Transport and logistics

Comprehensive sectoral analysis of emerging competences and economic activities in the European Union

European Commission

Submitted to the European Commission, DG Employment, Social Affairs and Equal Opportunities

Executed by:
TNO Netherlands Organisation for Applied Scientific Research
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DG EMPL project VC/2007/0866
Transport and logistics

This report is published as part of a series of forward-looking sector studies on New Skills and New Jobs in the frame of the project Comprehensive Sectoral Analysis of Emerging Competences and Economic Activities in the European Union.

This publication is commissioned under the European Community Programme for Employment and Social Solidarity - PROGRESS (2007-2013).

This programme is managed by the Directorate-General for Employment, social affairs and equal opportunities of the European Commission. It was established to financially support the implementation of the objectives of the European Union in the employment and social affairs area, as set out in the Social Agenda, and thereby contribute to the achievement of the Lisbon Strategy goals in these fields.

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Executive Summary

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European Commission

Directorate-General for Employment, Social Affairs and Equal Opportunities
Unit F3

Manuscript completed in 2009

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Preface

Education and training, in the context of a life-long learning perspective, are an indispensable means for promoting adaptability and employability, active citizenship, personal and professional fulfilment.

Investment in human capital through better education, and the development of skills and competences should be increased. It is important to anticipate skills needs — and also skills gaps — which are emerging in the European labour market, as well as to improve the matching of knowledge, skills and competences with the needs of society and the economy, as a means to increased competitiveness and growth, as well as to greater social cohesion, in Europe.

This is more important than ever in the current situation of crisis that will undoubtedly lead to substantial changes in economic activities in Europe coming years.

With this in mind, the Commission has elaborated a set of analysis of emerging competences in 18 sectors. Those analysis are available to all economic, social and professional organisations, educations and training institutions, etc. They can help them to refine their strategies and to engage into forward-looking actions.

Robert Verrue

Director-General, Employment,
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Aims and methodology

The renewed Lisbon strategy and European Employment strategy stress the need for Europe to place more emphasis on a better anticipation of skill needs together with the need to reduce labour markets mismatches. These policies aims also at minimising social costs and facilitating adaptation during restructuring processes through a better anticipation and positive management of change. Globalisation, technological change, climate change and demographic developments (including ageing and migration) in that respect pose huge challenges, comprising both risks and opportunities. In that context, the Commission has launched recently the New Skills for New Jobs initiative together with other related European projects aimed at identifying future job and skills needs using quantitative modelling approaches. While having advantages of robustness, stakeholders as well as the European Commission identified a clear need for complementary more qualitative forward-looking analysis. Consequently, the European Commission commissioned in 2007 a series of 18 future-oriented sector studies (horizon 2020) on skills and jobs following a uniform, qualitative methodology. Results of these studies have become available in summer 2009, and will be followed by a number of other initiatives over the oncoming year and beyond. The current economic crisis calls for the reinforcement of policies aimed at developing the employability of the workforce. This project fits within this policy objective.

18 sector studies, one methodology

The results of this study aim to serve as a guide in launching further EU and other actions to promote the strategic management of human resources and to foster stronger synergies between innovation, skills and jobs, taking into account the global context and encouraging adaptations to national and regional level.

To validate, add and complement the findings of the project and to make sure that results are disseminated as broadly as possible across Europe, relevant stakeholders including European social partners, other services from the Commission with the expertise in the sectors analysed, representatives from the European Parliament, the European Economic and Social Committee, the Committee of the Regions, Eurofound and Cedefop were involved in the project from the beginning.

Sectors Covered
Automotive industry
Defence
Textiles, wearing apparel and leather products
Printing and publishing
Chemicals, pharmaceuticals, rubber and plastic products
Non-metallic materials (glass, cement, ceramic…)
Electromechanical engineering
Computer, electronic and optical products
Building of ships and boats
Furniture and others
Electricity, gas, water & waste
Distribution, trade
Hotels, restaurants, catering and related services
Transport
Post and telecommunications
Financial services (bank, insurance and others)
Health and social work
Other services, maintenance and cleaning

A standard predefined methodology was developed by a panel of experts under the direction of Prof Maria João Rodrigues and applied to all 18 studies to ensure consistency and comparability of the results, the studies being produced by different contractors.

Based on the basic methodological framework, each contractor executed 7 defined steps, starting with the mapping of main trends, key drivers of change, leading to scenarios of plausible evolution and their implication for employment at the year 2020 time horizon, the identification of implications for emerging competences and occupation profiles in terms of jobs expanding, transforming or declining, and their implications in terms of strategic choices and subsequent recommendations for companies, education and training systems, social partners and public authorities at all levels. This foresight methodology implies an approach combining desk research and expert knowledge.

At the end of each sector study a final European workshop for the sector was organised by the Commission to validate results as well as refine recommendations. In

addition to European Commission and Eurofound staff, about 20 experts per workshop from industry, academia and sector organisations including workers and employers' representatives with a sound knowledge of jobs and skills were invited to comment and provide recommendations to the report as part of the methodology.

Brief description of the methodological steps

Mapping

The main purpose of this analysis was to provide factual background to identify key drivers used in the subsequent scenario development. Consequently, the Report analysed recent 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. It was based on an analysis of available time series data and relevant existing studies. It analysed 1) structural characteristics (production, value added, employment in various dimensions, and related factors); 2) the value chain; 3) technological change and innovation; 4) trade and international competition as well as 5) regulation. The results of all sections were summarised in a SWOT analysis and were used as input to identify key drivers.

Drivers of change

On the basis of the mapping of the sector, a set of key drivers, sector specific or not, was identified. Literature review and expert knowledge of the sector were then used to define a conclusive list of sector-specific drivers. Drivers were classified as exogenous or endogenous depending on the ability for the sector's stakeholders and policymakers to influence them. These lists of drivers were also discussed in the experts' panel workshops.

Qualitative scenarios and implications for employment trends

The set of selected sectoral drivers of change served as an input to develop scenarios for the evolution of the sector and implications for different occupations (composition of employment / emerging competences) in the period 2008 to 2020.

Implications of scenarios and emerging competences

Scenarios were built to assess the implications for the level (absolute

demand) and composition (relative demand compared to other job functions) of employment of different job functions by 2020. New and emergent skills required by different job functions were identified based on the analysis of the evolution of past data on employment by occupation, on the analysis from the present situation and of experts' comments during the workshop. The focus was on identifying and describing key and critical competences for the future for each of the major occupational function in relation to the different scenarios elaborated. These formed the basis for the strategic choices identified in a next step.

Strategic choices for companies to meet emergent competence needs

Each sector study assessed possible strategic choices in terms of feasibility and actor involvement. The options comprised recruiting workers from other sectors, countries, recruiting graduates, re-training employed workers as well as changing work organisation.

Specific implications for education and training

Options to improve or to adapt education and training systems were looked at in this step of the methodology, focussing more particularly on the specific role to be played by sectoral organisations, educational institutions and governments such as a stronger cooperation between stakeholders or an increased flexibility through modularisation of education and training.

Recommendations

Each sector study contains specific recommendations to the sector. However, with the studies analysing Europe as a whole, the recommendations remain general and need a follow-up at the national and regional level. The intention of the project especially in the follow up phase is to use the results to stimulate stakeholders at lower territorial levels (national / regional) to work out results in more details, repeat and adapt this exercise to local needs rather than providing standardised solutions. Some general recommendations call for an intensified co-operation between relevant stakeholders, the need to invest strongly in human capital, more standardised regulations, enhanced VET to increase social mobility and coordinated National and European Vocational Qualifications.

The transport and logistics sector – main characterisation

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 and for enabling the mobility of goods and persons. Without transport and logistics equipment and services neither raw materials nor products nor employees could get to the places where they are needed and industrial production, trade and globalisation would come to a standstill. On the other hand, the transport and logistics sector is also heavily dependent on the general economic climate and living standard of people. The financial crisis that began to show its global effects in 2008 had considerable negative impact on cargo transport, especially the shipping industry.

Distinction between different transport modes

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, for practical reasons referred to "inland waterway transport")

- 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. The difference between buses, taxis on the one

hand and trucks carrying freight on the other is quite obvious and requires much different skills and technologies. Freight road transport is also the sector within transport where the most SMEs are present. Many road transport firms are even one-truck micro-enterprises with less than 9 employees.

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. Whereas trams are much closer to road transport and have are also subject to road traffic rules, modern high speed trains are more similar to airplanes in regard to safety and control features.

In sea transport the main distinction has to be made between international operation on high sea or inland waterway transport on rivers, canals and lakes which is mostly short distance or domestic, whereas cruising ships may even for a separate category because of their distinctive features.

Intermodality

Intermodality and co-modality are important issues that should get more attention in regard to efficiency and environmental sustainability. These concepts focus on making 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 autonomous with humans mainly serving in planning, controlling and programming.

Technology

The transport and logistics sector is getting increasingly impacted by new technologies and technological changes. 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.

Main economic and employment trends

Economic figures

In 2006 the transport sector of the EU generated a total turnover of € 1,210 billion. Of this 30% has been produced by road transport (passengers and freight), which is more than air, rail and water transport together.

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 has been 3.2% over the period 1995-2006.

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

Employment

In general, 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 people employed in the transport sector.

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.

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
EU27	9,611,816	2.0 %	100 %	0 %
EU15	7,589,260	2.5 %	79 %	2 %
NMS	2,022,556	0.2 %	21 %	-2 %

Source: Eurostat/TNO data

Looking at employment figures by transport mode, by far the most people are employed in the road sector, especially in the freight category. Sea transport and inland water transport has the lowest number of workers. There are three times as many people working in freight and passenger road transport than in railways, water and air together.

Employment in the transport sector in the EU in 2004-2006

	Road (freight)	Road (passengers)	Railways	Inland water transport	Sea Transport	Air Transport	Others[2]
EU-27	2832404	1840000	900000	43492	171440	407062	2689612
EU-15	2217748	1414686	528258	35199	154429	377189	2318090
NMS	614656	425314	371742	8293	17011	29873	371522

Source: EC: EU energy and transport in figures 2009
[2] Others include: pipelines, travel and tour agencies and other auxiliary transport activities

The workforce in transport and logistics is male and old. In 2005 only 21.1% of the people working in transport were women. Only 17.5% of the workforce is in the age group 15 to 29.

Employment trends by job function

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%. 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 could also be attributed to the possibilities that some of these functions are listed under other NACE codes.

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

	EU 27	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

In most occupations, the changes in employment over the time period from 2000 to 2006 have not been substantial, except for drivers and mobile plant workers in the NMS. The situation within the EU-15 remained basically stable.

Qualification level of employees

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%. 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. Only 14% of all employees in the transport and logistics sector of the total EU have a higher qualification: most of them (45% for EU-15 and 61% for the NMS) working as ship/aircraft controllers or technicians. If looking at the changes from 2000 to 2006 it can be seen that the qualification requirements are getting higher throughout the sector. The share of people with low qualification has declined in every occupation.

Share of employment by qualification (all occupations, transport sector)

	EU 27	EU 6	EU 9	EU 15	NMS
Low qualification	28	32	36	33	7
Medium qualification	58	55	47	52	81
High qualification	14	13	17	15	12

SWOT analysis

The SWOT analysis provides an overview of perceived Strengths, Weaknesses, Opportunities and Threats of the sector. Because of the important differences between transport modes, the SWOT analysis has been performed for each transport sector individually. In the following an example for the road transport sector is provided. For the other analysis tables, please refer to the main document.

Example: SWOT Road transport sector

Strengths	**Weaknesses**
• 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)	• 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**
• 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.	• Rising oil prices: the cost of road haulage will increase in comparison with other transport modes. • Cost of CO_2 policies: possible introduction of CO_2 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 • Citizen's perception of "dirty road" transport

Main drivers of change

The most relevant drivers of change refer to demographic factors (ageing, declining population, social diversity), income situation, increasing global competition and market segmentation, global and regional production networks, labour and environmental regulations new services and technological innovation. A further description can be found in the main report.

Main drivers of change for the Transport and Logistics Sector

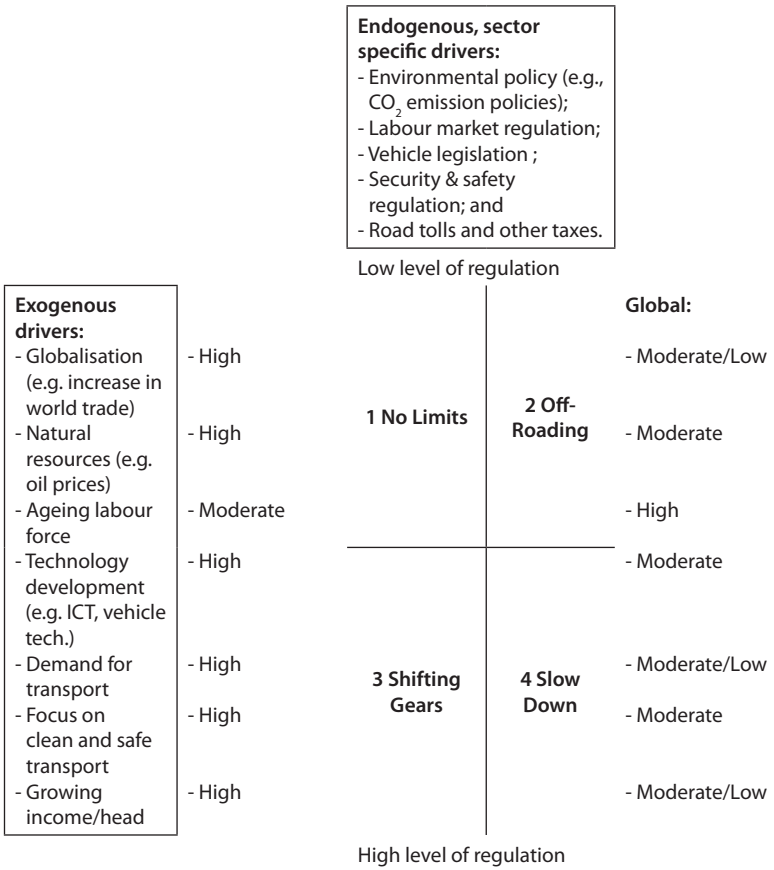
Category	Driver	Is this driver relevant for the sector? Y / N	How relevant is this driver for the sector? Scale 0-10	How uncertain is this driver for the sector? Scale 0-10	Are substantial impacts expected on the volume of employment? Y/N	Are substantial impact expected on employment composition? Y/N	Are substantial impacts expected on new skills? Y/N	Short, medium or long run impact?[3] S	M	L	Are substantial differences expected countries? Y / N[4]	Are substantial differences expected between sub-sectors? 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
Technology, R&D and product and process innovation	Advances in IT impacting on organizational structures & new business models	Y	7	3	Y	N	N	N	Y	Y	Y	Y
	New/additional value-added services	Y	8	5	Y	N	Y	X	X		Y	Y
Natural resources	Availability (and price developments) of oil and energy	Y	9	7	N	N	Y	X	X	X	N	Y
	Labour market regulation	Y	8	4	Y	Y	N		X	X	Y/N	Y

[3] Short = 0-3 years; medium = 3-7 years; long = > 7 years. All three categories may apply
[4] If necessary include footnote in cell with more precise info what differences are.

Scenarios and implications for employment

Four future scenarios have been constructed and explored: 1) *No Limits*, 2) *Off-Roading* 3) *Shifting Gears* and 4) *Slow Down* (see figure below). The scenarios depict plausible and credible futures for the utilities sector in Europe by 2020. Rather than wishful pictures of the future, scenarios are founded on drivers and trends observed and are derived in a logical and deductive way, hence making inferences about plausible future developments.

Four scenarios for the European transport sector



Source: TNO-SEOR-ZSI

The scenarios apply to the four sectors. This does neither imply that future developments in the road, rail, water or air transport sectors are to be taken as one and the same, nor that development paths between Member States need to be similar. The sectors will face different dynamics in terms of market structure and developments, while driven by similar but differently impacting drivers. The way the scenarios have been constructed enables such differentiation. Note that the demographics – ageing (less young, more retirees) – and its effects on labour supply have not explicitly been identified in selecting the drivers, as demographics in the time frame of 2009-2020 are relatively certain (i.e. predictable) and play a role across all scenarios. Education and training, which stricto sensu could be perceived as endogenous factors, have been excluded. They are together with a number of other strategies and/or policies discussed as solutions in response to the scenario outcomes.

Scenario I: *No Limits*

This scenario is a combination of a world economy that recovers fast from the current crisis and continues to grow (e.g. with a steady growth of trade with China and India). governmental regulations are less strict, pose little restrictions on the transport sector and allow for much flexibility. Although oil prices are rather high, the overall demand for transport is growing.

Scenario II: *Off-Roading*

This scenario is like steering through difficult terrain with high effort. It takes place in a setting with a stagnant or only slowly growing world economy, low income growth, rather high unemployment, relatively low oil and energy prices, but also low levels of regulation. The generally unfavourable economic situation also has a negative effect on the demand for transport.

Scenario III: *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, resumes 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 regulations and legislations for the transport sector.

Especially environmental issues and safety are the focus of attention and lead to a "green growth" strategy. Also much effort is being put into intermodality.

Scenario IV: *Slow Down*

This scenario depicts limitations and slow downs on many dimensions. The world economy is stagnating, as a result of which energy and oil prices remain relatively low (at least in the short run), but there are many regulations on issues dealing with the environment, safety and the labour market. Due to the generally unfavourable outlook this "regulatory pressure" is not turned into a stream on new products and services.

Implications of scenarios: job volume changes by function, 2009-2020 (example for road transport)

Sub-sector	Function	No Limits	Off-Roading	Shifting Gears	Slow Down
Road transport	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
	Freight handlers	I	M	I	D

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

Implications of scenarios for jobs, skills and knowledge by job function

Key driving forces that will dominate the shaping of the transport and logistics sector's future are : (i) *globalisation and world trade* (ii) *prices of natural resources* (iii) *environmental and vehicle regulation* (iv) *labour market regulation* (v) *safety policies*. The scenarios "No Limits" and "Shifting Gears" assume favourable economic conditions, more globalisation and increasing demand for transport. The main difference between those two however is the degree of regulation, especially in regard to the environment and safety, which are much higher and stricter in "Shifting Gears" than in "No Limits". Prices for energy and raw materials will be comparatively high in these two high growth scenarios, whereas many related cost reductions are achieved in "Shifting Gears" due to improvements in environmental technology. The economic conditions are less favourable in "Off-Roading" and "Slow Down", whereas in the latter one additional more regulatory constraints are present, which has different effects on working conditions, training and skills requirements and the number of people being employed.

Identification of emerging competences, skills and knowledge needs

By taking the scenarios and drivers as a starting point, logical inferences ('guestimates') of *skills* and knowledge needs were made for each of the identified job functions. Skills refer to the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the European Qualification Framework (EQF), 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). *Knowledge* refers to the outcome of the accumulation of information through learning. It is the body of facts, principles, theories and practices that is related to a field of work or study. In EQF context, knowledge is described as theoretical and/or factual. *Competences* refer 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. Competences thus defined come actually close to what is generally understood nowadays as 'soft skills'. In EQF context, competences

are described in terms of responsibility and autonomy. In the practical elaboration of future skills and knowledge needs for the purpose of this study, both have been further 'disentangled' to result into six clusters of similar and related skills and knowledge needs.

Overview of skills and knowledge needs identified for each job function and scenario

Knowledge ('hard skills')
• Legislative / regulatory knowledge (environmental / safety / labour / contracting); Language; e-skills; Marketing skills; Technical knowledge; Product knowledge; Product development
Social Skills
• Team working skills; Social perceptiveness (listening / understanding); Communication; Networking; Language; Intercultural
Problem-solving Skills
• Analytical skills; Interdisciplinary; Initiative, Multi-skilling; Creativity
Self-management Skills
• Planning; Stress and time management; Flexibility; Multi-tasking
Management skills
• Strategic & visionary; Coaching and team building; Change management; Project management; Process optimizing; Quality management; People skills crucial for collegial management style
Entrepreneurial skills
• Supplier and customer relationship / understanding; Business understanding / development; Trend setting / trend spotting

Source: TNO-SEOR-ZSI

Future skills and knowledge needs by job function

Across all job functions soft skills will become increasingly important, especially so for high skilled professional job functions. The general trend of upskilling across job functions is bound to continue in the coming years. Due to the changing nature of jobs, predefined technical knowledge capabilities will become somewhat less important while skills to adapt and learn new competences and life-long learning will be put at a premium. Certain knowledge – notably e-skills – will become more important. Emerging competences of higher skilled jobs mostly refer to how to learn, communicate, interact and adapt to changing environments in addition to a high quality education. Emerging competences in medium-educated job functions that mostly execute defined tasks and processes refer mostly to specific knowledge sets that can be taught through learning. Key emerging skills and knowledge needs by job function are sketched out in the following example[2]:

Managers - in the fast paced but much regulated "Shifting Gears" scenario managers have to focus on quickly picking up new trends, explore new markets and channels, invest in customer relations, optimize their processes and comply with new and stricter environmental and safety regulations.

Business and finance professionals – "Shifting Gears" requires much knowledge about regulations and environmental issues, but also about finance, trade (new types of trade like energy exchanges) and environmental issues. Especially for sales professionals communication, networking, language and intercultural become more important in the growth scenarios as markets have to be developed.

Engineers – E-skills, analytical skills and the ability to cope with new technologies are the most important emerging competences of engineers. Both, "Shifting Gears" and "No Limits" will also require more interdisciplinary abilities.

Drivers of vehicles, ship officers and pilots – Especially the "No Limits" and "Shifting Gears" scenarios call for new emerging skills for drivers, officers and pilots. Of high importance will be technological and e-skills since new technologies are likely to be introduced in all transport sectors.

2 For expected changes in main skills and knowledge clusters, see tables below. More extensive and detailed accounts on future skills and knowledge needs can be found in the main report, with further differentiations made by scenario.

Main strategic choices to meet skill and knowledge needs

In order to meet future skills and knowledge needs, apt and timely solutions – referred to here as strategic choices - are required (see table below). Strategic choices refer and relate to the medium- and longer term, even though emerging skills and knowledge 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 (including 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 to more precise assessments at the regional and company level. Increasingly the identification of skills and knowledge needs but also the search for adequate solutions will have to become an integral part of an overall longer-term business strategy, also for SMEs. Some solutions will be found within the company itself, e.g. through reorganising functions within or between plants, by offering (re) training trajectories or by active global sourcing of personnel. For SMEs and especially for micro-enterprises such longer-term, more strategic human resource management often will be more difficult to organise and operationalise.

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 is needed in order to agree on and implement a package of feasible solutions. Timely, targeted and reliable information to make decisions – i.e. adequate monitoring and analysis - is an essential prerequisite.

Conclusions

Implications, conclusions and recommendations have been made at two distinct levels: the individual job function (micro) level focusing on options by function and those, more generally, aimed at sectoral stakeholders (including education and training) and policy-makers (meso-level). The former are summarised in the table below. At the meso-level a further distinction has been made between education and training and 'other' main conclusions and recommendations.

Conclusions and recommendations on education and training

1) Adapt and modernise vocational education and training (VET) and general education systems, but do this on a national basis rather than for the EU as a whole

2) Improve the information provision on skill needs and job requirements: essential for improving training and education

3) Collaborate with all relevant stakeholders and intensify co-operation in education and training

4) Strengthen co-operation in sector-specific training measures to provide flexible and up-to-date training offers

5) Facilitate training co-operations between SMEs - to be supported by national training bodies and sectoral social partner organisations and supported by public funding, along with dissemination of best practices

6) Build joint training facilities to reduce costs for especially small companies

7) Enhance flexibility through modularisation of education and training and forms of blended learning, i.e. a mixture of different learning media, learning methods and forms supporting decentralised, self-directed and efficient learning more independently in time and space

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

		No Limits	Off-Roading	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, solcial, problem solving, self management, entrepreneurship, management,	Knowledge, solcial, entrepreneurship, management,	Knowledge, solcial, problem solving, self management, entrepreneurship, management,	Knowledge, solcial, 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 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	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

8) Supply special courses dedicated to sector characteristics

9) Supply special courses for older workers

10) Enhance transparency of the quality of training as well as improving the trans-national recognition of vocational qualifications

11) Pay more attention to multi-skilling, to combining technical and soft skills, and to interdisciplinary and multidisciplinary studies

12) Ensure the up-skilling of low skilled technical production workers.

Main other conclusions and recommendations

1) Improve collaboration between all stakeholders

2) Improve the image of the sector – among the young and the overall working population, especially women

3) Anticipate drivers of change - technological development and applications, changes in scarcity and prices of natural resources, and environmental and market regulation are very important for the sector.

4) Provide stability in legislation - to enable long(er)-term investment decisions in environmental technologies such as cradle-to-cradle applications and nuclear and sustainable energy

5) Improve career guidance and provide information on labour market possibilities

6) Increase international and intersectoral acknowledgement of certificates

7) Organise transfer of knowledge and expertise from old to new Member States

8) Organise and facilitate the transfer of experience of older to younger workers

9) Keep older longer in employment and support vocational training for older employees

10) Invest strongly in human capital and lifelong learning - in order to maintain competitiveness and be able to respond to favourable but also less favourable future scenarios.

Where to find more information?

The following information can be found on the Europa website under the address:
http://ec.europa.eu/restructuringandjobs

The other 17 sector studies on the analysis of the sector's evolution and future skills needs
The Restructuring in Europe report
The thematic restructuring forums
The checklist and the toolkit on restructuring processes
The training guide for SMEs
The national seminars on restructuring in 27 EU countries
Official documents related to restructuring policies