probably less need for recruiting workers from other sectors and (non-) Member States and less need for recruiting unemployed.

If increasing, analyse whether less radical options are enough to meet demand or whether options should be chosen like recruiting workers from other sectors and (non-) Member States and recruiting unemployed. [*Note: see Table 12.1 for estimated volume effects per scenario*]

Question 2. Are the required qualitative skills expected to be rather stable between now and 2020?

If there are not many changes in required skills and knowledge, there is probably no need to apply many strategic options. Please focus on the options that are most effective.

If many skills and knowledge categories are changing, there is probably a need to apply many strategic options. Create a package of strategic options to meet skill needs. [*Note: see Table 13.2 and following for the number of competences changing per job function per scenario*]

Question 3. Do SMEs and especially small companies (including micro enterprises) play a large role in the sector?

If yes, several options (like recruiting) are less viable for companies themselves as it is often difficult for small companies to organize this. If this is the case, sector organisations or intermediary organisation might play an important role in helping to match supply and demand. Another solution could be found in changing the work organisation. Through cooperation or mergers, for instance, the relevant scale can be increased which makes it easier to use these options. The same holds, more or less, for the organisation of training and re-training. Larger (associations of) companies have less difficulties to organise this and the need for support from other actors is lower [*Note see Table 3.14 for number of firms per size class*]

Question 4. Are companies in general active on Member State level, EU level or global level?

Companies who are active on a larger regional level will have, in general, more opportunities to use the option of recruiting workers from other Member States (for companies active at the EU level) and the option recruiting workers from non-Member States (for companies active at the global level). The same holds for the option offshoring. [*Note see chapter 3*]

Question 5. Are workers in a job function in general low-educated?

If yes, training is less easy to implement as a viable option as difficulties arise in organising this, while the need for training might be even higher. [*Note see Table 3.16 to 3.11 for education shares*]

Question 6. Are workers in a job function in general old (i.e. older than the average age in the subsector and compared to other sectors)?

If yes, training is less easy to implement as a viable option as difficulties arise in organising this and less new knowledge endogenously enters the companies, while the need for training might be even higher. [*Note see section 3.2, for age structure*]

Key questions for identifying suitable options and relevant acting stakeholders

The six questions form the first part of the short-cut approach. The second part discusses the viability of strategic options to tackle and solve emergent skills and knowledge needs for each of the job functions identified. It confronts the list of available strategic options with the analysis of quantitative and qualitative developments on headlines based on the preceding six questions. For each job function identified an assessment is made on whether the available strategic options are relevant or not, and who should be prime

actors to change the current situation into a more favourable direction. If the strategic option is considered relevant, a “yes” is filled in, else a “no” is included. If the strategic option is dependent on specific characteristics of the sub-sector or components thereof, this is included in the table. For example, if recruiting workers from other Member States is only an option for large companies a “Yes, but only for large companies” will be included. Characteristics that are dealt with in the table are based on the six question analysis, representing:

- The change in volume (as a reference we include the most challenging scenario in terms of change required)
- The change in skills (as a reference we include the most difficult scenario, which is often the scenario with the largest change in skills and knowledge needs)
- Education level
- Age of the workforce
- Scale of the company and region the company is working in.

The objective of this section is to identify the main strategic choices to meet the skills and knowledge needs identified (step 8). Some of the more specific implications relating to education and training (step 9) will be described in chapter 7. The first part of this chapter (sections 6.1 to 6.4) provides the framework that we have used to pick and select the most relevant strategic choices (i.e., solutions to meet skills needs) available. Strategic choices refer and relate to the medium and longer term, even though skills needs may also apply to the present and immediate future. Essential in seeking appropriate solutions is to keep this time perspective in mind. Rather than focusing on one single solution, a set of linked strategic choices will be the best strategy to be followed in most cases. Prioritising both in time (what first, where to follow up) and in allocation of resources (budgetary focus) as well as further fine-tuning is a clear necessity to guarantee that skills needs are targeted and solved.

Skills needs can be identified at various levels, ranging from assessments at the national or even European sector level to regional and company level. The former are by nature rather general, while the latter can be more precise and resulting in a more differentiated picture. Especially for large enterprises not only the identification of skills needs but also the search for adequate solutions will be an integral part of an overall, longer-term business strategy. Some solutions will be found within the company itself, for instance by reorganising functions within or between plants, by offering training trajectories or by active global sourcing of personnel. For SMEs and especially for micro-enterprises (less than 10 employees) such longer-term, more strategic human resource management often is more difficult to organise.

It should be emphasized that at all levels identified different players need to act to address skills needs and offer solutions. These can be individual firms, organised interests at the sector level (employers and employees), as well as local, regional and national governments. This chapter offers first of all a better insight in the ‘menu’ of possible strategic choices (section 6.2). It also provides a framework to identify skills needs at the appropriate level and helps to decide which should be the actual choices to be made (sections 6.3 and 6.4). This framework is subsequently applied to the transport sector in sections 6.5 and following.

14.4 Managers

14.4.1 Road transport managers

Table 14.4.1 Strategic options for road transport managers identifies viable strategic options for emerging skills and competences of managers in the road transport under the scenario with the most emerging skill changes, namely unrestricted growth. In this scenario the number of road transport managers is expected to remain constant and therefore skill gaps are more prevalent than shortages. In the scenario restricted transport stagnation the number of managers is expected to decrease, while in the other stagnation scenario it is expected to stay stable and in the growth scenarios the number is expected to increase.

Recruiting experts from other sectors, from other Member States and non-Member States is only a viable option in the unrestricted growth scenario where an increase of managers is expected. Moreover, even in this scenario it is limited in numbers due to the large numbers of SMEs and micro-enterprises in the sub-sector where the owners are also the managers. It will be only a viable option for larger companies in the transport sector. Even in the scenario where an increasing demand for road transport managers is likely to occur, recruiting of unemployed managers is of limited scope to meet the emerging skill shortages. Be that as it may, in these cases training will be necessary. More viable strategic choices present the recruitment of young people from the education system and the training the existing workforce to meet the emerging skill demand. The first of these two options offers the gaining of 'new blood', ideas and skills to the ageing work force of managers. The second option is necessary to meet the most urgent skill demands in the near future, in particular to raise social and entrepreneurial skills in both of the growth scenarios and to meet the stronger need of self-management skills in these scenarios. Changing vocational education and training is a viable option to react on the emerging skill needs of managers. In particular, besides, hard skills (e-skills) also soft skills should be stronger accentuated in university degrees for transport and supply chain managers such as social skills and entrepreneurship skills. Designing and offering new courses will be an important and viable option to address the future skill gaps. Especially flexible and affordable courses should be provided for SMEs and for an ageing workforce of managers. Larger companies of the sectors have quite good access to in-house trainings. Changing work organisation as well as outsourcing and off-shoring is a limited option owing to national markets and the high number of SMEs in the sub-sector. For larger companies both options are more viable but limited in scope. Team work with other occupations like business and logistics professionals are a suitable possibility to combine several skills.

Providing information about emerging skills is crucial in all scenarios in order to avoid any labour market mismatch. However, providing information is especially essential in the scenario with increasing demand for managers to prevent an influx of less qualified managers. Even for management functions a better image of the sector could help to attract young and perhaps female labour to the sector. For this reason and to design adequate courses a solid cooperation between the relevant stakeholders is a viable option to meet the demands.

Table 14.4.1 Strategic options for road transport managers

1. What is the maximum volume effect?	Increase	
2. What is the maximum change in skills?	22	
3. Do SMEs play a large role?	Yes	
4. Is the sector national/EU/global?	Mainly National/EU	
5. Is the workforce old?	Yes, 32% older than 50 and 36% between 40 and 49**	
6. Is the workforce low educated?	No, 84% hold a medium-or higher level of education***	
Options	Is this option viable?	Actors*
A. Recruiting workers from other sectors	Yes, mainly for emerging skills and for larger companies in the unrestricted growth scenario.	C
B. Recruiting workers from other Member States	Theoretically yes, but not for SMEs	C
C. Recruiting workers from non-Member States	Yes, mainly for emerging skills and for larger companies in the unrestricted growth scenario, but to a limited extent only	C, G
D. Recruiting unemployed with or without re-training	In general no, depending on the duration and type of unemployment	
E. Recruiting young people from the education system	Yes, mainly through placements for students and traineeships to meet the natural replacement demand and skill shortages.	C, E
F. Training and re-training employed workers	Yes, to address most urgent skill gaps, increasingly important in life-long-learning	C, E, U
G. Changing work organisation	Very limited	C,
H. Outsourcing and off-shoring	No, management is a core responsibility, not to be outsourced	
I. Changing vocational education	Yes, for SMEs only	C, E
J. Designing and offering new courses	Yes, mainly design flexible forms of training for SMEs and special courses for older managers.	C, E
K. Providing information about emerging skills	Yes, mainly about emerging sector specific qualifications.	C, E, U
L. Improve the image of the sector	Yes, a viable option to ease recruitment of young professionals	C, S, E, I, U
M. Stronger cooperation between stakeholders	Yes, in particular to develop flexible and suitable training for SMEs managers.	C, S, E, U

* C = company; S = sector organisations and chambers of commerce; E =education & training; G = governments; I = intermediary organisation, public or private, U = trade unions.

14.4.2 Rail transport managers

Table 14.4.2 presents viable strategic options for emerging competences of managers in rail transport. In the growth scenarios the overall number of managers is expected to stay stable while in the stagnation scenarios a decrease is expected. Hence, skill gaps are more prevalent than shortages. However, replacement demand will grow within the next years due to an ageing workforce of managers and this has to be met.

Due to the natural replacement demand recruiting workers from other sectors is a viable option. However, sector specific training will be needed. While general management skills are replaceable quite easily, some sector specific knowledge will be needed in particular in the scenario restricted transport growth. Due to an expected growth of an international supply chain, manager can be recruited from the postal sector or from sectors with a highly differentiated international supply chain which makes logistic knowledge highly necessary. Recruiting workers from other EU Member States also presents a possible option to meet the replacement demand but in the long run this will be a zero-sum game. Another less likely option is the recruitment of managers from non-Member State countries, due to the fact that European rail transport is (one of?) the most developed of the world. What is conceivable is to recruit managers from countries where railway transport is already privatised. Recruiting unemployed is a viable strategic option, but less likely than recruiting young, cheap and well educated professionals from the education system. This will be the most important and viable option, because of the need of a stronger diversification of the occupation in the future of the sector. However, it has to be taken into account, that this objective will only be met if the image of the sector will be improved simultaneously. In some occupational functions skill shortages are already occurring. Changing vocational education and training is a viable option to react on the emerging skill needs of managers. Besides hard skills (e-skills), also soft skills (such as social and entrepreneurial skills) should be stronger accentuated in university degrees for transport and supply chain managers. Training and re-training of employees is another option to address the emerging skill gaps. Especially the skill needs that arise from the stronger regulation in the scenario restricted growth have to be met. For this reason the design and offer of new courses is necessary. In the rail sector it will be of utmost importance to open training institutions for new market entrants (Teknologisk Institut 2007) and to provide flexible courses for them. In addition, special courses for older managers have to be developed.

Changing work organisation as well as outsourcing and off-shoring is currently of limited scope within the rail sub-sector and will only be a more viable option if re-regulation of the European railway sector is enhancing liberalisation and internationalisation of railway services. This is expected to take place in the unrestricted transport growth scenario. The provision of information about future skills is necessary to avoid a mismatch on the labour market, but it is also important to undertake regional studies about the exact volume changes to prevent a too strong influx in the sector. For this reason a solid cooperation between the relevant stakeholders is necessary.

Table 14.4.2 Strategic options for rail transport managers

1. What is the maximum volume effect?	Maintain	
2. What is the maximum change in skills?		
3. Do SMEs play a large role?	XXX	
4. Is the sector national/EU/global?	No	
5. Is the workforce old?	National/ EU/(global)	
6. Is the workforce low educated?	Yes, 32% older than 50 and 36% between 40 and 49** No, 84% hold a medium-or higher level of education**	
Options	Is this option viable?	Actors*
A. Recruiting workers from other sectors	Yes, to meet the natural replacement demand and get new management skills in the growth scenarios.	C, E
B. Recruiting workers from other Member States	Yes, to meet the natural replacement demand and get new management skills in the growth scenarios.	C, U
C. Recruiting workers from non-Member States	Yes, but less likely due to the high level of knowledge within Europe.	C, G, U
D. Recruiting unemployed with or without re-training	Yes, in order to meet the natural replacement demand, but limited in scope and plausibility	C, E, I
E. Recruiting young people from the education system	Yes, mainly through placements for students to meet the natural replacement demand and skill gaps.	C,
F. Training and re-training employed workers	Yes, in order to address most urgent skill gaps	C, E, U
G. Changing work organisation	Yes, most likely teamwork, but limited in scope for expected skill gaps in this occupational function.	C, U
H. Outsourcing and off-shoring	Yes, a viable option in the unrestricted growth scenario.	C, G, U
I. Changing vocational education	Yes integrate entrepreneurship and soft skills into the curricula	C, E
J. Designing and offering new courses	Yes, mainly design. Flexible forms of training for new market entrants and special courses for older managers.	C, E, S, I
K. Providing information about emerging skills	Yes, mainly about emerging skills and sector specific qualifications.	C, E, U
L. Improve the image of the sector	Yes, a viable option to ease recruitment of young professionals	C, S, E, I
M. Stronger cooperation between stakeholders	Yes, in particular to develop flexible and suitable training for SMEs managers.	C, S, E, U

* C = company; S = sector organisations and chambers of commerce; E =education & training; G =governments; I = intermediary organisation, public or private, U = trade unions.

14.4.3 (High) sea and air transport managers

Table 14.4.3 presents viable strategic options for emerging competences of managers in sea transport. While in the growth scenarios the overall number of managers is expected to increase, in the stagnation scenarios it is expected to remain constant. Hence, skill gaps and shortages may occur in the growth scenarios, while skill gaps will occur mainly in the stagnation scenarios.

Recruiting managers from other sectors is a viable option due to the common set of general skills managers possess. However, especially in the scenarios of restricted transport knowledge about sector specific regulation has to be trained. Recruiting workers from other Member States and non-Member States is another possible option because of the international character of the high sea transport sector. For this reason language problems will be of minor importance for this high skilled occupational function. Recruiting unemployed (high) sea transport managers could also be seen as a viable option. Yet, it is more probable and feasible to recruit young people from the education system. Training of the existing staff is a viable option to react on the most urgent skill needs of the sector. Teamwork will constitute one viable option to combine the different emerging skill needs for (high) sea transport managers. Together with the skills of business professionals and logistic professionals some of the emerging skill needs for (high) sea transport managers can be counterweight such as legislative and regulatory knowledge as well as e-skills . Outsourcing and off-shoring is another option. Hiring freelance counsellors for (high) sea transport management is an option in order to respond to acute skill gaps and shortages. Nevertheless, this option is generally limited due to the costs and the availability of freelance personnel. Changing vocational education and training is a viable option to react on the emerging skill needs of managers. Besides hard skills (e-skills) also soft skills should be accentuated more in university degrees for transport and supply chain managers such as social skills and entrepreneurial skills. Designing and offering of new courses is a viable option to respond to the ageing workforce of managers and to the emerging need of e-skills .

Providing information about the emerging skills of (high) sea transport managers is an important strategic option to prevent a mismatch on the labour market. It should be combined with an improvement of the image of the sector in some countries. For this reason existing co-operations should be deepened in the sector.

Table 14.4.3 Strategic options for high sea and air transport managers

1. What is the maximum volume effect?	Increase	
2. What is the maximum change in skills?	21	
3. Do SMEs play a large role?	No	
4. Is the sector national/EU/global?	International	
5. Is the workforce old?	Yes, 32% older than 50 and 36% between 40 and 49**	
6. Is the workforce low educated?	No, 84% hold a medium or higher level of education**	
Options	Is this option viable?	Actors*
A. Recruiting workers from other sectors	Yes, due to a common set of skills and to meet replacement demand in the growth scenarios.	C, E
B. Recruiting workers from other Member States	Yes, due to the high level of internationalisation.	C
C. Recruiting workers from non-Member States	Yes, due to the high level of internationalisation.	C, G
D. Recruiting unemployed with or without re-training	Yes, in order to meet the skill shortages in growth scenarios.	C, E, I
E. Recruiting young people from the education system	Yes, to meet the natural replacement demand and the expected increase in growth scenarios.	C,
F. Training and re-training employed workers	Yes, in order to address most urgent skill gaps	C, E, U
G. Changing work organisation	Yes, most likely teamwork.	C, U
H. Outsourcing and off-shoring	Yes, a viable option in the unrestricted growth scenario.	C
I. Changing vocational education	Yes, by integrating entrepreneurship and soft skills into the curricula.	C, E
J. Designing and offering new courses	Yes, mainly by designing flexible forms of training for new market entrants and special courses for older managers.	C, E, S, I
K. Providing information about emerging skills	Yes, mainly about emerging skills and sector specific qualifications.	C, E, U
L. Improve the image of the sector	Yes, a viable option to ease recruitment of young professionals	C, S, E, I
M. Stronger cooperation between stakeholders	Yes, in particular to develop flexible and suitable training for SMEs managers.	C, S, E, U,

* C = company; S = sector organisations and chambers of commerce; E =education & training; G =governments; I = intermediary organisation, public or private, U = trade unions.

**Manshanden, et al. (2008).

14.5 Air Pilots

Table 14.5 shows the strategic choices for pilots. The absolute numbers of pilots is mainly dependent on overall economic growth. Therefore, their numbers are expected to raise in the growth scenarios, while their numbers are expected to remain the same in the stagnation scenarios. Thus, skill shortages are likely to occur only in the growth scenarios.

Recruiting workers from other sectors is improbable due to the specialised and non-transferable skills of this profession. This option is not recommended without offering special training and, therefore, does not present a viable possibility because it is too expensive. Recruiting pilots from other Member States and non-Member States is a viable strategic option, because of the use of English as the main language in international air transport. Recruiting unemployed pilots will be a viable option especially in the growth scenarios. Up-dating practice skills could be necessary and public employment service can provide financial support. Recruiting young people from the education system could be another option to meet the natural and growing replacement demand of the stagnation scenarios and the expected labour shortage in the growth scenarios. Re-training of pilots mainly takes place if they have to adapt their skills to new equipment or new regulations. In addition, a regular update and check of skills is mandatory in European countries. They are mainly related to hard skills. However, also training of soft skills (which are emerging from the growth scenarios) is necessary for some air craft carriers. Hence, design and offering new forms of training is not a viable option to meet the emerging skill gaps.

Changing vocational education does not seem necessary, nor does changing the work organisation present a viable option due to the limited scope of potential changes in the specific environment of pilots. Outsourcing and even off-shoring is quite commonly used in the sector to minimise fixed costs, especially at low cost air craft carriers. Still, this option is limited in scope due specific social partner agreements in place in the sector. The skill needs of pilots are well recorded and the image of pilots is still very high. Thus, both strategic options do not necessarily have to be chosen. Consequently, a stronger partnership within the sector for this occupational function is not necessary.

Table 14.5 Strategic options pilots

1. What is the maximum volume effect?	Increase	
2. What is the maximum change in skills?	7	
3. Do SMEs play a large role?	No	
4. Is the sector national/EU/global?	International	
5. Is the workforce old?	Yes, 27% older than 50 and 36% between 40 and 49 years **	
6. Is the workforce low educated?	No	
Options	Is this option viable?	Actors*
A. Recruiting workers from other sectors	No, not viable due to the special qualification (exception: the air force)	-
B. Recruiting workers from other Member States	Yes, unlimited for pilots special training on airplane type may be needed.	C, E
C. Recruiting workers from non-Member States	Yes, unlimited for pilots special training on airplane type may be needed.	C, E
D. Recruiting unemployed with or without re-training	Limited, only if they have the necessary qualifications.	C, E, I
E. Recruiting young people from the education system	Yes, viable and important option due to an ageing workforce.	C,
F. Training and re-training employed workers	No, not feasible	-
G. Changing work organisation	No, not a viable option	-
H. Outsourcing and off-shoring	Yes, but limited in scope	C
I. Changing vocational education	No, not relevant	-
J. Designing and offering new courses	No, not necessary	-
K. Providing information about emerging skills	No, not necessary	-
L. Improve the image of the sector	No, not necessary	-
M. Stronger cooperation between stakeholders	No, not necessary	-

* C = company; S = sector organisations and chambers of commerce; E = education & training; G = governments; I = intermediary organisation, public or private, U = trade unions. Actors in bold should take initiative.

14.6 Ship officers (high sea/international)

Table 14.6 identifies the viable strategic choices for ship officers on international sea routes. The demand for ship officers mainly depends on overall economic growth. Therefore, their numbers are expected to increase in the growth scenarios, while in the stagnation scenarios they are likely to stay stable. Thus, skill shortages are expected to occur mainly in growth scenarios.

Recruiting ship officers from other sectors is quite unlikely due to the specialised and non-transferable skills at the medium and higher end of this profession. Thus, this option is impracticable without offering extensive specific training. Consequently, it is not a viable option. Recruiting ship officers from other Member States and non-Member States is a viable strategic option because of the use of English as the main language in international sea transport. For pilots in sea transport the opposite is true as special training is required on the specific circumstances in the ports (shallows, flow conditions, etc.). Recruiting unemployed ship officers will be a viable option especially in the growth scenarios. An up-date of skills of personnel is required, which can be supported financially by the public employment service. Recruiting young people from the education system could be another option to meet the natural and growing replacement demand of the stagnation scenarios and the expected labour shortage in the growth scenarios. Training of ship officers and, in particular, of captains is mainly undertaken if they have to adapt their skills to new equipment, vessels or regulations. A regular update and check of skills is mandatory in most European countries. The updates are mainly related to hard skills and are recognised as formal qualifications. Soft skills, such as self-management skills, are not directly included in any curricula. Hence, designing and offering new forms of training are viable options to meet the emerging skill gaps. Especially web-based training and other flexible forms of training should be offered. Moreover, web-based approval of qualifications should be adopted/extended in the sector. Because no major changes in the specific environment of sea transport is foreseen, changing the vocational education is not deemed necessary. Outsourcing and even off-shoring is already commonly used in the sector to minimise fixed costs (e.g., it is already quite usual to hire ship crews worldwide). In the future, however, the outsourcing and off-shoring trend may also affect the ship officers. Hence, off-shoring may become more important in the future as response to skill gaps and shortages within Europe. Providing information about the emerging skills of sea ship officers is an important strategic option to prevent a mismatch on the labour market. In addition, the image of the sector should be improved in some countries, for example in Germany and the United Kingdom. For this reason existing forms of cooperation, such as the International Shipping Federations, should be deepened in the sector.

Table 14.6 Strategic options ship officers on international sea routes

1. What is the maximum volume effect?	Increase	
2. What is the maximum change in skills?	18	
3. Do SMEs play a large role?	No	
4. Is the sector national/EU/global?	EU/ Global	
5. Is the workforce old?	Yes, 27% older than 50 and 36% between 40 and 49 years **	
6. Is the workforce low educated?	No	
Option	Is this option viable?	Actors*
A. Recruiting workers from other sectors	No, not viable due to the special qualification	-
B. Recruiting workers from other Member States	Yes, but limited for pilots and cruising vessels. Special training would be needed	C, E
C. Recruiting workers from non-Member States	Yes, but limited for pilots and cruising vessels. Special training would be needed	C, E
D. Recruiting unemployed with or without re-training	Yes, if they have the necessary qualifications. Update of skills could be necessary	C, E, I
E. Recruiting young people from the education system	Yes, viable and important option due to an ageing workforce.	C,
F. Training and re-training employed workers	Yes will become important in the future in the emerging skills	C, E, U
G. Changing work organisation	No, not a viable option	C, I
H. Outsourcing and off-shoring	Yes, already done and will become stronger in the future	C
I. Changing vocational education	No not necessary	-
J. Designing and offering new courses	Yes, in order to develop flexible training and approval of qualifications	C, E
K. Providing information about emerging skills	Yes, viable and important option to avoid mismatch	C, E, S, U
L. Improve the image of the sector	Yes, in some countries necessary for this occupational function.	C, E, I, S, G
M. Stronger cooperation between stakeholders	Yes, in order to change vocational training and develop new training forms	C, E, I, S, U

* C = company; S = sector organisations and chambers of commerce; E = education & training; G = governments; I = intermediary organisation, public or private, U = trade unions. Actors in bold should take initiative.

14.7 Ship officers (inland)

Table 14.7 identifies the strategic choices for ship officers operating on inland waterways. The number of ship officers on barges develops quite differently under the scenarios compared to the other occupational categories. The quantitative development depends on economic and regulatory developments. In general, it can be said that the stronger the regulation as well as the economic growth, the stronger is the increase of this occupational function and vice versa. For ship officers of barges only five skills are emerging and due to the structure of inland water transport only few strategic choices are viable in order to address the natural replacement demand and skill gaps. The inland waterway sector is dominated by micro-enterprises and SMEs with less than three barges. Therefore, not all strategic options are viable for ship officers on inland water transport.

Recruiting workers from other sectors will only be a viable option if labour shortages are growing. Because of the relative high degree of specialisation and formal qualification, training will be necessary, an option which is costly. More viable options are recruiting ship officers from other Member States or even non-Member States. Recruiting unemployed ship officers is another option but an update of skills and formal qualification could be necessary. Recruiting young people from the education system could be a viable option to meet the natural replacement demand. However, it has to be considered that workforce mainly is recruited out of their own families. Influx of external workers is low in the sector and the costs of obtaining a barge are high. Training and re-training of employees is a necessary and viable option. Especially hard skills and e-skills become more important in future of inland waterway transport. But also entrepreneurship skills and management skills should be taught to make the best use out of the technological and economic developments.

Changing work organisation is of limited scope within this occupational function and outsourcing and off-shoring will be only a possibility for the larger ship owners within inland waterway transport. A major change of vocational education training does not seem necessary, but in the growth scenarios with high competition a re-definition of block release in apprenticeships could be a strategic option. The development of e-learning within the sector could be strengthened and enhanced. Most ship officers already use the internet for business reasons (Kölsch 2002), but not for training. Thus, E-learning could still be improved.

Providing information about the emerging skills of sea ship officers is an important strategic option to prevent mismatch on the labour market. It should be combined with an improvement of the image of the sector. For this reason existing co-operations should be deepened in the sector.

Table 14.7 Strategic options ship officers (inland)

1. What is the maximum volume effect?	Increase	
2. What is the maximum change in skills?	5	
3. Do SMEs play a large role?	Yes	
4. Is the sector national/EU/global?	EU	
5. Is the workforce old?	Yes, 27% older than 50 and 36% between 40 and 49 years **	
6. Is the workforce low educated?	No	
Options	Is this option viable?	Actors*
A. Recruiting workers from other sectors	No, not viable due to the special qualification	-
B. Recruiting workers from other Member States	Yes,	C, E
C. Recruiting workers from non-Member States	Yes,	C, E
D. Recruiting unemployed with or without re-training	Yes, if they have the necessary qualifications. Update of skills could be necessary	C, E, I
E. Recruiting young people from the education system	Yes, viable and important option due to an ageing workforce.	C,
F. Training and re-training employed workers	Yes will become important in the future in the emerging skills	C, E, U
G. Changing work organisation	No, not a viable option	-
H. Outsourcing and off-shoring	Yes, but mainly for larger companies in the highly liberalised sector.	C
I. Changing vocational education	No not necessary	-
J. Designing and offering new courses	Yes, in order to develop flexible training and e-learning solutions.	C, E
K. Providing information about emerging skills	Yes, viable and important option to avoid mismatch	C, E, I
L. Improve the image of the sector	Yes, in some countries necessary for this occupational function.	C, E, I, S,
M. Stronger cooperation between stakeholders	Yes, in order develop new training forms	C, E, I, S, U

* C = company; S = sector organisations and chambers of commerce; E = education & training; G = governments; I = intermediary organisation, public or private, U = trade unions. Actors in bold should take initiative.

14.8 Business and finance professionals

Table 14.8 identifies the strategic options for business and finance professionals in the transport sector. Business professionals are a heterogeneous group comprising accounting professionals, lawyers and also sales and marketing professionals. Business professionals are expected to increase in both growth scenarios in all sub-sectors. In road transport their numbers are expected to stay stable whereas in the train transport sub-sector their numbers are expected to be constant in the unrestricted stagnation scenario only. Hence, besides the identified skill gaps also shortages are expected for this occupational function in all sub-sectors in the growth scenarios and even in the stagnation scenarios for air and sea transport. Due to this fact as well as due to the general sector independent skills of this occupational function nearly all strategic options are viable. However, they may differ in respect to their degree of feasibility in the sub-sectors.

Recruiting workers from other sectors is an important strategic option to gain new experience and “refresh” the sector with new ideas. In order to gain entrepreneurial skills and e-skills for an improved logistic chain and overall logistic business solutions, it, for example, would be reasonable to recruit experts already possessing this knowledge from other sectors such as distribution and trade or from the ICT sector. Searching for personnel outside the sector could become necessary because of labour market shortages. It will be important to train these “outsiders” in respect to sector specific regulation knowledge and knowledge about the logistic chain. Without enhancing the skills and respective training this strategic option would not be successful. Recruiting workers from other Member States and non-Member States is a less viable option. In order to react on the internationalisation of the sector recruiting sales personnel from other countries is a possible option. Hence, access to new markets can be gained. However, due to the national accounting regulation it presents a less viable option for accounting experts in this group.

Recruiting unemployed is a possible option to overcome skill shortages but might be of limited scope for the higher end of this occupational function. More feasible strategic choices are the recruitment of young people from the education system and training or re-training of the existing staff. The first option is viable to address the emerging skill shortages, the second to address the gaps. Of most importance are entrepreneurship skills, marketing skills, e-skills and in the restricted scenarios’ regulative skills (see section 5.6.).

Changing the work organisation is a viable strategic choice for larger companies in order to assist this occupational function (e.g. support sales personnel) in developing new products and services for customers and streamline existing services. Stronger team and project based work for logistics professionals could also be seen as a feasible strategic option to overcome existing and emerging skill gaps. This is true for outsourcing and even off-shoring of some tasks, mainly at the lower end of this occupational function.

Modifications in vocational education, up-to-date information about emerging skills, improvements of the image of the sector as well as solid cooperation between all stakeholders are viable and important strategic options. Especially in order to attract more business professionals, meet the emerging demand and up-skill employees with less promising occupations. Additionally, the opening of training institutions for new market entrants, for instance in train and air transport, should be developed. Still, updating courses to the latest developments in e-skills and e-tailing should be provided.

Table 14.8 Strategic options for business and finance professionals

1. What is the maximum volume effect?	Increase	
2. What is the maximum change in skills?	22	
3. Do SMEs play a large role?	No	
4. Is the sector national/EU/global?	National/ EU	
5. Is the workforce old?	No	
6. Is the workforce low educated?	No	
Options	Is this option viable?	Actors*
A. Recruiting workers from other sectors	Yes, a viable option for all sub-sectors due to independent general skills, but training will be needed.	C, E
B. Recruiting workers from other Member States	Yes, but limited due to national accounting regulation. More viable for large firms and sales professionals	C
C. Recruiting workers from non-Member States	Yes, but limited due to national accounting regulation. More viable for large firms and sales professionals.	C, G
D. Recruiting unemployed with or without re-training	Yes, but limited in scope (training is needed).	C, E, I
E. Recruiting young people from the education system	Yes, necessary to meet the expected increase.	C, E
F. Training and re-training employed workers	Yes, in particular to update skills of sales and marketing staff.	C, E, U
G. Changing work organisation	Yes, in particular for larger firms	C, U
H. Outsourcing and off-shoring	Yes, an option for some functions not only for larger companies.	C
I. Changing vocational education	No, major reforms are not necessary.	-
J. Designing and offering new courses	Yes, in particular flexible courses for sales personnel. SMEs in road transport but also in emerging skills for larger companies in other sub-sectors.	C, E
K. Providing information about emerging skills	Yes, as part of making some occupational functions more visible to the public.	C, E, S, U
L. Improve the image of the sector	Yes, this is mainly necessary for road transport	C, S, I
M. Stronger cooperation between stakeholders	Yes to provide more information about careers and to develop courses.	C, S, E, I, G, U

* C = company; S = sector organisations and chambers of commerce; E = education & training; G = governments; I = intermediary organisation, public or private, U = trade unions. Actors in bold should take initiative.

14.9 Logistics professionals

Table 14.9 identifies the strategic options for logistics professionals in the transport sector. Logistics professionals are a heterogeneous group comprising logistics specialists, ICT professionals, as well as engineers. The development of logistics professionals in the different scenarios equals those of business professionals in all scenarios and sub-sectors. Logistics professionals are expected to increase in both growth scenarios in all sub-sectors. In road transport their numbers are expected to stay stable whereas in the train transport sub-sector their numbers are expected to stay stable only in the unrestricted stagnation scenario. Hence, besides the identified skills gaps also shortages are expected for this occupational function in all sub-sectors in the growth scenarios and even in the stagnation scenarios for air and (high) sea transport. Due to this fact, nearly all strategic options are viable. However, their practicability may differ across sub-sectors. The skills of logistics specialists and engineers are more sector-specific than those of ICT professionals within the sector.

Recruiting workers from other sectors is one strategic option to meet the skill shortage of ICT specialists and engineers. Still, providing training on sector-specific skills will especially be necessary for engineers (ship, train and aircraft engineering). In general, logistics specialists, such as material planners and schedulers, can also be recruited from outside the transport sector. When shortages are very high, recruitment from other Member States and non-Member States are another option. The main requirement for recruiting experts from foreign countries, however, is to bridge the language gap. To address the enhanced internationalisation of the sector in particular, it is viable option to recruit sales personnel from other countries in order to gain access to new markets

In order to gain entrepreneurial skills and e-skills for an improved logistic chain and overall logistic business solutions, for example, it would be reasonable to recruit experts already possessing the knowledge from other sectors such as from distribution and trade or from the ICT sector.

Recruiting unemployed is a possible option to overcome skill shortages but might be of limited scope for the higher end of this occupational function. More feasible strategic choices are given by recruiting young people from the education system. Training of employees is an important option to address the anticipated skill gaps within this group. The legislative and regulatory knowledge in the restricted scenarios and the technical and e-skills in the unrestricted scenarios will be of utmost importance. Re-training and up-skilling of mechanics and of administrative staff is another possibility to address the rising demand for higher skilled occupational functions in the sector.

While logistic specialists are essential to process the logistic chain it is viable to outsource some logistic processes to external service providers. Changes of work organisation such as team work or job enlargement are limited in meeting skill gaps and shortages as well. Changing vocational education and training does not seem necessary for this occupational function. Yet, designing and offering courses are essential to meet skill gaps and training needs of new companies in the rail transport sub-sector (for more details see implications). Changes in the occupational functions, caused by stronger use of digital technology and more internationalisation in the sector, should be reported and the respective information should be provided for schools, students and the interested public to avoid false expectations by job entrants and to avoid a greater mismatch of skill needs of the sector and the supply.

Table 14.9 Strategic options for logistic professionals

1. What is the maximum volume effect?	Increase	
2. What is the maximum change in skills?	26	
3. Do SMEs play a large role?	Yes	
4. Is the sector national/EU/global?	National/ EU	
5. Is the workforce old?	No	
6. Is the workforce low educated?	No	
Options	Is this option viable?	Actors*
A. Recruiting workers from other sectors	Yes, a viable option to meet general skill shortages, more likely for larger companies, training for specialists will be needed. .	C, E
B. Recruiting workers from other Member States	Yes, a viable option to meet general skill shortages, more likely for larger companies, language gap has to be bridged. (More likely in public transport)	C,I
C. Recruiting workers from non-Member States	Yes, but options are limited, language gap has to be bridged..	C, G
D. Recruiting unemployed with or without re-training	Limited in scope (training will be needed).	C, E, I,G
E. Recruiting young people from the education system	Yes, necessary to meet the expected increase.	C, E
F. Training and re-training employed workers	Yes, in particular to update skills of sales and marketing staff.	C, E, U,S
G. Changing work organisation	Yes, in particular for larger firms but limited in scope	C, U
H. Outsourcing and off-shoring	Yes, an option for some functions for larger companies but limited in scope.	C
I. Changing vocational education	Yes, new modules on supply chain management.	E,S,U,G
J. Designing and offering new courses	Yes, in particular flexible courses for SMEs in road transport but also in emerging skills for larger companies in other sub-sectors.	C, E,I
K. Providing information about emerging skills	Yes, as part of making some occupational functions more visible to the public.	C, E, S, U
L. Improve the image of the sector	Yes, this is mainly necessary for road transport and technical occupations in the whole sector	C, S, I,U
M. Stronger cooperation between stakeholders	Yes to provide more information about careers and to develop courses.	C, S, E, I, G, U

* C = company; S = sector organisations and chambers of commerce; E =education & training; G =governments; I = intermediary organisation, public or private, U = trade unions. Actors in bold should take initiative.

14.10 Administrative staff

Table 14.10 presents the strategic options to solve the emerging skill gaps of administrative staff. The administrative staff category is only expected to grow under the *unrestricted growth* scenario for the road transport sub-sector. In all other scenarios and sub-sectors the administrative staff category either stays stable or decreases. Because no major staff shortages are expected, skill gaps are relatively modest. Not all strategic options have to be activated, with the road transport sub-sector under unrestricted growth as an exception.

Recruiting administrative staff from other sectors, other Member States or non-Member States, is generally a viable yet not necessary option to address the natural replacement of administrative staff in the transport sector. The one exception would be the growth of administrative staff in the road transport sub-sector under the unrestricted growth scenario. The same is true for recruiting unemployed. It will be important to recruit young people from the education and training system to meet the natural replacement demand and to train the existing workforce to adapt their skills.

Training the existing workforce is the other important option. In cases of well-educated staff also re-training and up-skilling of personnel in more secure positions can be a viable strategic option. Changing the work organisation is only a viable option in order to address the technical skill gaps and the expected knowledge gap. Yet, it has to be considered that most competences are directly related to the individual (e.g., self-management skills and language skills). Consequently, the effect of changing the work organisation is very limited. Outsourcing and off-shoring will mainly be driven by economic needs and will present a future possibility to hire personnel for lost functions by the companies of the sector. Changing vocational education and designing new courses is less important for this occupational function due to few emerging skill changes. Nonetheless, a stronger focus on language and self-management skills in training will be required in future. Provision of information on emerging skills is as essential as information on the volume changes in this occupational function in the sector in order to prevent a qualitative but also quantitative mismatch. For this specific reason as well as for improving the image of the sector a stronger cooperation between stakeholders of this sector is necessary.

Table 14.10 Strategic options administrative staff

1. What is the maximum volume effect?	Maintain	
2. What is the maximum change in skills?	8	
3. Do SMEs play a large role?	Yes	
4. Is the sector national/EU/global?	National/ EU	
5. Is the workforce old?	No	
6. Is the workforce low educated?	No	
Options	Is this option viable?	Actors*
A. Recruiting workers from other sectors	No, not necessary	-
B. Recruiting workers from other Member States	No, not necessary	-
C. Recruiting workers from non-Member States	No, not necessary	-
D. Recruiting unemployed with or without re-training	Yes, but also limited in plausibility	C, E
E. Recruiting young people from the education system	Yes, most viable options	C
F. Training and re-training employed workers	Yes, very important option	C, E, U
G. Changing work organisation	Yes, but limited in scope	C,U
H. Outsourcing and off-shoring	Yes	C
I. Changing vocational education	No	-
J. Designing and offering new courses	Yes, in particular flexible trainings for market entrants	C, E
K. Providing information about emerging skills	Yes, to avoid labour market mismatch	C, E, S, U
L. Improve the image of the sector	No	
M. Stronger cooperation between stakeholders	Yes	C, E, S, G, U

* C = company; S = sector organisations and chambers of commerce; E =education & training; G =governments; I = intermediary organisation, public or private, U = trade unions. Actors in bold should take initiative.

14.11 Stewards (Air)

Table 14.11 shows the strategic options to solve the emerging skills gaps of airway and train stewards. For both sub-sectors, the employment of stewards develops in the same direction under all scenarios. Employment of stewards is expected to be stable under the unrestricted growth and the restricted stagnation scenarios, to increase under the restricted growth scenario, and to decrease under the unrestricted stagnation scenario. The number of emerging skills is highest in the growth scenarios.

Recruiting stewards from other sectors is quite unlikely in train and air transport because of the special skills required for these functions. More likely, at least in air transport, is the recruiting of staff from other Member States and non-Member States and therefore is a viable strategic option in this sub-sector. This development is supported by the introduction of automated passenger information systems and the dominance of the English language in the sector. In the train transport sub-sector recruiting staff from other Member States and non-Member States is quite unlikely due to language barriers and the fact that most train transport is still national. With the ongoing liberalisation in the unrestricted growth scenarios, the emergence of cross-border passenger transport may support the recruitment of stewards from other countries and will lead to more internationally mixed teams on board. Hence, it is likely that the international recruitment option becomes more viable in the future. In any case, training of the specific national or company related services, for example, on ticketing systems as well as on health and safety regulations, will be required in rail transport.

Recruiting unemployed stewards or unemployed with related occupations can be a strategic option in the restricted growth scenario, where an increase of the occupational function is expected. In the other scenarios other options such as recruiting freshly trained youths from the education system are more viable to meet the demand caused by natural fluctuation.

Training of the existing workforce is the most viable option with a short-term impact. Quality management as well as understanding customers are next to e-skills the most important emerging skill needs in this occupation. Yet also language and intercultural skills will emerge in both growth scenarios. Changing the work organisation such as the introduction of international teams in train and air transport can help to overcome some of the predicted skill needs, particularly the language and intercultural skill gap. Outsourcing and off-shoring of certain tasks are quite possible if the quality standards can be kept up or improved. Changing initial vocational education and training for train stewards will be a viable option in order to respond to internationalisation and enable internationalisation of European rail transport. The development of European minimum standard requirements for train stewards will be a viable option to meet the emerging skill demand. Providing information about the emerging skills of stewards is an important strategic option to prevent a mismatch in all related sub-sectors. In addition, the image of the sector should be improved in the United Kingdom and , in particular the image of train transport is reported as very poor (GoSkills, n.d.: p.6). For this reason, existing co-operations should be deepened in the sector.

Table 14.11 Strategic options air stewards

1. What is the maximum volume effect?	Increase	
2. What is the maximum change in skills?	13	
3. Do SMEs play a large role?	No	
4. Is the sector national/EU/global?	National/Global	
5. Is the workforce old?	No	
6. Is the workforce low educated?	No	
Options	Is this option viable?	Actors*
A. Recruiting workers from other sectors	No, not viable due to the special qualification	-
B. Recruiting workers from other Member States	Yes, already practice in air transport, will become more important in train transport in the future.	C, E
C. Recruiting workers from non-Member States	Yes, already practice in air transport, will become more important in train transport in the future.	C, E
D. Recruiting unemployed with or without re-training	Yes, if they have the necessary qualifications. Update of skills could be necessary	C, E, I
E. Recruiting young people from the education system	Yes, viable and important option due to an ageing workforce.	C,
F. Training and re-training employed workers	Yes will become important in the future in the emerging skills	C, E, U
G. Changing work organisation	Yes, a viable option in all sub-sectors to reduce emerging skill gaps	C, I, U
H. Outsourcing and off-shoring	Yes, if quality of service can be kept up	C
I. Changing vocational education	Yes, development and recognition of an European minimum standard for international train stewards.	C, E, S, G
J. Designing and offering new courses	Yes, in order to develop flexible training and e-learning solutions.	C, E
K. Providing information about emerging skills	Yes, viable and important option to avoid mismatch	C, E, I,U
L. Improve the image of the sector	Yes, in some countries necessary for this occupational function.	C, E, I, S,
M. Stronger cooperation between stakeholders	Yes, in order develop new training forms	C, E, I, S, U

* C = company; S = sector organisations and chambers of commerce; E =education & training; G =governments; I = intermediary organisation, public or private, U = trade unions. Actors in bold should take initiative.

14.12 Mechanics

Table 14.12 presents the strategic options to solve the emerging skill gaps of mechanics in the transport sector. Changes in the employment of mechanics in the different sub-sectors and under different scenarios differ strongly.

Recruiting mechanics from other sectors could be a strategic option but will be very limited in scope due to the specialist knowledge required for this occupation. It is feasible that mechanics from the energy sector are hired as ship or train mechanics. However, it is less likely that they will be recruited by the air and road transport sub-sector. Therefore, this strategic option is limited in scope and not very viable without offering sector-specific training resulting in formal qualifications. Due to high costs, this possibility will only be viable if major shortages have to be met. Recruiting workers from other Member States and non-Member States seem to be more practicable. The main barrier in this case is the language skill gap. However, it will become necessary to overcome this gap if, for instance, train transport becomes more European/international. In that instance mechanics have also to acquaint themselves with the different technical standards still in use across Europe. This may reduce the obstacles of international recruitment in this field. In road, (high) sea and air transport language skill gaps and technical skill gaps resulting from national regulation are of a minor aspect. In these sub-sectors it is much easier to recruit workers from other (non-)Member States.

Recruiting unemployed will be a viable strategic choice if skills shortages are expected. In such case an update of skills of the personnel will certainly be necessary. Recruiting young people from the education system is an important option in all.

In train and (high) sea transport a skill shortage of mechanics is already perceptible in some countries (for instance Skills for Logistics 2006b). Recruiting young people from the education system will in such cases only be feasible if the image of technical occupations in the sector improves. In order to meet the most urgent skill gaps training of the existing workforce is necessary. Most emerging skills in this occupational function are e-skills and adaptation of the knowledge of the workforce to new technologies. In addition, also language skills and problem solving skills for mechanics are emerging in the growth scenarios.

Outsourcing of technical services has to some extent already taken place in the air and road transport sector in order to enhance efficiency. With emerging liberalisation and internationalisation outsourcing is also an option for train transport. Off-shoring of technical services and maintenance in general is limited for road and train transport due to the predominant national-wide operation areas and standards which all have to be met. It is conceivable, however, that in border regions off-shoring could be used more often in the future. As a result of the emerging liberalisation and Europeanization, European-wide minimum standards will be introduced for mechanics in the train transport. Changes in the curricula will be necessary. Not only in train transport the design and offer of new training measures and courses will be necessary to meet the emerging skill gaps. In the rail sector training institutes focusing on new market entrants should be opened. Additionally, more flexible training needs to be offered in all sub-sectors.

Providing information about emerging skill needs is essential for offering optimal placement possibilities. For most sectors it will be necessary to attract more women to the technical occupations in order to meet the future labour market demand in the growth scenarios.

Table 14.12 Strategic options for mechanics

1. What is the maximum volume effect?	Increase	
2. What is the maximum change in skills?	15	
3. Do SMEs play a large role?	Yes	
4. Is the sector national/EU/global?	National/ EU	
5. Is the workforce old?	Yes	
6. Is the workforce low educated?	No	
Options	Is this option viable?	Actors*
A. Recruiting workers from other sectors	Yes, but very limited in scope and quite cost intense.	C, E
B. Recruiting workers from other Member States	Yes, viable option if language gap can be bridged. Training in rail transport will be needed.	C, E
C. Recruiting workers from non-Member States	Yes, viable option if language gap can be bridged. Training in rail transport will be needed.	C, E, G
D. Recruiting unemployed with or without re-training	Yes, together with training for certain skills.	C, E, I
E. Recruiting young people from the education system	Yes, in all sub-sectors to strengthen age diversity in this occupational function	C,
F. Training and re-training employed workers	Yes, especially regarding emerging e-skills and problems solving skills.	C, E, U
G. Changing work organisation	Yes more flexible working hours, but limited in scope	C, S, U
H. Outsourcing and off-shoring	Yes, outsourcing is a viable option but off-shoring limited by national operation level.	C
I. Changing vocational education	Yes, in train transport a stronger Europeanization of national qualification standards will be taken up also for mechanics.	C, E, S, G
J. Designing and offering new courses	Yes, regarding soft skills training. Flexible forms of training are essential.	C, E, I
K. Providing information about emerging skills	Yes, to enable an optimal placement.	C, E, I, U
L. Improve the image of the sector	Yes, necessary for this function in train and ship transport mechanics.	C, E, S, I,
M. Stronger cooperation between stakeholders	Yes, for designing new courses and enable optimal placement.	C, E, S, I, G, U

* C = company; S = sector organisations and chambers of commerce; E =education & training; G =governments; I = intermediary organisation, public or private, U = trade unions.

14.13 Train drivers

Table 14.13 presents the strategic choices to solve the emerging skills gaps of train drivers. In the scenario of *restricted growth*, the number of train drivers is expected to rise and, hence, not only skill gaps but also skill shortages are likely to occur. In the other scenarios employment for train drivers is expected to stay stable, except in the *unrestricted stagnation* scenario which foresees a decrease in employment.

Due to the high specialisation of the occupation there are only few really viable strategic options to choose from. Should the skill shortage and the skill gaps lead to a desperate situation in the sector, human resource officials could envisage to recruit workers from other sectors. However, due to the huge training demand this option is clearly less likely than to recruit train drivers from other Member and non-Member States. Yet, also in these cases national sector specific training and language skill training is necessary. Hence, both strategic options are viable but less likely to be opted for within the next years.

Recruiting unemployed train drivers could present a possibility, but their numbers are relatively low in Europe. In some cases, especially in regions with a high demand for train drivers, recruiting unemployed could provide an option. In some cases the public employment service together with companies have already financed training course¹⁹, even for the unemployed. This is a specific option which is, in particular used by companies entering the market. Certainly a more viable option is to recruit and train young people deriving from the education system. However, it has to be taken into account that the reputation of the profession is quite low in most countries. Therefore, this will only be a feasible option, if the image of the occupation as well as those of the profession will be improved. Moreover, it will be essential to improve the working conditions of train drivers in order to attract workers.

Due to the increasing internationalisation, respectively Europeanization, of the sector and the ongoing liberalisation, new transnational and international skills such as e-skills and technological knowledge will be required from train drivers. The technological changes may also lead to new skill requirements. However, the changes will also lead to a reduction in numbers of train drivers in the *unrestricted stagnation* scenario. Therefore, a stronger adjustment of vocational training to European demands and a European-wide recognition will be necessary in the future, at least for train drivers crossing borders. This emerging demand also makes the design of courses and new training content necessary (Danish Technological Institute, et al., 2007). Providing information about emerging skills and on the future of this occupation is also a viable option to direct the workforce towards the right pathways. It is expected that the demand for train drivers will rise in the scenario restricted growth. Hence, the image of the sector and the profession has to be improved in order to attract more workers and meet the future demands. In order to develop stronger Europeanised train driving licences, a solid cooperation between all relevant stakeholders should be built.

¹⁹ E.g. <http://www.rurtalbahn.de/> from December 2008

Table 14.13 Strategic options train drivers

1. What is the maximum volume effect?	Increase	
2. What is the maximum change in skills?	7	
3. Do SMEs play a large role?	No	
4. Is the sector national/EU/global?	Mainly national	
5. Is the workforce old?	Yes, 27% older than 50 and 31% between 40 and 49**	
6. Is the workforce low educated?	No, usually higher educated than truck and bus drivers	
Options	Is this option viable?	Actors*
A. Recruiting workers from other sectors	Yes, but only with train driver training	C, E
B. Recruiting workers from other Member States	Yes, but limited due to the need of national training and certification also basic language skills have to be trained	C, E
C. Recruiting workers from non-Member States	Yes, but limited due to the need of national training and certification also basic language skills have to be trained	C, E
D. Recruiting unemployed with or without re-training	Yes, if they have the necessary driving license. If regional demand is very high and foreseen PES can provide training.	C, E, I
E. Recruiting young people from the education system	Yes, viable and important option due to an ageing workforce.	C,
F. Training and re-training employed workers	Yes will become very important in the future in the emerging skills	C, E, U
G. Changing work organisation	No, limited for this occupational function	C, I, U
H. Outsourcing and off-shoring	No	C
I. Changing vocational education	Yes, development and recognition of an European train driving licences	C, E, S, I, G, U
J. Designing and offering new courses	Yes, in order to develop flexible training to adapt to technological change and open training for market entrants	C, E
K. Providing information about emerging skills	Yes, viable and important option to avoid mismatch	C, E, S, U
L. Improve the image of the sector	Yes, necessary for this occupation function.	C, E, I, S, G
M. Stronger cooperation between stakeholders	Yes, in order to change vocational training and develop new training forms	C, E, I, S, G, U

*C = company; S = sector organisations and chambers of commerce; E = education & training; G = governments; I = intermediary organisation, public or private, U = trade unions. Actors in bold should take initiative.

14.14 Road drivers

Table 14.14 shows the strategic choices to solve the emerging skill gaps of road drivers. As labour and skill shortages in regard to Large Goods Vehicle (LGV) drivers and severe problems in meeting the actual demand are already occurring, all strategic options have to be taken into account. Which strategic options will be activated will vary between companies and Member States depending on their specific circumstances.

Recruiting road drivers from other sectors will be a strategic option if they possess the necessary driving licenses and the transport sector company is able to meet their wage claims (which will, under the current and emerging circumstances, be quite unlikely). Recruiting workers from other Member States and non-Member States is already taking place in some European countries in order to address staff and skill shortages (Skills for Logistics, 2006b: p. 24). In these cases a basic training is required.

Recruiting unemployed is only easily manageable if the potential workers possess the required driving license. If there is a strong demand for road drivers in some regions, public employment services together with the companies could provide financial assistance for relevant training. Recruiting young people from the education system is another viable option to address the staff and skill shortages in this occupational function of the sector. However, this measure will only be successful if the image of the occupational function is strengthened. Road drivers are not seen as reputable respectful occupation. The main reasons are the poor working conditions of road drivers in the sector such as long working hours and shifts, stress, poor wage and career prospects, long absence from home and only few possibilities to develop a private life. Due to that, changes in the work organisation (and explicitly of working conditions) would be a viable strategic option to attract more drivers. More flexible working hours and part-time work could also help to diversify the workforce. Outsourcing and off-shoring are already in place to gain access to new markets and to meet peaks of distribution and lower prices of transport to some extent. The process of outsourcing will be fostered by an enlargement of cabotage in the future.

If internationalisation and mobility is growing, the development of a European road driver apprenticeship model is conceivable in order to address future skill gaps. In general, the sector invests little in the training of road drivers. Hence, up-skilling of the workforce will only be possible if there is a strong, sector-wide commitment to training as to avoid a distortion of competition in Europe. Thus, an expansion and deepening of the Certificate of Professional Competence (CPC) seems necessary. Designing and offering new courses in order to address the emerging skill shortages is a viable and necessary option. The most important content of training is eco-efficient clean driving, updating of vehicle knowledge, and customer handling skills. Yet, even more important is to provide flexible new training methods to keep absence of employees from work low and training cheap and flexible. It will become important to adapt the skills of drivers regularly to new technologies and to changes in regulation in the both scenarios where competition is restricted. A solid cooperation of all relevant stakeholders to pursue different strategic choices more efficiently is necessary. Firstly, to develop and adapt training to the special needs of SMEs, and, secondly to attract more drivers to the sector.

Table 14.14 Strategic options road drivers

1. What is the maximum volume effect?	Increase	
2. What is the maximum change in skills?	9	
3. Do SMEs play a large role?	Yes	
4. Is the sector national/EU/global?	Mainly national/ EU	
5. Is the workforce old?	Yes, 27% older than 50 and 31% between 40 and 49**	
6. Is the workforce low educated?	Yes, 37% of the drivers has a low level of education and 59% a medium level of education***	
Options	Is this option viable?	Actors*
A. Recruiting workers from other sectors	Yes, to recruit drivers from other sectors is in general feasible.	C
B. Recruiting workers from other Member States	Yes, with respective training i.e. basic language skills	C, E
C. Recruiting workers from non-Member States	Yes, with respective training i.e. basic language skills	C, E
D. Recruiting unemployed with or without re-training	Yes, if they have the necessary driving license. If regional demand is very high and foreseen PES can provide training.	C, E, I
E. Recruiting young people from the education system	Yes, viable and important option due to an ageing workforce, but only successful with point L	C, U
F. Training and re-training employed workers	Yes in the emerging skills	C, U
G. Changing work organisation	Yes, to diversify the workforce and attract more persons employee friendly work organisation would be helpful, but limited by fierce competition	C, I, U
H. Outsourcing and off-shoring	Yes, already done but will become stronger if cabotage regulation in Europe is weakened.	C
I. Changing vocational education	Yes, development of a European truck-driving licences.	C, E, S, I, G,
J. Designing and offering new courses	Yes, in order to develop flexible training for SMEs.	C, E
K. Providing information about emerging skills	Yes	C, E, S, U
L. Improve the image of the sector	Yes, to diversify the workforce in the sector and address skill shortages	C, E, I, S, G
M. Stronger cooperation between stakeholders	Yes, in order to develop training forms suitable for employees in SMEs and to improve the image of the sector	C, E, I, S, G

* C = company; S = sector organisations and chambers of commerce; E = education & training; G = governments; I = intermediary organisation, public or private, U = trade unions. Actors in bold should take initiative.

14.15 Ship crew

Table 14.15 shows the strategic choices to solve the emerging skills gaps of ship crew members for both high sea and inland water transport. Ship crew members are carrying out lower services on transport vessels such as co-ordination and application of landing manoeuvres, loading and unloading of cargo as well as other lower tasks. In general, there is no specific training offered in order to enable staff fulfilling the tasks of a ship crew. The tasks are mainly carried out by European as well as non-European workers with low qualification levels. Even non-skilled workers are employed as ship crew members. Occupational definitions are boatswains, seamen. Apprentices and trainees of higher occupational function fulfil also often the tasks of ship crew members.

Due to the low skilled profile of the job nearly all strategic options are viable. Workers for fulfilling the low skilled tasks of the ship crew can be recruited either from other sectors or from other and non-Member States. The last option is already widely used in (high) sea transport. Recruiting unemployed or young persons from the education system are also possible options. Training of the existing workforce is another option, but courses have to be adapted for the “educationally disadvantaged” and non-skilled workers from Europe and other continents. Changing work organisation is very limited as strategic option on ships due to the specific working environment and responsibilities. Therefore, it is not a viable option. Outsourcing and off-shoring already takes place in form of hiring freelance personnel. There is no vocational training offered for the lower functions of ship crews, but the development of some training courses for an internationally mixed and non-skilled labour force would help to meet quality standards.

Providing information about the emerging skills of ship crew members is an important strategic option to prevent a skill mismatch. For this reason as well as in order to develop flexible forms of training existing co-operations should be deepened in the sector.

Table 14.15 Strategic options ship crew

1. What is the maximum volume effect?	Increase	
2. What is the maximum change in skills?	13	
3. Do SMEs play a large role?	No	
4. Is the sector national/EU/global?	EU/Global	
5. Is the workforce old?	Yes, 27% older than 50 and 31% between 40 and 49**	
6. Is the workforce low educated?	Yes, 37% of the drivers has a low level of education and 59% a medium level of education***	
Options	Is this option viable?	Actors*
A. Recruiting workers from other sectors	Yes, due to the low skills level and a mainly physical work	-
B. Recruiting workers from other Member States	Yes, already practice in the sector	C, E
C. Recruiting workers from non-Member States	Yes, already practice in the sector	C, E
D. Recruiting unemployed with or without re-training	Yes, due to the low skills level	C, E, I
E. Recruiting young people from the education system	Yes, apprenticeships and placement possibility in this occupational for students of naval studies.	C,
F. Training and re-training employed workers	Yes, but difficult to the international and mainly non skilled labour force.	C, E, U
G. Changing work organisation	No	C, I, U
H. Outsourcing and off-shoring	Yes already done to some extend by freelance personnel.	C
I. Changing vocational education	No	C, E, S, G
J. Designing and offering new courses	Yes, develop flexible training for non skilled and international heterogenous group of labourers.	C, E
K. Providing information about emerging skills	Yes, viable and important option to avoid mismatch	C, E, I, U
L. Improve the image of the sector	No	-
M. Stronger cooperation between stakeholders	Yes, in order develop new training forms	C, E, I, S, U

* C = company; S = sector organisations and chambers of commerce; E =education & training; G = governments; I = intermediary organisation, public or private, U = trade unions. Actors in bold should take initiative.

14.16 Freight handlers

Table 14.16 shows the strategic choices to solve the present or emerging skills gaps of freight handlers in the transport sector. Freight handlers are carrying out lower services in the transport sector. In general, no apprenticeships are necessary for the lower end of warehousemen and freight handlers. The numbers of freight handlers develop differently in the different sub-sectors in the same scenarios due to expected substitution effects caused by either economic growth or regulation. In the *restricted growth* scenario there is an increase in numbers of all freight handlers expected with the exception of air freight handlers. They are likely to stay stable in numbers. In all other scenarios the effects within the sub-sectors are more heterogeneous. In the other growth scenario the amount of freight handlers either will increase or stay stable in numbers, in the *stagnation* scenarios they are expected either to stay stable in numbers or decrease.

The most important driver of skill changes of freight handlers is the ongoing automation of the supply chain and logistics. Therefore, e-skills and technical knowledge becomes more important. There are two possible pathways for this occupational function according to the growth scenarios. On the one hand some tasks of freight handlers are moving towards technical based freight controllers and the occupational function is mainly controlling automated freight processes (Schnalzer, et al. 2003). On the other hand the physical task will remain constant. Hence, different strategic choices are viable. Recruiting workers from other sectors, from other Member States and non-Member States are quite viable options because of the general low skill level of freight handlers and the common “training on the job” in this occupational function. Recruiting unemployed and young people from the education system are also possible strategic choices. Training of the existing workforce is a necessary and viable option to address the emerging e-skill demand and the rising technological knowledge required to fulfil the tasks of a freight handler in future. Changing work organisation, outsourcing and off-shoring are less viable options for this occupational function. For the lower end of freight handlers there is no vocational education available in most countries. For warehouse clerks apprentices a change into available vocational education and training could become necessary, especially when e-tailing becomes common. The design and offer of new training courses will become essential and will go hand in hand with the ongoing changes in the supply chain automation technology. Yet, also new flexible courses for training of soft skills are viable options to meet the emerging skill demand.

Providing information about the emerging skills of freight handlers and the impact of technology on this occupational function is an important strategic option to prevent a skill mismatch. For this reason as well as in order to develop flexible forms of training existing co-operations should be deepened in the sector.

Table 14.16 Strategic options freight handlers

1. What is the maximum volume effect?	Increase	
2. What is the maximum change in skills?	8	
3. Do SMEs play a large role?	Yes	
4. Is the sector national/EU/global?	National/ EU	
5. Is the workforce old?	No	
6. Is the workforce low educated?	Yes, 47% of the freight handlers has a low level of education.**	
Options	Is this option viable?	Actors*
A. Recruiting workers from other sectors	Yes due to the low skill level.	-
B. Recruiting workers from other Member States	Yes, but limited due to language gap	C, E
C. Recruiting workers from non-Member States	Yes, but limited due to language gap	C, E
D. Recruiting unemployed with or without re-training	Yes, but training could be necessary	C, E, I
E. Recruiting young people from the education system	Yes, to meet the natural placement demand.	C,
F. Training and re-training employed workers	Yes, in the main emerging skills in particular e-skills	C, E, U
G. Changing work organisation	No	-
H. Outsourcing and off-shoring	No	-
I. Changing vocational education	No, not in the next years necessary	-
J. Designing and offering new courses	Yes, develop flexible training for low skilled group of labourers.	C, E
K. Providing information about emerging skills	Yes, viable and important option to avoid mismatch	C, E, I, U
L. Improve the image of the sector	No	-
M. Stronger cooperation between stakeholders	Yes, in order develop new training forms and react quickly on new skill needs.	C, E, I, S, U

* C = company; S = sector organisations and chambers of commerce; E =education & training; G =governments; I = intermediary organisation, public or private, U = trade unions. Actors in bold should take initiative.

14.17 Scenario implications, future skills and knowledge needs and possible solutions: summary and main conclusions

Implications of the scenarios in terms of expected volume changes in employment (jobs), future skills and knowledge needs as well as ways to address and solve these needs (strategic choices) have all been analysed so far at the individual job function level. This section serves to summarise (in Table 14.17 for the road transport sector) the main implications and solutions for each of the job functions presented in chapters 12, 13 and 14. It serves as a bridge to the next chapter where we shift from a micro perspective (job functions) to a meso (sector and policy) perspective.

Summary of job volumes, skills changes, strategic choices and main players for anticipatory action by scenario (road transport sector)

		No Limits	Off-Roadng	Shifting Gears	Slow Down
Road Managers	1. Employment volume change	I	M	M	D
	2. Skills changes counted	22	13	21	13
	3. Emerging skills needs	Knowledge, social, problem solving, self management, entrepreneurship, management,	Knowledge, social, entrepreneurship, management,	Knowledge, social, problem solving, self management, entrepreneurship, management,	Knowledge, social, entrepreneurship, management,
	4. Most important solutions	Recruiting workers from other sectors, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, changing work organisation, changing vocational education, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting unemployed, recruiting young people from the education system, training and re-training employed workers, changing work organisation, changing vocational education, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, changing work organisation, changing vocational education, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, changing work organisation, changing vocational education, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders
	5. Most important actors	C, E	C, E	C, E	C, E
Road Business Professionals	1. Employment volume change	I	M	M	D
	2. Skills changes counted	21	5	20	6
	3. Emerging skills needs	Knowledge, social, problem solving, self management, entrepreneurship, management,	Knowledge,	Knowledge, social, problem solving, self management, entrepreneurship, management,	Knowledge,

	4. Most important solutions	Recruiting workers from other sectors, recruiting workers from other Member States, recruiting workers from non-Member States, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, changing work organisation, outsourcing and off-shoring, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting workers from other Member States, recruiting workers from non-Member States, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, changing work organisation, outsourcing and off-shoring, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting workers from other Member States, recruiting workers from non-Member States, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, changing work organisation, outsourcing and off-shoring, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting workers from other Member States, recruiting workers from non-Member States, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, changing work organisation, outsourcing and off-shoring, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders
	5. Most important actors	C, E	C, E	C, E	C, E
Road Logistics Professionals	1. Employment volume change	I	M	I	M
	2. Skills changes counted	15	16	21	11
	3. Emerging skills needs	Knowledge, social, problem solving, self management, entrepreneurship, management,	Knowledge, self management, entrepreneurship	Knowledge, social, problem solving, self management, entrepreneurship	Knowledge, social, problem solving, self management, entrepreneurship, management,

	4. Most important solutions	Recruiting workers from other sectors, recruiting workers from other Member States, recruiting workers from non-Member States, recruiting young people from the education system, training and re-training employed workers, changing work organisation, outsourcing and off-shoring, changing vocational education, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting workers from other Member States, recruiting workers from non-Member States, recruiting young people from the education system, training and re-training employed workers, changing work organisation, outsourcing and off-shoring, changing vocational education, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting workers from other Member States, recruiting workers from non-Member States, recruiting young people from the education system, training and re-training employed workers, changing work organisation, outsourcing and off-shoring, changing vocational education, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting workers from other Member States, recruiting workers from non-Member States, recruiting young people from the education system, training and re-training employed workers, changing work organisation, outsourcing and off-shoring, changing vocational education, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders
	5. Most important actors	C, E, S, U	C, E, S, U	C, E, S, U	C, E, S, U
Road Administr. Workers	1. Employment volume change	I	D	M	M
	2. Skills changes counted	16	1	17	8
	3. Emerging skills needs	Knowledge, social, self management, entrepreneurship	Knowledge	Knowledge, social, self management, entrepreneurship	Knowledge
	4. Most important solutions	Recruiting young people from the education system, training and re-training employed workers	Recruiting young people from the education system, training and re-training employed workers	Recruiting young people from the education system, training and re-training employed workers	Recruiting young people from the education system, training and re-training employed workers
	5. Most important actors	C, E	C, E	C, E	C, E
Road Mechanics	1. Employment volume change	I	D	I	D
	2. Skills changes counted	15	7	15	9
	3. Emerging skills needs	Knowledge, social, problem solving, self management	Knowledge, problem solving	Knowledge, social, problem solving, self management	Knowledge, problem solving

	4. Most important solutions	recruiting workers from other Member States, recruiting workers from non-Member States, recruiting young people from the education system, training and re-training employed workers, outsourcing and off-shoring, changing vocational education, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	recruiting workers from other Member States, recruiting workers from non-Member States, recruiting young people from the education system, training and re-training employed workers, outsourcing and off-shoring, changing vocational education, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	recruiting workers from other Member States, recruiting workers from non-Member States, recruiting young people from the education system, training and re-training employed workers, outsourcing and off-shoring, changing vocational education, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	recruiting workers from other Member States, recruiting workers from non-Member States, recruiting young people from the education system, training and re-training employed workers, outsourcing and off-shoring, changing vocational education, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders
	5. Most important actors	C, E, I, U	C, E, I, U	C, E, I, U	C, E, I, U
Road drivers	1. Employment volume change	I	M	M	D
	2. Skills changes counted	9	3	9	4
	3. Emerging skills needs	Knowledge, social self management	Knowledge	Knowledge, social self management	Knowledge

	4. Most important solutions	Recruiting workers from other sectors, recruiting workers from other Member States, recruiting workers from non-Member States, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, changing work organisation, outsourcing and off-shoring, changing vocational education, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting workers from other Member States, recruiting workers from non-Member States, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, changing work organisation, outsourcing and off-shoring, changing vocational education, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting workers from other Member States, recruiting workers from non-Member States, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, changing work organisation, outsourcing and off-shoring, changing vocational education, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting workers from other Member States, recruiting workers from non-Member States, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, changing work organisation, outsourcing and off-shoring, changing vocational education, designing and offering new courses, providing information about emerging skills, improve the image of the sector, stronger cooperation between stakeholders
	5. Most important actors	C, E, I, S	C, E, I, S	C, E, I, S	C, E, I, S
Road Freight Handlers	1. Employment volume change	I	M	I	D
	2. Skills changes counted	7	3	8	4
	3. Emerging skills needs	Knowledge, social	Knowledge	Knowledge, social	Knowledge
	4. Most important solutions	Recruiting workers from other sectors, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, designing and offering new courses, providing information about emerging skills, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, designing and offering new courses, providing information about emerging skills, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, designing and offering new courses, providing information about emerging skills, stronger cooperation between stakeholders	Recruiting workers from other sectors, recruiting unemployed with or without re-training, recruiting young people from the education system, training and re-training employed workers, designing and offering new courses, providing information about emerging skills, stronger cooperation between stakeholders
		C, E, I, U	C, E, I, U	C, E, I, U	C, E, I, U

15 Conclusions and recommendations for education and training

15.1 Introduction

This chapter presents the main conclusions and recommendations for education and training; chapter 16 presents the main other conclusions and recommendations. Whereas the earlier chapters very much take a micro perspective by focusing on job functions in terms of expected volume changes, skills and knowledge needs and ways to address and solve these needs (strategic choices), chapter 15 takes a *meso* or *sector* perspective. It addresses a number of issues, part of which coming already to the fore in earlier chapters, and part being ‘new’ issues although much related to those already raised. The conclusions and recommendations are mostly based on the results of the preceding chapters; they were discussed during the final workshop with social partners, the industry and other experts.

The recommendations contained in this chapter should not be seen as fully exhaustive. They rather form the basis for further discussion and elaboration at various decision-making levels, ranging from the European Union and the Member State to the regional and local level. Industry itself – firms – have an important role to play, as do education and training institutes, social partners and the government (EU, national, regional and local). In most cases action should be taken jointly, by involving various actors, sometimes even at different levels. Collaboration and co-operation as buzzwords in today’s economy are easily coined. Making collaboration work in practice is, however, a challenge which requires mutual understanding, compromise and perseverance.

15.2 Conclusions and recommendations for education and training

1) Differentiate initial and vocational training system

The expected changes in the growth scenarios will lead to profound changes in both business strategies and occupational functions. However, the precise extent of the impact of these changes is hard to predict. The education and training system has to cope with and adapt to this uncertainty rather by a transition to flexible training (e.g., modularisation) than by offering new content. However, training institutions are unable to face this challenge on their own. In order to keep up pace with sector developments they need to provide the latest technology, the latest knowledge about emerging business possibilities and training for the skills of tomorrow. This challenge can not be met by one actor alone. The half-life period of skills and knowledge is also getting shorter due to changes in customer demands and resulting changes in business models. This leads to several implications for education and training systems on the level of both, the nature and the contents of the trainings provided.

Especially in the transport sector most employees have medium or low qualification levels, while low educated within the sector are decreasing in numbers (Manshanden, et al. 2008). Therefore, the initial vocational training system is important for most of the job functions such as for stewards, mechanics, train drivers, and logistics professionals. Before outlining several possibilities for improving Initial Vocational Training (IVET), different systems will be described.

Different systems of Vocational Education and Training (VET) as well as a combination of Initial and Continuing Vocational Education and Training (IVET and CVET) are implemented in the European Member States (compare Clematide 2005, Koch et al. 1998). Various characteristics of the VET system have to be taken into consideration when discussing possible specific implications for education and training. In general, VET systems can be grouped by the player who decides about the structure and content of the VET system. At the hand of this distinction, three main types of VET systems can be identified, namely: (a) Liberal; (b) State-controlled; and (c) Corporatist (see Table 7.1).

The three VET systems of Germany, France and the United Kingdom are of specific importance as they can be regarded as 'ideal types' representing many variations of the VET implementations in Europe. The enterprise-based training system of Germany (the 'Dual System') is implemented by the social partners and the state. Next to this prevailing system, other forms of VET exist. In France, a school-based training system is established and implemented by the state. Even though the full-time, school-based training system competes to some extent with an upcoming apprenticeship training system, it is still the dominant form of vocational training in France.

The system implemented in the UK, the national vocational qualification, is regulated and driven by market forces in several important segments. Although national vocational qualifications (NVQ) and general national vocational qualifications (GNVQ) are regulated at national level, the implementation of training is not regulated at national level. Commercial certification systems are still competing with national ones. Thus, work-based as well as full-time school-based training can be found. Special training schemes for unemployed such as school-based schemes for unemployed youths or social enterprises for long-term unemployed are present in several European Member States.

Besides those ideal types, several mixed forms exist in Europe. In Spain, for example, there are more informal forms of VET to be found. In Central and East European countries the VET system tends to move from a state-controlled model to a more corporatist model.

Box 6. Vocational education and training– rich variety between Member States

A number of different systems in Vocational Education and Training (VET) as well as Initial and Continuing Vocational Education and Training (IVET and CVET) can be observed throughout the European Union. Various characteristics of these systems have to be taken into consideration when discussing possible specific implications for education and training. Existing VET-systems can be grouped into three main categories ('idealtypes'), (i) liberal, (ii) state-controlled and (iii) corporatist VET-systems, each having a different underlying rationale and distinguishing characteristics. Key in this distinction are those who decide about the structure and content of VET: business itself, the state or the state together with social partners (see Table below). The three VET-systems of Germany, France and the United Kingdom are of special importance as they can be taken as representative for each of the three 'idealtypes' categorisations. They are evidence of the rich variations in existing VET systems and their implementation in Europe. The enterprise-based training system of Germany (the 'Dual System') is implemented by the social partners and the state. Next to this prevailing system other forms of VET exist. In France, a school-based training system is established and implemented by the state. Even though the full-time school-based training system competes to some extent with an upcoming apprenticeship training system, it is still the dominant form of vocational training in France. The system implemented in the UK, the national vocational qualification, is regulated and driven by market forces in several important segments. Although national vocational qualifications (NVQ) and general national vocational qualifications (GNVQ) are regulated at national level, the implementation of training is not yet regulated at national level. Commercial certification systems are still competing with national ones. Work-based, as well as full-time school-based training can be found. Special training schemes for unemployed, such as school-based schemes for unemployed youths or work social enterprises for long-term unemployed, are present in several European Member States. Besides these 'idealtypes' several mixed forms in Europe exist. In Spain, for example, one finds more informal forms of VET and in Central and East European countries the trend can be detected, that VET moves from a state centred model to a stronger corporatist model, while also business driven approaches exist in some sectors.

Table to Box 6. Three 'ideal-type' VET-models (elaborated from Clematide, 2005)

	A. Liberal	B. State-controlled	C. Corporatist
Decision maker	Business (and individuals)	State	State and social partner organisations
Rationale	Liberalistic competitive	Centralistic state-centred	Corporative – social consensus
Programmes	Business and individual	Education and citizen	Occupation
Content	Needs of business and individual, utility oriented, short term and specific	Politically determined, general knowledge, course-oriented, academic	Determined by social partners, occupation centred, traditions
Labour markets VET relates to	Internal (business) labour markets	Occupational and internal labour markets	Occupational labour markets
Strengths	Flexible, cheap for the state, close to the needs of production	Strong linkage to the education system, no lack of training places	Broad vocational educations with status equal to general education
Weaknesses	Under-investment in training and education	Weak linkage to the labour market	Inertia in the institutions
Representatives	United Kingdom, Ireland	France	Germany, Austria, Denmark
Trends	Stronger state involvement in certification and quality	"Dual system" emerging and stronger orientation on business needs	Internal labour markets Marketing of VET

The different VET systems in Europe all have their own merits. It would make no sense to try to standardise VET throughout Europe. Especially in the new Member States, more focus and assistance is required to further fine-tune the existing VET systems to new and emerging needs (see further below).

Social mobility in many European countries is low. The VET system plays a key role for people to move up the social ladder. It is especially important to exploit the potential of 'late developers' that in the first instance did not reach tertiary education. VET systems should be enhanced to facilitate the option for people to continuously up-skill – also in light of life-long learning (LLL).

2) Bring engineering and science to the classroom

In several European countries initiatives to improve the image of engineering professions are underway – some of them with a clear focus also to attract pupils to transport and especially to the railway sector. Initiatives of this kind should be elaborated, expanded, and disseminated across Europe. New ways of learning, combining basic education and scientific knowledge are required to facilitate the interests of youth in engineering professions and to attract more students to the engineering professions in the transport sector.

3) Sector-specific skills at an early stage

Ongoing technological change and fierce competition in the transport sector make it necessary to combine early on theoretical, academic and vocational knowledge at all education levels and in all forms. The transferability and connectivity of the different education and trainings systems should be enabled. At the same time it will be necessary to keep up high training standards in generic and soft skills to enable people to adapt to the expected growing internationalisation of the transport sector and its specific demand for language skills.

To improve the matching of skills taught at schools and skills needed by the industry, the British Department for Children, Schools and Families (DCSF) has created a new education pathway for children from 14 to 19 years.²⁰ The so-called 'Diploma' was jointly founded by education officials and the industry and tries to bridge general academic and vocational education. For the transport sector, the relevant skill councils, 'goskills' and 'skills for logistics'²¹ participate in the programme. The sector skills councils contribute to the design of the sector-specific education pathway which will complement the existing pathways in the British education and (initial) vocational training system and lead to accepted school leaving certificates. Diplomas combine principal learning (knowledge about the chosen sector endorsed by employers and universities), learning of generic functional (English, Maths and Computer skills) and social skills, and additional and specialised learning: selected courses from the classical pathways of the General Certificate of Secondary Education (like Accounting, Art, Biology, Business Studies, Chemistry, Economics, Geography, Natural Economy and Physics) or A-level examinations. The diplomas are rounded off with mandatory placements of at least ten days in a company of the respective sector. The transport sector skill council 'goskills' is cooperating with other skill councils in travel and tourism diplomas, engineering diplomas and language diplomas, which are either already

²⁰<http://www.dcsf.gov.uk/14-19/index.cfm?go=site.home&sid=47> from October 2008 and <http://yp.direct.gov.uk/diplomas/> from October 2008

²¹ http://www.goskills.org/index.php/standards_quals/36/27/ / <http://www.skillsforlogistics.org/en/index/> from December 2008

implemented or on their way of being introduced. For the language diploma the transport sector is the main and leading responsible partner, a fact which underlines the important role of languages in the sector and its bigger importance in the future.

The expected skill shortages in the technical occupations of the sector, which also applies to train and truck drivers in some countries (Skills for Logistics, 2006b), makes an improvement of the image of the sector in schools necessary to attract more labour to these occupational functions in the future.

4) Cooperation to improve information regarding skill needs and job opportunities

Deficits originating from information gaps regarding present and future education and training needs and subsequently their supply are still evident. Consequently, a mismatch between actual VET supply and demand in quality as well as - to a lower extent - in quantity is observed for some occupational functions. Also commercial training providers often do not meet the real training needs. In the United Kingdom this mismatch is recognised by the sector stakeholders and consequently several reforms are on its way. Information systems on the sector level as well as on the regional, national and European level assist in minimising information asymmetries in order to overcome skill gaps resulting from information deficits. To support students entering the labour market in finding a suitable occupation is equally important as it is to assist employees in finding new job opportunities based on their existing skills or in guiding them to find fitting vocational training courses.

Close collaboration between all relevant stakeholders, companies, education and training organisations, social partners, research institutions and public authorities will help to reduce information deficits on current and emerging skills needs. The traditional training system has to adapt to the new situation and collaboration is an effective instrument to stimulate the implementation of changes in VET. A strong linkage between industry and education and training is recommended in state-driven, full-time and school-based VET systems (Koch and Reuling, 1998). In all countries (and in particular in the new Member States) cooperation is essential to improve the practical orientation in VET (Skjølstrup and Mayen, 2007). The 'Sector Skills Councils' in the United Kingdom - in particular GoSkills, Skills for Logistics and the Maritime Skills Councils for the transport sector - are examples on how VET can be organised differently.²²

5) Joint Training Networks to foster apprenticeships in the sector

Due to technological change and the liberalisation of train transport, joint training networks between companies for job entrants (and also for mature workers) will become more important in the future. Only few companies will be able to provide all train transport related services and have the ability to use the latest equipment. Hence, only few new market entrants will be able to provide for all necessary technical equipment and resources to offer qualified training for job entrants. This is a particular disadvantage of niche players in the train transport sector. Regional based joint training networks between companies are one possibility to provide the comprehensive training job entrants need. In Germany, the state-owned 'Deutsche Bahn' provides cooperative training for several different apprenticeships.²³ The main purpose of joint training systems is that apprentices

²² www.sscalliance.org; The 'Sector skill councils' in UK are funded by the Department for Innovation, Universities and Skills and form part of the government's skills strategy for the 21st century. The councils ensure that individuals gain the skills they need and those that are required in order to provide persons with adequate skills for the industry. Sector skills strategies are defined for each sector based on the analysis of present and future skills needs.

²³ <http://www.deutschebahn.com/site/bahn/de/geschaefte/personaldienstleistungen/bildung/verbundausbildung/verbundausbildung.html> from December 2008

pass through all necessary stages of an apprenticeship, although the main training company can only provide some of these stages. This model can also be applied to other sub-sectors, e.g. SMEs in the road transport sector.

6) Open and joint teaching facilities for all: keep vocational teaching up to date

Especially training of pilots, train drivers and high sea or inland waterways ship officers can be improved by the use of simulators though this might be cost intensive. Additionally, training facilities in Europe are still working for one major company only or the companies are training their staff in-house in own training facilities (Danish Technological Institute, et al, 2007: p. 40 ongoing; EMCC 2008: p. 7). This limits the access for foreign market entrants and national niche players to training facilities and can be seen as an obstacle to promote a common railway market. Training institutions operated and financed by different stakeholders, such as companies, social partner organisations, and training institutes of the sub-sectors could be a possible solution to make training more accessible for market entrants and smaller players.

7) Internationalisation and 'Europeanization' of initial vocational education (and continuing vocational training)

One of the major trends of transport is its growing internationalisation, respectively Europeanization, which should be perceived by the education and training system and should be stronger taken into account in IVET and apprenticeships. This does not only mean that language education should be given higher priority in initial vocational education, but also international exchange of apprentices and placements for students should be enhanced in the sector. While this applies for all sub-sectors of transport, in rail transport a recently undertaken study outlines sub sector specific implications (Danish Technological Institute et al., 2007: p. 118 ongoing; Olson et al. 2002). According to this study, the development of common minimum standards of training should be fostered to be prepared for transnational interoperability of railway traffic (also for stewards Schäfer et al 2004); a European-wide certification or recognition of competences of railway staff as well as of trainers in the sector should be fostered; a European network of training institutes should be set up because all of them are facing the same challenges and could jointly develop solutions for tomorrow's skill needs and also shortages. This could also be applied to other sub-sectors. For example, in road transport there is already a European-wide Certification of Professional Competence (CPC) required to become a road haulage or passenger transport operator (though there are some exceptions). The implementation of the directive differs between the Member States and parts of it should be stronger harmonized, as another study recommends (NEA et al. 2005). A European network could try to improve the coordination of the content of the underlying directive and find a common standard in the implementation of CPC training.

8) Europe wide recognition of skills

Due to the internationalisation especially in the train transport sector and the need for technical unification of the existing network it will be necessary to constantly adapt the knowledge and skills of the employees. To ensure international standards as well as the required mobility of labour a European recognition of skills and a corresponding adaptation of national initial vocational training is recommended for train drivers and stewards of the sector. The European Qualification Framework can provide a common basis for the European transport sector to pursue this aim. Social partner organisations, the European Commission and Companies and training providers should adopt the European wide validation system for the sector and develop a special certification system.

This would also support trans-national mobility within in the sector and enhance a common rail transport market.

9) Raising awareness of the utility of training in SMEs and their employees

In order to enhance training in the transport sector, the image of training has to be improved for SMEs as well as for micro enterprises of the sector and their awareness of the value of continuous vocational training for business development has to be strengthened. Still, training is only acquired in a piecemeal way, that is to say, on-the-job and mainly for the purpose of adapting workers to new equipment available. In order to enhance CVET especially among SMEs in the road transport and inland waterway sector, specialised financing or training models for employees should be developed and installed. The good reputation of the CPC in road transport (NEA 2007) and the growing acceptance of eco-efficient driving should be used to raise the awareness of the utility of training in the transport sector in general; a corresponding campaign should be envisaged. Such a campaign should be developed by training providers, companies and sector representatives together to reach the highest impact.

10) Special training offers and support to self employed and SMEs in the road transport sector

For self employed and to some extent also for SMEs it is quite difficult to keep up with the latest developments in training needs. They face specific problems when confronted with skill developments. The main barriers to adequately train self-employed, or for them to enrol in courses, are high fees plus the loss of earnings during participation and a lack of information about content and quality of training. To some extent these are also the general problems SMEs face. In general, there is either no time to release employees for training or a lack of sufficient financial resources. There is training need for SMEs and for self-employed on all levels in the sector to refine their position within the changing transport environment.

11) Facilitation of training co-operations between SMEs

The prevalence of SMEs in particular in the road transport and inland waterway transport sector makes cooperation for initial and continuing vocational training necessary. These co-operations should be supported by national training bodies and sectoral social partner organisations and supported by public funding. Existing models should be made public and good practice examples should be disseminated. Joint training networks should be used for apprenticeships but also for the training of the employees of the sector. In regional centres of the sector provincial or regional authorities can support the establishment of training co-operations.

12) Development of e-learning and blended learning

A stronger use of e-learning also in apprenticeships could help to reduce pressure from SMEs in this respect. This is also a quite useful tool to support training supervisors of apprentices in companies and to provide latest information about developments in the sector. As side effect apprentices also get used to electronic equipment and acquire some e-skills when applying e-learning systems. E-learning should and can be used more intensively, in particular in (high) sea transport where learning is mostly undertaken in the form of block-trainings. E-learning can also help to reduce absence from work, to strengthen self-directed learning and to get apprentices used to lifelong learning. The development of e-learning content is a major challenge for training providers, for

companies as well as for social partner organisations within the sub-sectors and should be pushed forward. There have already been some initiatives within the e-TEN programme or Marco Polo programmes with first results related to the sector, such as the 'Inland navigation eLearning system (INES),²⁴ which offers logistic professionals, apprentices, schools and employees interactive online courses for training skills in inland waterway transport.²⁴

13) Enhance flexibility in learning forms

Strengthening the information basis on skill demand, career possibilities and the supply of training is a prerequisite for enhanced flexibility (and adaptability) of continuous vocational education and training. As already stated, flexibility in our sense refers to the capability of the VET system to adapt effectively to new training needs in terms of quality and quantity (see 2.1.3). In principle, blended learning combines face-to-face and group-based learning with up-to-date offline media and online e-learning forms, as for example digital learning modules on websites, video conferences, joint learning applications, newsgroups and blogs for interactive online learning. Therewith, costs of further training are reduced and flexibility to combine work with training is enhanced. Other positive effects on skills are the following: As large parts of this training are self-directed and informal, the learner builds up several competences, like self reflection, self motivation, strength of purposes and an effective information processing. While there already are some e-learning platforms existing (e.g. INES in inland waterway transport), the supply of e-learning offers should be improved in the whole sector.

14) Cooperation for flexible, sector-specific training measures

In vocational education and training more attention should be paid to inter- and multidisciplinary abilities as different technical skills need to be combined with the required non-technical skills. Even though a sound technical education still provides the basis, attention will have to be paid to enhance other abilities such as social, problem solving and self-management skills. Such elements should also be an integral part of apprenticeships, traineeship programs as well as of Higher Education. The flexibility of training forms should be improved and the full participation of niche players and "new" market entrants should be ensured. To reach these goals a strong commitment by the social partner organisations is necessary.

It has to be taken into account that also for comparatively low-skilled workers more and more non-technical skills, including the above mentioned social, problem solving and self-management skills will have to be improved to enable them to effectively cope with sector developments. Given the rapid internationalisation this requires also better language capabilities. The overall development of the sector and the necessary increase in efficiency in the transport chain logistics, respectively, will not be reached unless this target group will be given the necessary attention.

15) Preparing for multi-skilling for higher- and low-skilled occupations

The internationalisation of transport, the growing depth of the value chain, technological development and regulation concerning transport in Europe makes multi-skills necessary for managers, business professionals and logistic professionals and to some extent also for lower skilled occupations. Additionally, soft skills in order to quickly adapt to these changes as well as to keep up employability through continuing vocational training are becoming more and more important in the transport sector in future years. New technology and the growing depth of the value chain will enhance efficiency in

²⁴http://www.inlandnavigation.org/en/shipping/ship_web.html from December 2008

intermodal international transport and will thus also increase the importance of multi-skills for handling the transport chain and applying the relevant technology. This also implies that professionals have to gain knowledge about other transport systems.

On the other end of the education level applying new technology will also make up-skilling of low skilled occupations necessary. This will be the case in computer based warehouse management and also in new freight handling technologies. Especially SMEs in road transport should *seize the opportunity* to build up co-operations with training institutes and external career counsellors to develop training plans for their staff and to improve their business opportunities (*provided that the corresponding costs remain reasonable*). On the other side these technological developments will lead to a reduction in numbers of low and unskilled labour, which will make individual up-skilling or even re-training for more promising occupations more necessary than today.

16) Re-training and up-skilling of low skilled occupational functions

To ensure employability of freight handlers and of administrative staff in the transport sector, up-skilling and re-training towards other occupations within the sector will be necessary. According to most scenarios, this will be a challenge in the years to come. Hence, public authorities such as the public employment service or communities should engage and support companies and individuals in their training efforts and prepare these groups for the future. The data shows a general trend to higher qualifications in each occupational function of the transport sector. Hence, up-skilling of the existing workforce is an important measure to keep up their employability and to ensure the necessary skills to support companies in their economic performance.

17) Special courses for an ageing workforce in the transport sector

To minimise costs of off-the-job vocational training for SMEs, joint vocational training networks can be established between firms. In such models companies of the sector get together to decide about common training requirements and send their staff to jointly organised trainings offered by external training providers. This could help to reduce training costs. In some countries (e.g. Austria) these training networks are supported by the public employment service when they are specially targeted at certain groups, e.g. the older workforce. Another example is Germany, where the Bochum-Gelsenkirchener Straßenbahnen AG (BOGESTRA), a public transport enterprise, developed an age sensitive further training measure for its employees.²⁵

16 Main other conclusions and recommendations

16.1 Introduction

This report concludes with a number of ‘other’ (i.e. going beyond education and training) conclusions and recommendations based on the results and insights gained during the course of this study. They include the results of an intensive two day workshop with various stakeholders and the European Commission during which the draft final results, including preliminary recommendations, were discussed. The conclusions and recommendations apply to the sector at large (including individual firms, sector

²⁵ <http://www.innova-projekt.de/pages/index.html> from December 2008

organisations, chambers of commerce, social partners), intermediary organisations, education and training institutes, as well as policy-makers (EU, Member States, regions).

The recommendations point into viable and useful directions rather than that they represent ready-made proposals for change. Reflection and debate, and finding creative answers to plausible futures in skills and jobs is, in the absence of a crystal ball, the way forward. The bandwidth between the expected developments in the most extreme scenarios is indicative for the degree of uncertainty by which the future should be approached. Solutions to future skills needs should therefore be flexible, smart and encompassing enough to address the differences between the various scenario outcomes, not knowing what real future will eventually emerge.

16.2 Main other recommendations

A number of tentative conclusions and recommendations can be made, based on the main findings of the previous chapters. These may apply to firms, sector organisations, chambers of commerce, intermediary organisations, education and training institutes as well as policymakers at different levels – including the EU, Member States and Member State regions. The conclusions and recommendations included in this stage of the project can by their very nature only be tentative as the final workshop will be a vital and crucial part of the methodology itself. The main function of this report is to pre-structure workshop discussions and to inform the participants about main trends and developments in the sector, looking backward as well as forward. This also includes the elaboration of credible and plausible future scenarios and their implications for skills and jobs. Especially the recommendations and conclusions of this exercise should be a matter of intensive debate together with sectoral stakeholders and experts from various backgrounds, balancing the various arguments and coming up with workable and feasible recommendations for the medium and longer term. Even though the year 2020 may seem to be far off, the future will announce itself earlier than we tend to think. What is very clear is that, in this age of continuing and pervasive globalisation and strong changes in production and value management worldwide, timely preparations are called for more than ever before.

Within this study, new emerging competences by occupational function as well as the development in the number of jobs were described for the transport sector. Resulting skill gaps and staff shortages were identified on European level. In order to facilitate the operation, we distinguish between general and more specific recommendations.

16.3 General recommendations

The principal recommendation to meet existing as well as emerging skills needs is to intensify cooperation between all relevant stakeholders of the sector. The challenge to overcome sectoral skill gaps and staff shortages will only be met if industry, training providers, social partners, research institutions and public authorities act in concert. Collaboration is not only required to meet skills needs, but (and perhaps even more important) also to support the development of sectoral learning strategies.

Cost-sharing mechanisms between such different actors like public authorities, companies and individuals need to be developed and lifelong learning should be promoted. Learning must be made more attractive to all, e.g. via tax incentives and a change in attitudes in order to integrate learning into all phases of the life-cycle. In addition, training and

education systems in Member States need to be improved and become more modular so that they can address specific knowledge shortages and up-skilling needs.

Lifelong learning is the key for companies as well as for individuals to match competitiveness and to prevent less favourable scenarios. Social partners should develop joint programmes of lifelong learning in cooperation with public authorities and other relevant stakeholders such as training organisations and universities in order to up-grade skills of the workforce in the sector. Examples of good practices should be made available to all.

16.4 Specific recommendations

Different strategic options by job function were presented in Chapter 6. Additional specific recommendations relate to the following (it has to be taken into account that most of the recommendations will apply only to a limited number of professions because the highly differentiated sector):

1) Development of career paths for lower skilled workers in transport

Training, up-skilling and re-training of lower skilled and “endangered” occupations such as those of freight handlers and administration staff (in particular in air transport) but also those of truck drivers in road transport should be stronger supported by education and training institutions, companies, social partner organisations and by intermediate organisations such as public employment service in the future. This could also help to attract drivers to the road transport sector in countries which are already facing shortages in this qualification level, such as the United Kingdom (Skills for Logistics 2006a). Promising career paths can attract drivers to the sector if they show that employment as a truck driver is not a dead end street.

However, basic training to allow for up-skilling has to be provided. In some cases experience is traditionally taken as the only qualification criteria (Skills for Logistics 2006b: 14). Thus training of generic skills (literacy and numeric skills) for low skilled occupations will be necessary to keep up employability of this group. Generic skills are vital in order to keep pace with the technological development within the sector and are the precondition to apply the devices. The results of this study can lead to the assumption that training institutions have to take into account that large numbers of this target group is of mature age. Hence, design of training should be adapted to this reality.

2) Career guidance for employees

Career guidance can be used to pursue the following two objectives: First of all, it can help to redirect pupils and students to the sector in particular and to occupations where an increased demand is expected. Secondly, career guidance assists in supporting the placement of those mature workers which are threatened of becoming unemployed. In the sector scenarios, it is expected that lower skilled occupations like freight handlers, mechanics (in some sectors) and administrative staff will decrease either by natural fluctuation or by layoffs. Additionally, it has to be stated that vertical mobility especially for lower-skilled personal and truck drivers within the sector is in some countries low (Skills for Logistics, 2006b: p. 114). Career guidance assists in finding new job possibilities within or outside the sector. In combining career guidance with skills assessments (e.g., potential analysis) as well as with the recognition of soft skills by companies the scope for placements can be expanded for the employed as well as for

labour market entrants. With an ageing workforce job replacements due to poor health can increase in the future, which makes greater mobility within the sector necessary. Persons equipped with required skills and qualifications are available on a regular basis but do not apply for vacancies due to the lack of information on the labour market possibilities. Career guidance and personal development for mature lower-skilled workers could be supported by an assessment of those skills which have not been certified or documented so far. Systems for the recognition of prior learning (RPL) support the determination to what extent people possess necessary competences for a new job (Duarte 2004). The integration of RPL in career guidance and targeted training bridges the gap of hidden competences especially for mature workers. Some Member States included RPL in their system. In Portugal, for instance, a national system of Recognising, Validating and Certifying Prior Learning (RVCC) is implemented through a network of centres. Adults, whether employed or unemployed, are offered a three-tiered service, namely information, counselling and complementary training, including the accreditation of competencies (OECD/European Communities, 2004, p. 31). The centres are supported by the Ministry of Education and are run by training organisations or universities. The certification and validation of skills is conducted by a jury with an external evaluator. Companies, sector representatives and intermediate institutions such as the public employment service should develop and implement career paths which support the vertical job mobility of lower skilled workers within the sector.

3) Improving the image of the sector and career guidance for job entrants

In the United Kingdom and Germany as well as on an international level several initiatives exist to improve the visibility of the sector and to improve its image in schools. Some take a special focus to attract more women to the still male-dominated sector and occupations. In Austria and Germany the “Girls day” is an initiative where female pupils can inform themselves about technical occupations. It is supported by the major sector players of these countries and by the Ministries of Education.²⁶ Such approaches should be directed to attract more women to the technical occupations of the sector and thus help to diversify the labour force. The state-owned German ‘Deutsche Bahn’ is participating in this programme and is running a special website for pupils to inform them in an age-related manner about job opportunities at the company.²⁷ The French SNCF also has an extra website for pupils to inform them about job opportunities.²⁸ While the train sector on the continent has a quite good image, in the United Kingdom the poor image of rail transport leads to shortages in the quality and quantity of job entrants (Goskills, n.d.: pp. 6, 38, 57)

The International Maritime Organisation (IMO) has launched the campaign ‘Go to sea!’ together with the International Labour Organisation (ILO) and other partners to attract more workers to the sector and designed a website to inform about careers at sea.²⁹ However, this initiative needs support by national bodies to get linked to the pupils, job entrants, women as well as the unemployed (Adamson 2008). In Germany, the association of carrier built up a website to inform about the different occupations in the transport and logistics sectors. Compared to other sectors career guidance initiatives could be improved to react on the already existing labour shortages.

²⁶ <http://www.girls-day.de/>

²⁷ http://www.deutschebahn.com/site/schueler/de/berufsorientierung/girls__day/girls__day.html from December 2008

²⁸ http://www.sncf.com/en_EN/flash/#/CH0003/BR0052/ from December 2008

²⁹ <http://www.marisec.org/careers/intro.htm>

In most countries career guidance for pupils is undertaken by a number of different actors such as schools, training organisations, public employment services and related career information centres, trade unions, universities, sector organisations and companies. To enhance career guidance better and solid regional co-ordination between these actors could help to counsel and direct pupils and students into professions suitable for them. Career guidance can be supported by user friendly online-tools, also enabling self orientation. A good example constitutes the German website <http://www.think-ing.de/> (October 2008) which provides information about educational and training pathways of engineering professions in logistics, and the relevant occupations they lead to. In addition, other information about the sector is published online. The website is targeted at higher educated pupils and students rather than primary school attendants and published by the federation of German employers' association in the metal and electrical engineering industry. To redirect engineering students to the rail transport sector in Great Britain private companies have launched a partnership with universities to fight against the skill shortages the companies already face and to get job entrants with perfect skills for the rail transport sector.³⁰ In Germany, the 'Deutsche Bahn' has one major cooperation with a university.³¹

4) Enhanced flexibility and modularisation

Several implications arise due to the strengths and weaknesses of the different VET systems in place, with sector specific challenges on the one hand and the employer needs on the other. Firstly, enhanced flexibility in education and training of technical occupations is needed. Flexibility in this sense refers to the capability of the VET system to adapt effectively to new training needs in terms of quality and quantity. A flexible VET system is required in particular in circumstances in which profound changes take place and job functions and occupational profiles alter quickly. In order to achieve more flexibility and to respond in-time with altering training contents and enhanced quantity a modularisation of education and training is recommended. Even if problems occur in the modularisation of training in some IVET systems, modular systems facilitate the building up of competences and ease the interaction between IVET and CVET systems. Flexibility is also required for different forms of education and training. Enhanced flexibility and a modularisation of IVET is a big challenge for the state-controlled and the corporatist systems. Liberal systems will find their ways easier. However, the liberal market-driven systems with their strong focus on technical on-the-job skills lag behind in general education, which in turn becomes an obstacle to the up-skilling of the individual and a higher permeability of the education system. Besides, general and generic skills are not obsolete but become more important as a basis for the ability to react on new training demands emerging from new technologies and changing production processes.

More important and sometimes presenting a deadlock is the consequence for Life Long Learning of the individual following from different VET systems. The corporatist and school-based VET system guarantees a more universal initial vocational training and in the case of combined apprenticeships also a practical training on the job (dual system). However, continuing training is disregarded. The qualification level once acquired leads to reposing on the achieved and Life Long Learning is not given a key focus. VET structures are not capable of adapting quickly to the new skill needs. Thus, a solid cooperation between VET suppliers and companies is required to better match the skills needed by the industry and the supply throughout the working life cycle.

³⁰ <http://www.networkrail.co.uk/aspx/1088.aspx>

³¹ http://www.deutschebahn.com/site/schueler/de/duales__studium/duales__studium.html

In the growth scenarios a broader set of skills in all occupational functions and the ability to choose between the right ones by the individual worker is expected. While a stronger need for soft skills is identified, the scope for initial vocational training (and continuing vocational training) becomes smaller due to stronger competition in transport. Additionally, the possibilities of companies new on the market in rail transport to release employees for training are naturally low. For this reason, in some countries, a new balance between on the job training and theoretical block training would be a good solution to provide for adequate training while reducing the need for absence from work. New forms of e-learning respectively blended learning can be implemented as a substitute (for more details see below).

5) Improve diversity within the sector

To attract more women to the sector has its limits at the moment due to the main features of work organisation. Any approach to open up the sector employment to women will therefore require a major change in work organisation and conditions. Such a project will have to pay special attention to the prevailing social situations relevant for women on the labour market, especially the difficulties in combining family life with a professional career. This will help to overcome shortages in some occupational functions and on the other hand contribute to higher diversity on the labour market as such.

An improvement of work organisation will also be necessary to keep older workers in employment. On the one hand this is especially crucial to keep the knowledge and the experience of older workers available and to avoid skill gaps – especially for higher qualifications. On the other hand it will be necessary to accompany the employment of an aging workforce (which is a key factor of this sector) with more constant learning offers to avoid a down-skilling given the constant change in technology. Corresponding part time retirement schemes should be developed by the responsible authorities and applied by the companies.

6) Interdisciplinary forecast studies and cooperation for sector specific training measures

In order to keep pace with technological and subsequent organisational developments knowledge about future skill demands (short and long-term) of the sector is required on a continuous basis. The demand for building up cooperation between companies, social partners, training providers and research institutions is obvious. This applies in particular to skills needed for enhancing inter-modal transport and to better integrate inland waterway transport into to transport chain. Also with regard to ecology inland waterway transport is the most environmentally acceptable transport form of today. But it seems that its full potential in the inter-modal transport chain is not developed yet. More research about the further development of inland waterway transport should be supported taking account of all its aspects –and especially its consequences for the skill needs of the employees.

Interactions between all actors involved should take place on a regular basis and should be implemented in a dynamic way. Such co-operations should help to gain knowledge about future skill needs and implement adequate training models.

Annex I. Contributors to this study

This report appears in a series of 11 sector reports on the future jobs and skills commissioned by the European Commission and executed by a core consortium of TNO (Delft/Leiden, the Netherlands), SEOR Erasmus University (Rotterdam, the Netherlands) and ZSI - Zentrum für Soziale Innovation (Vienna, Austria). The consortium was led by Dr F.A. van der Zee (TNO Innovation Policy group; TNO Innovation & Environment). The report on the transport and logistics sector was prepared by the core TNO-SEOR-ZSI consortium.

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Annex III. Strategic options – a detailed description

A. Recruiting workers from other sectors

A possible solution to meet skill needs is to recruit workers from other sectors, which have and can provide the skills and knowledge needs of the sector and more specifically the firm. Whether or not this is a desirable option depends, amongst others, on the job function under consideration. For managers of large corporations it is quite usual to bring their general know-how to bear in different sectors. Also for business professionals (e.g. financial analysts, software engineers) sector specificities are of lesser importance. Sector mobility of low skilled workers is much more limited than the mobility of higher educated employees. The lesser the grade of sector specialisation of the occupational profile, the easier employees are able to change between sectors. In other cases recruiting workers from other sectors will need training of sector specific skills. In some cases it will also be possible for highly specialised workers to change sectors.

B. Recruiting workers from other Member States

Recruiting workers from other Member States could be in some cases a possibility to overcome skills problems. However, owing to language, cultural and other problems, including certain entrance barriers left to the Member States, mobility within the European Union is still underdeveloped. Border regions are attracting workers from other countries mainly because of wage advantages and in this way can succeed in solving their skills shortages and gaps. However, regions that face such outward migration (e.g. Poland, East Germany, Parts of Austria, Hungary, Czech Republic, Slovenia, Bulgaria) at the same time face serious problems in meeting their labour market demands. Some have responded by recruiting workers from non-Member States. Even if this might appear a temporary problem, from a longer term perspective, such developments could have serious consequences for the growth of the regional economy – in what might be termed a ‘skills drain’ (cf. ‘brain drain’’).

C. Recruiting workers from non-Member States

Recruiting workers from non-Member States is not a zero-sum game for the European economy. Yet this strategic choice is as limited in its overall impact as the strategic choice that proposes to recruit workers from other Member States. On top of this, such recruitment is much more difficult than recruitment from within the EU. In all Member States significant barriers for entering the labour market for workers from outside the EU exist, even for temporary workers. To increase the influx of these workers by, e.g. increasing the immigration quota several political hurdles have to be mastered. Action can be taken here at Member State as well as at EU level, the recent ‘blue card’ proposal and negotiations serving as an example.

D. Recruiting unemployed workers with or without training

Recruiting unemployed workers without training is a strategic option, especially in case of skill shortages if there are not enough skilled workers to meet the employers demand). This option should in these cases be combined with adequate training. Unemployed workers might have various placement handicaps, especially skills deficits and poor levels of basic qualifications. Low educated groups are still representing the majority of the unemployed labour force, but also highly skilled workers like engineers could be threatened by unemployment.

E. Recruiting young people coming from the education system, with or without re-training

This strategic choice is always a possibility to overcome skill shortages as well as skill gaps. But demographic change should be taken into account too. While in the next few years, until around 2015, there will be a continuous inflow of students entering the labour market, a significant reduction is expected in 2020. In some EU regions there is already a need for young qualified and skilled workers and apprentices. Even where sectors may pay relatively high wages and offer stable career prospects, it is not easy to attract enough labour in critical occupational functions. While in the last years labour in business and finance professionals as well as administrative staff and customer services could be attracted the situation in technical occupations (engineers/technicians, construction workers, plant operators) is still critical. Hence, the recruiting of young people can only be successful, if this measure is supported with the other strategic options such as “Improving the image of the sector” and “Stronger cooperation within the industry”. To be more precise, a stronger cooperation between schools, university, training organisations, career managers on the one hand and the industry on the other is needed. The principal aim should be to overcome the mismatch of requirements and wishes of individuals on the one hand and the economy on the other.

F. Training employed workers

In some cases training and re-training could also constitute a strategic choice to meet skill demands. In this case, the employee will be trained for a new working place or task. In general, re-training ends with a formal graduation or certificate. Re-training is an option if the work place or the occupational function is not needed any more. But re-training is only one option. Further education or further training, refresher training and updating courses, or advanced vocational qualification to adapt the workforce to emergent skills needs are also options, which should be taken into account. Re-training or further training of employees can encompass all levels of skills. Training and qualification could be done in-house and on the job as well as by an external education institution. It is more likely that less fundamental variations of up-skilling or re-training will be a strategic choice because re-training has to be regarded as a long term and quite expensive measure compared to the other vocational education forms.

G. Changing the work organisation

Work organisation can be defined in different ways. First, it can be defined as a system of work organisation (e.g. Taylorism, Fordism and Post-Fordism) and second, as a form of division of labour and specialisation. In modern economies productivity is based on the division of labour which by definition implies also a division of skills. There are several instruments of work organisation to react on skill shortages and gaps. Thus, changes in the work organisation can help to overcome skill gaps. In general, work can be reorganised in the following possible ways:

- Group work: A group is a limited number of people who work together over a longer period with a frequent, direct interaction. A group is defined through the differentiation of roles and joint values. Groups are able to produce better results than single persons due to the combination of different competencies and experiences, the reduction of wrong decisions, stronger work motivation, the direct use of information, new insights and creativity and a better acceptance of decisions, just to mention a few of the many advantages. There are several kinds of group work, like project groups, quality groups and learning circles, as well as committees.

- Job rotation: Within this type of work organisation several people change their work places in a planned alteration. Job rotation enhances the overview of the different production processes, the understanding of different tasks and the feeling for group work. Additionally, monotony and dissatisfaction are reduced.
- Job enlargement: Extension of the scope of work through the combination of several structurally equal or similar tasks. It can produce similar effects as job rotation.
- Job enrichment: Extension of the scope of work through the combination of several structurally different tasks. The scope of decision making and self-control increases, as well as the quality and quantity of work. In general, up skilling of the employee is necessary, but this is also implemented on the job.

Under the influence of new technologies, like information and communication technologies, virtual forms of work organisation, which substitute hierarchies through a horizontal network co-ordination, are also possible. In this sense, mergers and acquisitions as well as project based business collaboration are also available options to change the work organisation. Both measures are strategic possibilities to get access to needed resources or to incorporate new skills. Modern (communication) technology can support the co-ordination and co-operation of labourers working at different places and in combining their respective strengths.

H. Outsourcing and offshoring

In public discussion the terms outsourcing and offshoring are mainly used together, yet it must be emphasised that they describe different technical approaches. While outsourcing means the transfer of management or day-to-day execution of business functions or processes (production, manufacturing, services) to an external service provider, offshoring describes the relocation of business functions or processes from one country to another. Both could be applied as a strategic choice on company level to meet skill needs, by integrating the knowledge, experience and competences of the other firm in the production process.

Outsourcing of personnel as a result of technological change and economic pressure was and still is an ongoing trend. Due to de-regulation and privatisation several tasks and with it skills and competences in the sector were outsourced and in some countries dislocated to other countries to increase labour productivity. Several occupational functions in the production chain have been outsourced nowadays. Skill gaps can be closed by hiring subcontractors with the needed knowledge and competences. If one considers this strategic option to meet skill needs, it has to be taken into account that for subcontracting firms, freelance or contractual workers continuing vocational training often plays a marginal role, because employees are all too often indispensable. One should also bear in mind that freelancers are not available at any time and in unlimited numbers. Outsourcing and offshoring is therefore a limited strategic option to overcome skill gaps. It seems to be more adequate to overcome skill shortages.

I. Changing vocational education

Changing vocational education has a long-term effect. It must be taken into account that changes will have a substantial impact in quality and quantity starting at the earliest within three years time after the changes. The process of changing initial vocational education in content or in structure takes itself several years. The process from defining the needs and problems to the implementation of a new curriculum involves several stakeholders from different expert levels like companies, social partner organisations, training institutes as well as representatives of national and regional education

administration. These bargaining processes could take several years and are dependent of the VET-system of the European Member State. Hence, this strategic choice will only be drawn if major structural changes are expected.

Despite these facts, possible changes can be seen in a stronger modularisation of curricula of initial vocational training as well as in building up or strengthening interplant and interregional training infrastructure. The first option could in the long run help to overcome identified skill needs in a sound, flexible and a relatively quick way. The second option is amongst others a possibility to provide the latest high-value equipment for training quickly by sharing resources of several partners.

J. Designing and offering new courses (continuing vocational education and training)

Once it is clear that the current content of vocational training is not up to date and therefore does not address the demands, the development of new courses for continuing vocational education and training could be a strategic option with a short term impact (see also *M. Stronger cooperation between stakeholders*).

K. Providing information about jobs and (emerging) skills

There is still a lack of transparency concerning current and emerging skill needs and job opportunities in different economic sectors. Information systems on regional, sectoral, national or European level could help to minimise information asymmetries and in that way overcome skill gaps resulting from information deficits. As a consequence, it could prove highly effective in helping students to enter the labour market and find a suitable occupation, just as much as in assisting employees to find new job opportunities based on existing skills or guide them in finding the suitable vocational training course.

Career guidance impacts rather short term. Therefore, it can help to overcome the mismatch between the needs and interest of the individual and those of the prevailing economy. The basic assumption of this strategic choice is that there already exist people who are equipped with the required skills and qualifications, but, due to a lack of information about the labour market possibilities, do not apply for these jobs. Career guidance for students and employees can help to overcome this mismatch. In this respect there can be a clear connection to training. Systems for recognition of prior learning (RPL) can help to determine to what extent people possess necessary competences for a new job. Targeted training can bridge the gap for the failing competences.

L. Improving the image of the sector

Improving the image of the sector could be an easy and suitable measure especially to overcome skill and labour market shortages and attract new employees. Several instruments could be implemented by sector organisations in co-operation with different non sector actors like schools, career management organisations, training organisation, public employment services, and public administration. Instruments could be company visits for pupils, offering internships for pupils and enhanced public relation. Especially in sectors where framework conditions and occupational functions changed fundamentally, due to technological or organisational restructuring or low wage levels, this offers a possibility to overcome stereotypes as much as old fashioned views and to attract more labour. Moreover, this measure does not only provide a chance to overcome stereotypes in relation to the sector but also to some occupational functions. The effect of this strategic option is long-term. In consideration of the apprenticeship system, which can take up five to seven years (if the specialisation of high qualified jobs in the sector is taken into account) until the volume effect is reached, one must arrive at the conclusion that in some occupational functions it has to be initiated right now.

M. Stronger cooperation with the industry

A stronger co-operation between industry and training institutes on a regular basis is one possibility to meet the skill needs in the sector. In some sectors and countries training of employees does not seem to be in line with the industry's emerging needs. New training and teaching solutions are to be developed between the industry, sector representatives, education institutions and research centres, public bodies, etc. Information exchange and a stable cooperation between the relevant stakeholders could improve the matching of training needs and demands. In the long run it will enhance the efficiency of training output, strengthen the quality of training and maximize the individual potential. To build up this kind of cooperation takes time, but in the long run it might well be capable to provide accurate solutions for problems. Networks and partnerships between these stakeholders to forecast skill needs in the sectors also present a long term measure. They could help to define emergent skill needs. While knowledge about the development of skill supply is quite high, the knowledge about the development of skill demand in different sectors is still improvable. These kinds of networks can cooperatively detect the need for action and contribute to the development of recommendation of actions.

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Glossary

Apprenticeship. Systematic, long-term training alternating periods at the workplace and in an educational institution or training centre. The apprentice is contractually linked to the employer and receives remuneration (wage or allowance). The employer assumes responsibility for providing the trainee with training leading to a specific occupation. (Cedefop, 2004)

Competence. Competence refers to the proven ability to use knowledge, skills and personal, social and/ or methodological abilities, in work or study situations and in professional and personal development. In the context of the European Qualifications Framework, competence is described in terms of responsibility and autonomy;

Compulsory education. The minimal legal standards and duration of obligatory schooling. (ILO, 1998)

Concentration index. The concentration index assesses the relative contribution of a specific sector to the national economy compared to a greater entity, such as the EU, thereby correcting for the size of the country. In more general terms, the concentration index is a measure of comparative advantage, with changes over time revealing changes in the production structure of a country. An increase of the concentration index for a sector signifies relatively fast growth of that particular sector in the country concerned compared to the same sector in the EU. How does the concentration index work in practice? A few (hypothetical) examples: if sector x represents a 5% share of the German economy and a 5% share of the EU economy, the concentration index of sector x equals a 100. If sector x represents 5% of the German economy, but 10% of the EU economy, the concentration index of sector x is 50. If the same sector x represents 10% of the German economy and 5% of the EU economy, the concentration index of sector x is 200.

The concentration index concept can be applied using different indicators (variables). In our study we measure the concentration index using employment, value added and trade, in order to make a distinction between the relative performance of countries EU-wide. We distinguish between four country groupings, each signifying a different sector performance over time. If a sector in a country has a strong position (hence showing a concentration index higher than 100) and has experienced a clear index growth over the last years, the sector is defined as winning in that country. If the sector has a strong position, but experienced a decline of the concentration index, we say the sector is losing momentum. If the sector has a weak position, but gained in the past, we say that the sector in that country is upcoming. If the sector has a weak position and experienced a decline of the index, we say that the sector is retreating.

Employability. The degree of adaptability an individual demonstrates in finding and keeping a job, and updating occupational competences. (Cedefop, 2000)

European Credit system for Vocational Education and Training (ECVET). A device in which qualifications are expressed in units of learning outcomes to which credit points are attached, and which is combined with a procedure for validating learning outcomes. The aim of this system is to promote:

- mobility of people undertaking training;

- accumulation, transfer and validation and recognition of learning outcomes (either formal, non-formal or informal) acquired in different countries;
- implementation of lifelong learning;
- transparency of qualifications;
- mutual trust and cooperation between vocational training and education providers in Europe. (Cedefop)

European Qualification Framework for life-long learning (EQF). A reference tool for the description and comparison of qualification levels in qualifications systems developed at national, international or sectoral level. (Cedefop)

Full-time Employment. Traditionally means a 'regular job'. Work that is about eight hours a day, five days a week and forty-eight weeks of the year with four weeks paid leave.

Informal learning. Learning resulting from daily activities related to work, family or leisure. It is not organised or structured in terms of objectives, time or learning support. Informal learning is in most cases unintentional from the learner's perspective. (Cedefop, 2008)

Interdisciplinary (multidisciplinary). Interdisciplinary refers to research or study that integrates concepts from different disciplines resulting in a synthesised or co-ordinated coherent whole. New disciplines have arisen as a result of such syntheses. For instance, quantum information processing amalgamates elements of quantum physics and computer science. Bioinformatics combines molecular biology with computer science. An interdisciplinary team is a team of people with training in different fields. Interdisciplinary teams are common in complex environments such as health care.

Job mobility. Any change of job, regardless of where the new job is located.

Knowledge. Knowledge refers to the outcome of the accumulation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the European Qualifications Framework, knowledge is described as theoretical and/or factual.

Knowledge society. A society whose processes and practices are based on the production, distribution and use of knowledge. (Cedefop, 2008)

Learning outcomes. Learning outcomes refer to statements of what a learner knows, understands and is able to do on completion of a learning process, which are defined in terms of knowledge, skills and competence.

Lifelong learning. All learning activity undertaken throughout life, with the aim of improving knowledge, skills/competences and/or qualifications for personal, social and/or professional reasons. (Cedefop, 2008)

Low, medium, high educated. See also under qualifications. The Labour Force Survey (LFS) collects data for a number of characteristics of employees, one being the level of education of an employee. The LFS is based on the ISCED 1997 classification (International Standard Classification of Education).

- Low-educated encloses all levels up to the compulsory education (ISCED 1+2). ISCED 1: primary education or first stage of basic education. ISCED 2: lower secondary education or second stage of basic education.
- Medium-educated comprises all the post compulsory education not tertiary (ISCED 3+4). ISCED 3: (upper) secondary education. ISCED 4: post-secondary non tertiary education
- High-educated comprises all tertiary education including university education (ISCED 5+6). ISCED 5: first stage of tertiary education). ISCED 6: second stage of tertiary education (leading to an advanced research qualification).

Low, medium, high skilled. In general this classification refers to the skills required for a specific occupation that an employee currently holds. In existing taxonomies skills levels are usually proxied by educational attainment (see low, medium, high educated).

Mobility, see job mobility.

Multi-skilling. Multi-skilling refers to training an employee to cover a range of different jobs in one workplace. A multiskilled worker is an individual who possesses or acquires a range of skills and knowledge and applies them to work tasks that may fall outside the traditional boundaries of his or her original training. This does not necessarily mean that a worker obtains or possesses high-level skills in multiple technology areas. However, the worker can be an effective and productive contributor to the work output of several traditional training disciplines.

Multi-tasking. The ability of a person to perform more than one task at the same time.

Profession. An occupation which requires knowledge gained through academic study, such as law, medicine or teaching.

Qualification. Qualification refers to a formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards.

Qualifications, Comparability of -. The extent to which it is possible to establish equivalence between the level and content of qualifications (certificates, diplomas or titles) at sectoral, regional, national or international levels. (Cedefop, 2000)

Qualification, level of -. Low: at most lower secondary (ISCED 0-2); medium: upper secondary (ISCED 3-4); high: Tertiary (ISCED 5-6).

Qualification framework. An instrument for the development and classification of qualifications (e.g. at national or sectoral level) according to a set of criteria (e.g. using descriptors) applicable to specified levels of learning outcomes. (OECD, 2007)

Retraining. Training enabling individuals to acquire new skills giving access either to a new occupation or to new professional activities. (Cedefop, 2004)

Revealed Comparative Advantage (RCA). Relative comparative advantage compares the relative contribution of sector x to the comparative advantage of the national economy with other sectors. It is calculated as follows:

$$RCA = \tanh (\ln ((Exports S / Imports S) / (Exports C / Imports C))) \times 100$$

Interpretation: 0 = the comparative advantage of sector x equals the average of the comparative advantage of the entire national economy. Near -100: the sector contributes nothing to the comparative advantage of that country. Near + 100: the sector contributes strongly to the comparative advantage of the country.

The use and logic of the country groupings winning, losing momentum, upcoming and retreating in combination with revealed comparative advantage is similar to the concentration index (see above).

Skills. Skills refer to the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the European Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).

Skills gaps. Skills gaps arise where an employee does not fully meet the skills requirements for a specific job function but is nevertheless hired. This skills gap needs to be closed through training. Skills gaps can arise where new entrants to the labour market are hired and although apparently trained and qualified for occupations still lack some of the skills required.

Skills needs, emergent -. Emergent skills needs are defined in this study as the change in skills that is needed to adequately fulfil a certain job function in the future. Addressing emergent skills is needed in order to avoid skills shortages and/or skills gaps in the future.

Skills shortages. Skills shortages exist where there is a genuine lack of adequately skilled individuals available in the accessible labour market. A skill shortage arises when an employer has a vacancy that is hard-to-fill because applicants lack the necessary skills, qualifications or experience.

Tertiary education. Tertiary education refers, in most settings to non-compulsory education provided via a specialist institution once secondary schooling is completed, usually labelled as a college, polytechnic or university (in English) with variants of these in other languages. Tertiary education may be delivered virtually or at a distance.

Trade balance. Exports minus imports.

Training. The development of skills or knowledge through instruction or practice; a kind of vocational learning such as an apprenticeship or traineeship which includes both formal education and on-the-job experience.

Unskilled work. Work which lacks specialist training or ability and generally involves simple manual operations which can be learned in a short time.

Up-skilling. Short-term targeted training typically provided following initial education or training, and aimed at supplementing, improving or updating knowledge, skills and/or competences acquired during previous training. (Cedefop, 2004)

Vocational Education and Training (VET). Education and training which aims to equip people with skills and competences that can be used on the labour market. (adapted from ETF, 1997).

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The seven-year Programme targets all stakeholders who can help shape the development of appropriate and effective employment and social legislation and policies, across the EU-27, EFTA-EEA and EU candidate and pre-candidate countries.

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