

D4.2 Report on future perspectives
regarding framework conditions for
the European transport
manufacturing industry



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1 Introduction

1.1 Project Background

This report has been created within the SCORE project “Scoreboard of Competitiveness of European Transport Manufacturing Industry”. It is the second report for Work Package 4 “Framework and Recommendations” and is part of Task 4.1 “Investigate European and global policy, regulatory and legal frameworks and its impact on competitive position” . The deliverables therefore analyses societal goals and strategic objectives by European initiatives in section 2, before section 3 focus on the identification of industrial needs to secure continued competitiveness of European manufacturers. This is done through a thorough expert analysis with the main stakeholders in the European transport manufacturing industry in close collaboration with T3.3. Eventually, the overall objective is to derive gaps that need to be addressed through new political frameworks.

WP 4 “Framework and Recommendations”, led by TOI, investigates framework conditions, legacy instruments and derive a comprehensive set of tangible recommendations towards the relevant public and private stakeholder groups.

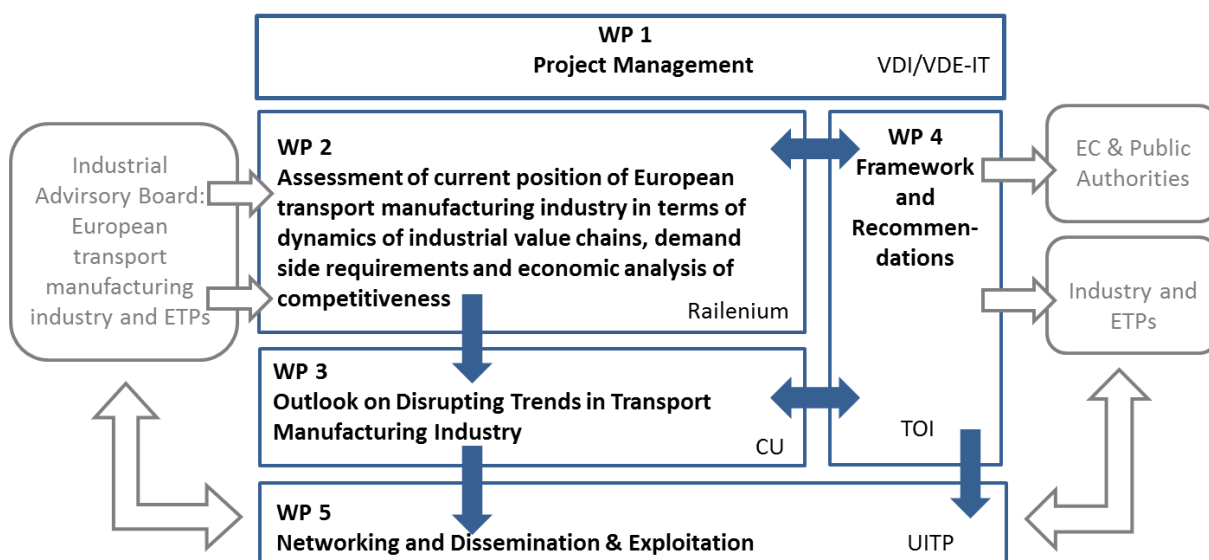


Figure 1: Working Package Relations of the SCORE project

1.2 Objective of the task

The current global competitive position of the European transport manufacturing industry as well as the trends and future developments impacting them are significantly affected by policy and legal developments. Hence, WP 4 provides information on relevant framework conditions and current anticipated developments in relevant policy areas for the work in WP 2 and WP 3. The major objective of WP 4 is, however, to derive a comprehensive set of tangible recommendations towards the relevant decision makers in industry and public authorities. This will be achieved by building on the thorough knowledge base that has been developed within WP 2 and WP 3. Specific objectives of WP 4 thus are:

- Investigate current status and future perspectives of global and European framework conditions and set them in relation to the current and anticipated competitive position of the European transport manufacturing industry derived in WP 2 and 3 and identify possible barriers, gaps, hurdles and enablers

The different policy areas within this inventory of policies and actors are analyzed with regard to their aims, strategies, instruments and implementation measures. Furthermore, future developments and perspectives on novel policies and legislative measures are anticipated. Moreover, the binding character of these policies is assessed, i.e. on the one hand to what extent mandatory laws exist and on the other hand whether there are areas allowing a certain degree of administrative discretion.

The derivation of impacts of policies on the transport manufacturers' competitiveness and also on trends and future developments that also affect the competitiveness of transport manufacturers is carried out in collaboration with WP 2 and WP 3.

1.3 Methodology

The methodological approach for this deliverable is based on a well-established method mix, connecting desk research to scan and review existing strategy documents on policy frameworks, programs, initiatives and strategic papers. Furthermore, a board of 70 experts was chosen and surveyed to score the most relevant policy topics identified within the SCORE project. The results were discussed in an expert workshop and with the SCORE Industrial Advisory Board. The gap analysis from which recommendations are derived in D4.3 is described in section 4.

2 Societal goals and outlook

This chapter gives an insight into societal goals defined by the European Commission to be then able to see to what extent current industry efforts already work towards attaining these goals. It is founded on desk research of existing political frameworks that gather societal goals set by the European Commission or related initiatives. Policies were chosen that have a huge impact on the transport manufacturing industry or areas mainly influenced by transport. This includes the environment, smartness/digitalisation and safety in transport as well as cross-border connectivity in a seamless European transport area.

2.1 EU industrial policy priorities

To provide relevant political framework conditions for a future-oriented transport manufacturing industry, this chapter gives an overview of existing political frameworks and therein the EU's strategic objectives. Firstly, the top priorities of the European Commission are listed and secondly, programs and proposed strategies are assessed. Through this approach both an overarching meta-perspective (top priorities) as well as a more detailed micro-perspective (Europe on the Move, STRIA) is taken.

2.1.1 Top priorities

The European Commission within DG GROW defined top priorities to follow in order to establish a continuously growing economy in the EU with a main focus on providing an innovation environment for the (manufacturing) industry, intellectual property protection, sustainability of business and resources and no borders within the internal market. The top priorities are¹:

- fostering competitiveness;
- encouraging innovation by supporting actions related to innovation and research;
- promoting businesses that produce in a sustainable and socially responsible way;
- working to ensure that enterprise and industry has access to resources, including finance, skilled labour, energy, and raw materials;
- a well-functioning internal market;
- promoting a business friendly environment;
- supporting the internationalisation of EU enterprise and industrial goods and services;
- providing support for the protection of intellectual property rights (IPR);

With these priorities the European Commission aims to reach an industrial attribution to GDP at 20% in 2020. The EU further tries to reduce development costs by fostering global technical harmonisation².

2.1.2 Europe on the Move

'Europe on the Move' is a wide-ranging set of initiatives that will make traffic safer, smarter, more eco-friendly, less bureaucratic and fairer. "The long-term benefits of these measures will extend far beyond the transport sector by promoting growth and job creation, strengthening social fairness, widening consumers' choices and firmly putting Europe on the path towards zero emissions."³ This set of policies was chosen as part of the analysis because of its broad scope that shows the wide range of influence transport has on society.

¹ European Commission (2017). EU Industrial Policy. Retrieved from: https://ec.europa.eu/growth/industry/policy/eu_de. Accessed on: 6 December 2017.

² European Commission (2017a). Automotive industry. Retrieved from: https://ec.europa.eu/growth/sectors/automotive_en. Accessed on: 6 December 2017.

³ European Commission (2017b). Europe on the Move: Commission takes action for clean, competitive and connected mobility. Retrieved from: https://ec.europa.eu/transport/modes/road/news/2017-05-31-europe-on-the-move_en

This agenda for a socially fair transition towards clean, competitive and connected mobility for all is communicated by the European Commission towards the European parliament, the Council, the European Economic and Social Committee and the Committee of the Regions.

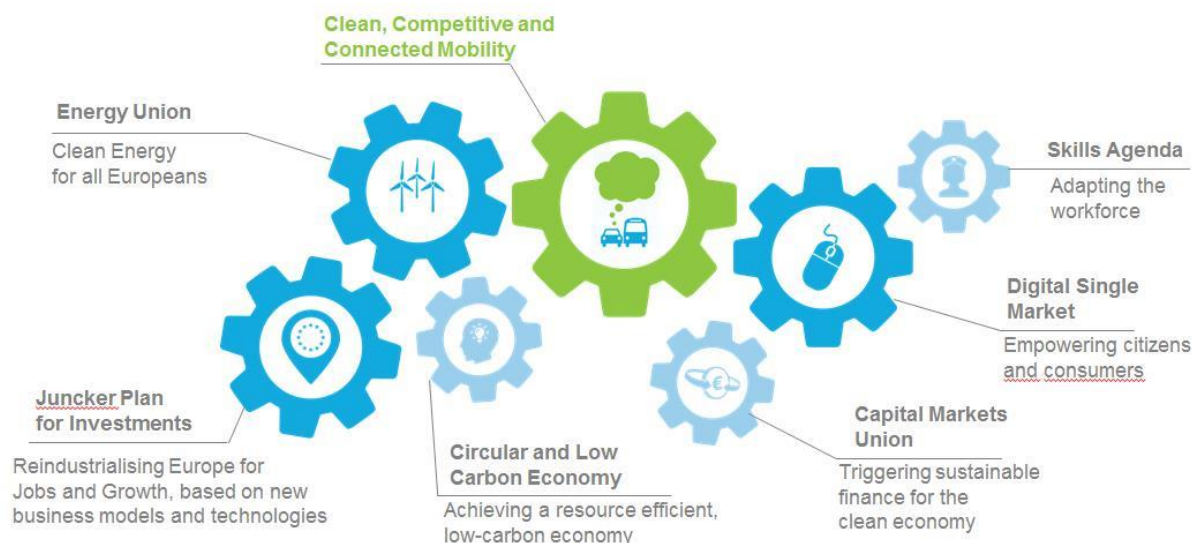


Figure 2: Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions. An agenda for a socially fair transition towards clean, competitive and connected mobility for all. European Commission (2017).⁴

Objective⁵

The objectives of this program are described as follows:

*“Digitalisation, automation and alternative energy sources are challenging traditional features and creating new opportunities linked with resource efficiency and the collaborative and circular economy. But such changes can also be disruptive. While they create new jobs, they can also make others obsolete. They call for new skills, good working conditions and need anticipation, adaptation and investment.”*⁶

The European Union shall become a single European Transport Area, in order to guarantee a safe and efficient, affordable cross-border mobility network connecting all modes.

Resources necessary⁷

The following financial resources are planned within this programme:

“...EUR 740 billion are needed to complete the core network corridors of the Trans - European Transport network 26 by 2030 – creating a genuine Single European Transport Area, supporting the EU Single Market and decarbonisation, and making full use of digitalisation. Total investment for EU transport infrastructure (combining the Trans - European

⁴ European Commission (2017). Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions. An agenda for a socially fair transition towards clean, competitive and connected mobility for all. Retrieved from: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017DC0283>. Accessed on: 6 December 2017.

⁵ ibid.

⁶ ibid.

⁷ ibid.

- *Transport (TEN - T) Networks comprehensive network and urban transport*) are **estimated at EUR 130 billion per year**, broadly consistent with historical levels of about 1 % of the GDP.⁸

The EU has already undertaken the following actions:

Accelerating the shift to clean and sustainable mobility⁹

1. Promoting sustainable mobility through improved emissions standards:
 - The EC has begun to revise the post-2020/2021 carbon dioxide standards for cars and vans.
 - Carbon emission are supposed to increase by 10% from 2010 until 2030, thus: Fostering the transition towards a low-carbon economy is a priority for the EU's cohesion policy. This includes an estimated EUR 39 billion for supporting the move towards an energy-efficient, decarbonised transport sector which in turn includes EUR 12 billion devoted to low-carbon, multi-modal, sustainable urban mobility.
2. Empowering the consumer to make informed choices by establishing
 - a new labelling framework;
 - multimodal travel information services; and
 - driving restriction in urban areas.
3. Smart road charging
 - "User and polluter pays"-principle
 - Inclusion of external environmental costs into the fee to foster reductions for zero-emission cars in order to support them
 - Special vignette for heavy good vehicles
4. Public procurement as a market driver for clean transport
 - Objective: incentivize the creation of new mobility markets
 - The public transport stands out, since "here is particular potential for public transport vehicles, such as buses, to use low-emission alternatives. EU co-financing is available, for example from the European Regional Development Fund"¹⁰
5. Cleaner and smarter mobility in cities
 - Urban Agenda for the EU (based on experience through projects like CIVITAS)

Ensuring a fair and competitive internal market for road transport¹¹

1. Creating a level playing field in road haulage:
 - "Reducing the number of unnecessary empty runs, improving the clarity of the rules to tackle market fragmentation , and better enforcement"
 - "It is estimated that the Commission's proposal would allow savings for businesses of around EUR 3 to 5 billion for the EU for 2020 – 2035"
2. Enhancing the social framework and employment conditions:
 - Social legislation in road transport
 - Provide high social protection for people working in transport
 - Lower administrative burdens of companies
 - Minimum wage laws across the EU

⁸ ibid.

⁹ ibid.

¹⁰ ibid.

¹¹ ibid.

- Regular briefing of workers by postings
- 3. Better compliance and enforcement through smart digital technologies:
 - Digital tachograph shall ensure compliance of working hours of road haulers
 - Applying differentiated road charging schemes
- 4. Supporting a change in skills:
 - Blueprint for sectoral cooperation on skills under the New Skills Agenda for Europe
- 5. Road safety:
 - Vision Zero by 2050
 - By the end of 2017, the Commission will complete a review of the general safety requirements for cars, lorries and buses defined under the type-approval framework with a view to upgrading them.

Harnessing the benefits of digitisation, automation, and intelligent mobility services¹²

1. Co-operative, connected and automated mobility
 - Coordinated roll-out of mass market partially automated and connected vehicles by 2020
 - 5G technologies
 - L3PILOT 59 is an important demonstration pilot project under Horizon2020 which will start in summer 2017. It will focus on large-scale piloting of a wide range of automated driving functions for passenger cars.
 - Digital Single Market Strategy
2. Enhancing the efficiency of transport networks
 - The Commission has set up the Digital Transport and Logistics Forum

Investing in a modern mobility infrastructure

1. Boosting investment in infrastructure for the future
 - Investment Plan for Europe triggered EUR 194 billion
 - Connecting Europe Facility for Transport (EUR 24 billion)
2. Accelerating alternative fuel infrastructure deployment
 - EU backbone charging infrastructure by 2025: the Commission will address the issue of investment financing in the context of an Alternative Fuels Infrastructure Action Plan to support the deployment of an EU backbone charging infrastructure, with the aim of providing full coverage of the Trans-European Networks - Transport (TEN-T) corridors' core network with charging points by 2025.
 - 6 million charging points (2.8 million pre-cabling and 3 million actual charging points) could be deployed in non-residential and residential buildings.
3. Batteries as a key enabling technology
 - Improve battery performance (weight, size, range, durability, recyclability)

In conclusion, the transport system in the EU needs to become safe, with the goal of zero-fatalities and sustainability through new technologies pushed by automation and digitisation. At the same time the demand for seamless movement within the EU is increasing. This can become a reality through digital services that deliver mobility-as-a-service on the base of harmonised time tables, flexible last mile solutions and information interfaces. In view of the high number of people employed in the transport sector further goals are stated within this programme as well, e.g. legal protection regarding social legislation, and minimum wage regulation across the EU.

¹² ibid.

Interestingly, digital services shall empower transport users but at the same time it is them that lead to huge changes in the working environment. New digital production processes and increasing automation within factories create new challenges for workers and require them to re-train or re-educate.

2.1.3 Strategic Research and Innovation Agenda (STRIA¹³)

The Strategic Research and Innovation Agenda is a key component of the recently implemented Energy Union's R&I strategy. It provides a framework to achieve EU energy and climate goals based on five interlocking dimensions. In coordination with Member States and transport stakeholders, STRIA aims to set out common priorities and deploy innovative solutions to address the Energy Union and other policy goals. It builds on and integrates seven thematic transport research areas:

1. electrification;
2. alternative fuels;
3. vehicle design & manufacturing;
4. connected and automated transport;
5. transport infrastructure;
6. network and traffic management systems;
7. smart transport and mobility services (incl. urban).

It is chosen as part of the analysis as it is one of the EU's most comprehensive transport policy framework and thereby acts at the interface between other relevant sectors such as energy and ICT. In view of the benefits of a cross-sectoral collaboration, discussed in the next chapter, this is of utmost importance for the European transport manufacturing industry.

The STRIA proposes the following actions based on the EU environmental goals for electric mobility, providing clean transport and milestones for market share. The milestones are based on the roadmap "Electrification in Road Transport".

EU targets for environment¹⁴

- 20% GHG emissions below 1990 levels by 2020
- 40% GHG emissions 1990 levels by 2030
- 80% GHG emissions the 1990 by 2050
- 27% renewable energy in the mix by 2030
- CO₂ emission 20% less than 1990 by 2030; 60% less CO₂ by 2050

Example: Milestones from the Implementation Plan for Electrification in Road Transport¹⁵

- 2020: 5-10% market share of EVs
- 2025: 60% total market share and 100% in small vehicle segment
- 2030: 100% CO₂-free vehicle fleet

Proposed Actions by STRIA

¹³ European Commission (2017). Towards a Single and Innovative European Transport System. International Assessment and Action Plans of the Focus Areas. Final Report.

¹⁴ European Commission (2017). Energy Union: Commission takes action to reinforce EU's global leadership in clean vehicles. Retrieved from: https://ec.europa.eu/transport/modes/road/news/2017-11-08-driving-clean-mobility_en. Accessed on: 12 December 2017

¹⁵ ERTRAC (2017): Implementation Plan for Electrification in Road Transport. Retrieved from: https://eqvi.eu/uploads/Modules/Publications/ertrac_electrificationroadmap2017.pdf

- Promote the development and uptake of a +400-km electric passenger car market (meeting customer expectations; KPI: range)
- Development of small and light electric vehicles (KPI: more than 50 percent in weight reduction)
- Progress and demonstration in urban bus electrification (R&I program on energy storage systems, thermal comfort as well as low energy air conditioning; KPI: carry all energy for a one day trip on the bus and stay within cost targets)
- Public and commercial procurement of EVs (kick off the market and create awareness of electric vehicles' maturity and stabilize the residual value of electric vehicle; KPI: above average share of electric vehicles in public and private fleets)
- Certification of electric vehicles performance (better comparability of EV types, also for commercial applications, by providing reliable information on parameters that are critical from a customer perspective, e.g. range, battery life, impact of thermal conditions as well as life cycle comparison of WTT and TTW energy consumption). Develop electro-chemical systems for future high-density EV batteries: Gather unique knowhow for potential European leadership in battery technology production. KPI: energy density >300 Wh/kg at cell level)
- Support local production of batteries, components and electric vehicles
- Demonstration of more electric and electrified road systems for Heavy Duty Vehicles (about EUR 1 to 2 million per km)

2.2 World Economic Forum Europe 2020 Competitiveness Index

The World Economic Forum has analysed Europe's industry based on their Competitiveness Index. It follows the categories "smart", "inclusive" and "sustainable".

2.2.1 Smart

- **Enterprise environment**

The goal is to set up an effective antitrust policy and appropriate regulation competition as well as to stimulate entrepreneurship and facilitate business creation by improving the businessstart-up environment. To reach that goal, the access to capital shall be eased, administrative barriers shall be lowered and taxes shall be decreased.¹⁶

- **Digital agenda**

Within the Europe 2020 strategy the EU defined to use spill-over effects of the ICT economy to transform other industries in order to make them become more efficient and productive. This would offer an excellent opportunity for exchange in information and experience between strong and weak performers.¹⁷

- **Innovative Europe**

It is articulated that firms in European countries must design and develop cutting edge products and processes to maintain a competitive edge. At the same time, less technological advanced countries should be provided strategies to follow-up.¹⁸

- **Education and training**

Within this category secondary and tertiary enrolment rates, as well as the quality of education provided, is measured. The ability of an economy to shift towards more knowledge-intensive, higher-value-added activities will depend on its capacity to generate new knowledge through better performing innovation and educational systems.¹⁹

¹⁶ World Economic Forum (2014). The Europe 2020 Competiveness Report. Building a More competitive Europe. 2014. Retrieved from http://www3.weforum.org/docs/WEF_Europe2020_CompetitivenessReport_2014.pdf . Accessed on 3rd February

¹⁷ ibid.

¹⁸ ibid.

¹⁹ ibid.

2.2.2 Inclusive

- **Labour market and employment**

The inclusiveness deals with the capacity of an economy to mobilize all human resources to contribute to the economic growth of a society. Thereby, addressing socio-economic inequalities is critical to sustainable growth. It must be ensured that workers are allocated to their most efficient use in the economy and are provided with incentives to give their best effort in their jobs. Labour markets must therefore have the flexibility to shift workers from one economic activity to another, rapidly and at low cost. Furthermore, incentives have to provide equity between all genders.²⁰

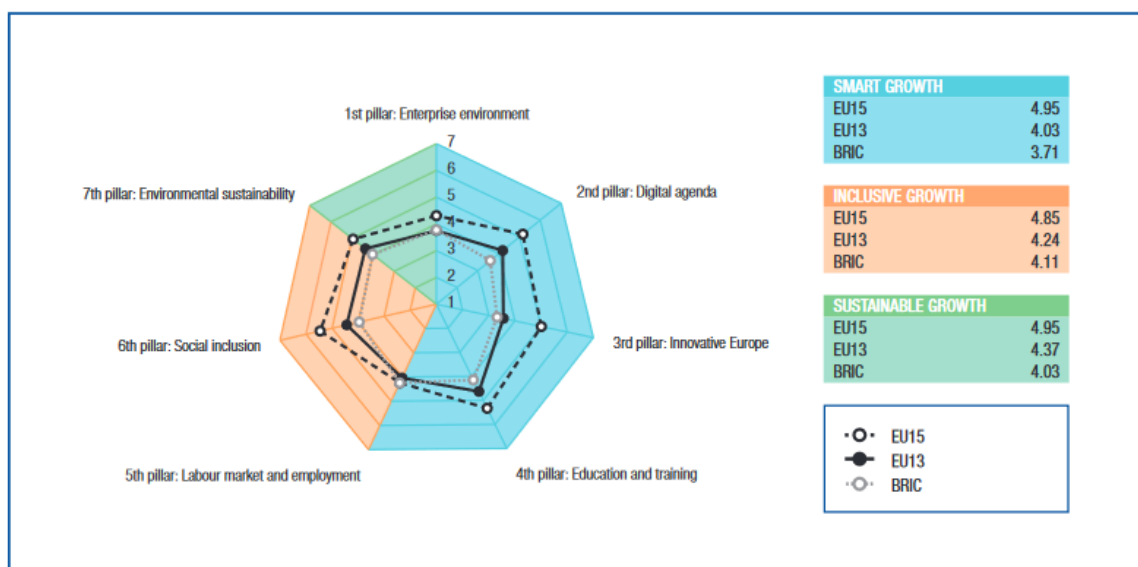
- **Social inclusion**

This sub-index records how much society benefits from economic growth on an individual level. It is based on the assumption that inclusive societies are more stable (measured by the Gini coefficient). Therefore, the social mobility, health, drug and crime rates are measured.²¹

2.2.3 Sustainable

- **Environmental sustainability**

The index assesses the share of renewable energy consumption, the enforcement of environmental legislation, the ratification of international environmental treaties and the quality of the natural environment, the latter including the measurement of air pollution levels through carbon dioxide (CO₂) intensity and PM2.5 emissions.²²



Source: World Economic Forum, 2014.

EU13: Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic and Slovenia

EU15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom

BRIC: Brazil, China, India, Russian Federation

Figure 3: Illustration of the multidimensional competitiveness performance based on data from the World Economic Forum

²⁰ *ibid.*

²¹ *ibid.*

²² *ibid.*

2.3 Conclusion

The report concludes that the current situation of Europe is acceptable, but that “*decisive measures need to be adopted to raise Europe’s competitiveness*”.

Furthermore the report constitutes that

“the EU continues to underperform in comparison to the United States and other advanced economies in terms of building a smart, innovation-based, knowledge-driven economy”
which is of rather big importance to remain productive within Europe.

Last but not least, substantial differences between the member states of the European Union were identified which should be addressed with differentiated strategies that take international, national and/or regional characteristics into account.

3 Industry needs

The information within this chapter was obtained through various empirical studies including an online expert survey and several expert workshops. Respondents include the project's Industrial Advisory Board as well as external stakeholders of the project partners' network and conference participants.

3.1 Expert survey

For the expert survey of the SCORE project, extensive collaboration between VDIVDE-IT and TOI (Work Package Leader 4 and Task Leader 3.3) was established. This resulted in bilateral workshops in Oslo and Berlin where amongst others the synapses of policy implications from WP2 and WP3 was discussed, the status assessment for WP4 objective fulfillment was reviewed and conclusions were drawn and reflected in the creation of the questionnaire for the expert survey. Within this document an overview about the expert survey and the gathered results with a focus and implication on policy-relevant topics is given. Further details and sector-specific evaluations can be looked up in Deliverable 3.3 – “Analysis of future global competition arenas for the European transport manufacturing industry” where several additional competitiveness aspects are assessed.

3.1.1 Survey design and data collection

The design of this expert survey was based on findings from the literature on global and regional risks, previous SCORE work packages and deliverables, as well as inputs and insights from the project's Industrial Advisory Board. Together, these inputs served as a basis for the inclusion of several global risk categories and developments, and their possible impacts on the global competitiveness of European transport manufacturing industries.

The resulting survey questionnaire included different types of questions, such as scoring/rating questions, ranking questions, and questions about the characteristics of the respondents' organizations. Respondents were asked to rank the likelihood of the occurrence of a particular scenario on a 5-point scale: very likely, likely, possible, doubtful, impossible. The questionnaire also provided respondents ample opportunities to give open answers or to provide additional comments. The full questionnaire is available for reference in Appendix A of Deliverable 3.3 - “Analysis of future global competition arenas for the European transport manufacturing industry”.

In light of the SCORE project's objectives, intended respondents constitute of business leaders and/or managers who held different executive positions at European OEMs and suppliers in the four main transport industry segments (rail/rolling stock, aeronautics, shipbuilding and automotive), and also other relevant actors in the value chain of the respective transport manufacturing segments. To attain such a qualified sample, all partner organizations in the SCORE consortium were provided with survey links to connect with their known networks of stakeholders in different industry segments.

3.1.2 Results of the industry expert survey

The survey was conducted through an online questionnaire tool between December 5th, 2017, and January 9th, 2018, taking into account holidays in the countries of respective SCORE consortium partners. At the end of the data collection phase, 69 completed surveys were registered. The following section provides a selection of relevant survey topics relevant for this deliverable.

- **Emerging technologies**

New communication and manufacturing technologies and breakthroughs have the potential to disrupt established business models and threaten the continuity of businesses that do not respond to these changes quickly enough. Respondents were asked if they expect that any or all of the above technologies will impact their business and competitiveness positively or negatively in the near future and towards 2030. Results indicate that the overwhelming majority of experts have positive expectations about the effect of the introduction of new technologies for their organizations. This indicates that European transport manufacturers consider it likely that new emerging technologies will help to strengthen their competitiveness compared to competitors.

- **Shortage of qualified workers**

Skilled employees and workers are often crucial for the adoption of innovation, R&D activities, and technology leadership in given manufacturing sectors. Experts were therefore asked about their views on the potential challenge of a shortage of qualified workers, and its consequences for their organization and competitiveness in the near future and towards 2030.

It can be concluded that a shortage of qualified workers is considered as a rather likely threat to the future competitiveness of European transport manufacturers: Almost two thirds of the surveyed experts regard it likely or even very likely that their organisation will be affected by this risk. Based on feedback from a voluntary and open follow-up question, experts are concerned that the lack of qualified workers could form a barrier to the adoption of new technologies, and therefore lead to a loss in competitiveness. For large companies, one possible consequence is that European development centres might have to be moved to another continent with a better access to skilled staff. Responses to the open question also indicated concerns about a shortage of skilled workers in the fields of cybersecurity and data analytics. In addition, experts are worried about the shortage of qualified workers with regard to existing technologies and systems. Some products have long life-time cycles, and the outflow of skilled staff with expert knowledge about these products could prove hard to replace.

- **New business models and new entrants**
In addition to workforce challenges, transport manufacturers are expected to face other, often global developments. New business models, substitutes, and fierce rivalry from new entrants might for example pose a threat to established businesses and their value chains. Results show that new business models and new entrants are both considered possible or probable influencers of the business and competitiveness of the experts' organizations. Among the three addressed developments, new entrants are feared the most, while substitutes are seen as less likely to affect businesses and their competitiveness.
- **Transnational trade and financial exchanges**
Shifts in global or regional legal and political environments can impose business risks. Protectionism and/or government interventions might for example restrict access to markets of interest and harm global or regional trade, with examples of such scenarios being governments in some major markets (e.g. USA/China) imposing border taxes on imports and/or financial sanctions. Results show that the large majority of experts consider it possible, likely or very likely (24%, 31%, and 30% respectively) that their organization will be affected by general protectionism/government interventions in the near future, while only a minority is doubtful about this scenario materialising.
- **Protectionist measures in China**
China's rapid development and increasing welfare over the past decades has significantly increased demand for transport solutions. For many transport segments, China therefore constitutes a large market with huge sales and revenue potentials. However, protectionist policies of the Chinese government might create downward risks for European transport manufacturers and thereby diminish prospects for business expansions. Results shows that when it comes to a scenario with Chinese protectionism, European transport manufacturers are most concerned about potential deteriorations of the competitive position of their organizations. Also the potential loss of revenues and the breakdown of production/delivery are expected to be relatively severe, while less concern exists about damage to the value chain. This pattern turns out to be rather similar across all industry segments.
- **Competition with Chinese manufacturers**
The competition from and output of Chinese firms in transport manufacturing industries has increased dramatically over recent decades. Where other deliverables in the SCORE project put considerable emphasis on the European market in particular, respondents to the expert survey were also asked about how strongly they expected Chinese competitors to challenge their position on American and/or Asian markets. Responses indicate that the large majority of respondents expect Chinese manufacturers to challenge the European manufacturing fields in their respective industry significantly in American/Asian markets towards 2030.

3.1.3 Results of the industry expert survey with a focus on cross-sectoral collaboration

One way for European transport manufacturers to deal with risks and challenges is to improve their competitive position across industrial sectors. This section therefore addresses the potential of cross-sectoral collaboration as well as benefits and potential barriers.

- **Benefits of technology transfers**

The adoption of novel technologies across different industry sectors can be both beneficial and challenging for transport manufacturers. Benefits, for example, might result from knowledge transfers between organisations in different industries or industry segments. Results show that ICT and Internet of Things are considered as important areas in which transversal technologies and cross-sectoral collaboration can benefit firms. Also the sharing of best practices and technologies across sectors was seen as an important channel for creating benefits. Digitised and multimodal transports, and particularly knowledge about advanced materials, were generally ranked somewhat lower in terms of importance. However, the distribution of rankings and the average ranking of the alternatives suggest that none of the alternatives should be dismissed as unimportant.

- **Barriers/challenges to cross-sectoral collaboration**

Cross-sectoral collaboration can be beneficial for innovation and the competitiveness of European transport manufacturers. At the same time, however, industry sectors exhibit fundamental differences, for example when it comes to innovation cycles, timelines for the deployment of new manufacturing technologies and standards, or regulatory frameworks. Together or separately, these differences may form barriers that impede cross-sectoral collaboration between e.g. manufacturers and IT/software providers and/or other companies and transport manufacturers. Overall, experts considered different regulatory frameworks between industry segments to constitute the largest barrier. Differences in work practices and culture, and silo-orientations and established value chain structures, were also considered significant barriers. Differences in innovation cycles/investment timelines, or industry-specific technologies and applications seemed less important to respondents.

- **Collaborative structures**

Industry experts were asked for their opinion on the importance of a number of collaborative structures, for the competitive position of their organisations in the near future and towards 2030. Examples of such collaborative structures were e.g. strategic partnerships, joint ventures, etc. All in all, academic or industrial strategic partnerships were by far considered the most important structures for cross-sectoral collaboration among the examples given. This was followed by ad-hoc project alliances, while joint ventures, contractually formalized technology platforms, as well as mergers and acquisitions were considered somewhat less important for collaboration across industries. However, even the examples considered relatively less important, received rather high scores in absolute terms.

3.2 Sector-specific policies and funding

Derived from Deliverable 4.1, an overview of current sector-specific policy and funding is given in the following. Details can be looked up in the respective deliverable document.

3.2.1 Automotive

Currently the car industry is witnessing a turning point in its history. Not only are the global economic geographies changing but the entire automotive industry is also being disrupted by three different trends: electrification, automation, and new business models such as Mobility as a Service (MaaS). Policies were analysed for electrification and automation since they are of huge relevance for European automotive manufacturers.

The focus of policy efforts in the three considered areas (Europe, USA and China) depends on different factors, one of them being market openness. Unsurprisingly, in the U.S., the most liberal market, the government is hesitant to introduce policies that might have too big an effect on its automotive industry, e.g. policies in relation to climate change. However, there is a strong regional fragmentation, e.g. California putting a lot of effort into curbing the emission of pollutants while other states do not tackle these issues at all. Europe's policy strategy centres on global as well as intra-European technical harmonisation and R&D, including both academic as well as industrial research. In China there are still a big number of protectionist policies that favour the national industry. However, this is gradually reducing since China became a member of the WTO in 2001.

To exemplify global policy efforts in the automotive industry an overview of the domains (1) environment & climate action, (2) protectionism & competition, (3) purchase & tax incentives, and (4) safety & security is given in the following.

Environment & climate action: Continuously engaging in international multilateral negotiations such as the Kyoto or Paris climate summits, Europe and China have set high goals regarding the reduction of pollutant emission. Due to international pressure to reduce the emissions to help combat climate

change, the Chinese government has recently issued very ambitious measures that were not expected within the international automotive community. In the U.S. it remains to be seen how this issue will be tackled in the current administration. So far, there are hardly any policies on national level. Especially with regard to climate change and the great challenge faced by businesses and politics, it is extremely commendable to find such variety of regulations on climate protection issues (e.g. electrification). However, some proposals do not seem entirely sustainable, since at present the energy source of electric vehicles is neglected, or at least not sufficiently reflected in the legal regulations.

Protectionism & competition: In view of the threat from increasing globalization, both the US as well as China have issued rather protectionist policies that help push the national car industry. The overarching Chinese 13th Five-Year Plan serves as the base for many policies in the transport area to follow. In comparison to these two countries Europe has introduced far less protectionist policy measures.

Purchase & tax incentives: In recent years many countries across the entire world have issued tax incentives or purchase subsidies for the procurement of new energy vehicles. These were found to be of great impact on the demand and thus on the automotive manufacturers' sales numbers in all countries under study. The effect of such system is of considerable magnitude.

Safety & Security: Policy initiatives, such as the EuroNCAP, regarding safety and security, have contributed to a tremendous improvement in safety for all road users. Many communities and municipalities have adopted the state-orientated directives as an opportunity to pass and implement their own laws. There are a number of both binding as well as non-binding policy instruments. It was found that even those that were non-binding such as the EuroNCAP still have a huge impact as most companies use these standards as selling propositions to market their products.

3.2.2 Aeronautics

The review of various governing instruments that enforce regulations in the civil aviation sector reveal that they are heavily controlled globally. With the increased passenger and freight traffic and the continuous growth in international trade, organisations such as the ICAO and IFA have now been enforcing regulations that need to be adopted by all member countries so that trade, business and movement of people across international borders occur smoothly and peacefully. These regulations have also overseen that safety, security and environmental measures are being followed by all member countries. As shown in Figure 1, the policies and regulations set by the international bodies are then adapted by regional or state regulatory agencies (SRA's) such as the EC, CAA and FAA to suit regional requirements. Some of the policies governing the environment, energy, safety and security areas though have a negative impact in the short term, the long term changes are more positive and contribute to the continuous growth of the sector. It is also seen that the global policy regulations in the aviation sector are supranational and so stringent that all member countries have to follow them. It should also be noted that all regional policies have been derived based on these overarching international policies and thus control the entire aviation sector globally.

This research has also identified future pathways and frameworks in the form of future roadmaps which have been specifically designed to improve and maintain the European Civil Aviation sector's global leadership position. These strategic documents (such as the Flightpath2050) clearly mention future goals and directions that need to be achieved and the ways to achieve them through set targets in terms of increased delivery of aircrafts to match the rising demands. Further, these roadmaps also put in place those measures that not just identify new and emerging markets such as the far-east and south-east, but also provide insights in the strategic funding models that support cutting edge research and innovation that would establish Europe's competitive standing in the global arena against the likes of the United States, Russia and China. The policies set by the European regulators clearly establish the future directions that the aviation manufacturing industries will take up to remain attractive and competitive against global players.

3.2.3 Rail Rolling Stock

The assessment of policy impacts on the competitive positions held by European rolling stock manufacturers focused on both direct and indirect effects on manufacturing processes, which can manifest either in the short or long term. Direct impacts on manufacturing were assumed to affect costs and revenues, and the scale and scope of production, whereas that indirect impacts were assumed to cause changes in the industry structure, and influence manufacturing indirectly through effects on collaborating actors. The assessment points towards the fact that the set of European policy instruments analysed might strengthen the global competitive position of European rolling stock manufacturers in the long term. However, before the desired long-term policy effects can materialise, manufacturers have to bear the associated short-term costs which, if transferred to their clients, might yield other results. Of critical importance will be the manufacturers' adaptation strategies to resist

through the transition period before the expected policy outcomes emerge, at the same time that fending off increasing pressure from Asian competitors and legislations.

An example of this are the European regulations to standardise rolling stock (Technical Specifications for Interoperability) which might bring significant long-term benefits to European manufacturers, such as the reduction of production costs, the increase of the liquidity of rolling stock assets and the promotion of innovation. However, in the short term, these specifications impose higher production, homologation, transaction and financial costs (e.g. onboard equipment and verification of compliance with the TSIs). Similarly, the ongoing liberalisation process of the rail passenger market could be very beneficial for manufacturers in the long term if the cost-effectiveness induced by competition exceeds the cost caused by the different technical specifications that come with the reform. Energy and environmental policy follows the same pattern of long-term benefits, materialised in increased capacity to innovate and to access foreign markets, along with short-term costs which might be non-negligible.

3.2.4 Shipbuilding

The analysis of soft and hard instruments influencing the shipbuilding sector has shown that the sector is clearly administrated by global framework conditions. Those internationally agreed regulations with regard to technical matters are mainly developed and promoted by the International Maritime Organisation (IMO). These regulations refer to enhanced safety and security measures in international shipping, to extended environmental issues in order to prevent marine pollution from maritime transport, to energy related topics to reduce impacts on air, water and noise from ship operations. It became also obvious that 'hard' instruments, in particular, are often transport-related as the demand for vessels from shipbuilding is to be considered as a diverted demand for transports. Binding regulations for the shipping sector – either already implemented or expected to be implemented have to be followed accordingly within the design and shipbuilding phase in order to ensure an operation in compliance with these regulations.

Based on the analysis, it has become obvious that development in the shipping sector towards becoming a more sustainable mode of transport with regard to its impact on the environment, related instruments and regulations have direct consequences on the shipbuilding industry. Introductions of lower thresholds for emissions like Sulphur Emission Control Area (SECA), Nitrogen Emission Control Area (NECA) and the implementation of IMO NOx Tier III Regulation require technical adaption in the shipbuilding process.

As these regulations tackling issues like e.g. safety and security, environmental protection and energy efficiency require technological innovations, they offer opportunities for the shipbuilding sector in the EU to get in the driver seat position with regard to the development of new technologies and market niches.

As a final concluding remark it can be stated that the air transport manufacturing and the shipbuilding sectors are more prone to global regulations than the automotive and rail transport manufacturing sectors – which corresponds to the transport markets they are corresponding to, i.e. air and sea transport are not only related to the EU but serves also on intercontinental routes while rail and cars are generally deployed on more limited geographical areas, i.e. like international rail transport within Europe and cars even more on domestic or urban routes. Hence, the impacts of policies and policy instruments have to be considered differently with regard to the four transport manufacturing industries.

3.3 Cross-sectoral policies and funding

During various stakeholder and expert workshops²³ it was discussed whether or not the European industry could benefit from cross-modal or cross-sectoral policies and funding instruments in order to improve its competitiveness. In the process of elaboration, participants also identified barriers that stand against such efforts.

In the following an overview of identified opportunities and barriers is given.

3.3.1 Opportunities for cross-modal policies and funding

- **Automation**

The automation is a transversal topic as it is of utmost importance in all traffic modes. In the automotive sector connected and automated driving promises to reduce traffic fatalities. In

²³ D.5.2 First Industry Workshop, D5.3 2nd Industry Workshop

other sectors it increases efficiency and service levels. As software solutions and necessary hardware, such as sensors, radars, cameras etc. can be developed for different modes.

- **Cybersecurity & Data Management**

Considering the vast amount of data generated through the digitisation of traffic and constant connectivity demands for various service innovations (Business-to-Business and Business-to-Consumer), cybersecurity becomes an increasingly important topic. It must be ensured that traffic operators and users are always well protected from cybercrime and hackers. Especially when it comes to the automation of driving functionalities this is one of the most crucial areas for user acceptance.

- **Standardised Communication**

In light of urbanisation and the trend towards new business models (e.g. servitisation), multimodal transport becomes an increasingly important topic for urban citizens. Standardised communication across modes and devices becomes an important prerequisite. To create it, all transport modes have to share efforts. Furthermore, communication needs to be standardized across borders to enable a seamless travel within the European Union and in a second step even globally.

- **Best Practice sharing**

Best practice sharing is a promising tool to decrease inefficiencies by adapting knowledge gained in similar circumstances. Through joint learning and co-operation between modes, sectors and countries technologies and applications can be developed much more efficiently.

- **Technology and knowledge transfer**

In view of the similarity of technologies and application scenarios in different modes, the transfer of knowledge becomes increasingly important. Redundancies can be drastically reduced leading to efficiency gains.

- **Materials & Processes: optimisation, joint development, re-use of materials after end of life in one sector in other sector**

There is a huge potential to optimise the development of materials as well as the production processes themselves by, for example, re-using materials not needed in one sector anymore in another sector. This would not only reduce material waste but also costs.

- **Engineering for life (extending life of equipment)**

“Design as a process” is a valuable tool to extend the life of equipment. This would help increase ecological sustainability by reducing the resources needed for production.

3.3.2 Barriers for cross-modal policies and funding

- **Different innovation cycles**

Technologies in different transport modalities and sectors follow different innovation cycles. This makes it difficult to share R&D&I efforts.

- **Different regulations**

For different transport modalities different regulations are in place. This makes it hard to join R&D&I efforts as different regulations need to be followed and different standards are applicable.

- **Discrepancies in the alignment of Technology Readiness Levels (TRLs)**

Current funding mechanisms differ in terms of Technology Readiness Level (TRL) applicable to different transport modalities. This misalignment makes it difficult to establish cross-modal funding mechanisms.

- **Joint implementation as a hindrance for advanced technology development**

A joint implementation might hinder sector-specific advanced technologies as the focus of the funding becomes more generic.

- **Complacency & vested interest**

Different industries have different goals and interests. It might be difficult to establish cross-sectoral and cross-modal funding due to the vested interest of certain industries with strong lobbies that do not take other industries' needs sufficiently into consideration or deliberately push down their needs.

- **Different supply chain structures (and approval/certification)**

Each transport mode has its own, unique supply chain structure. Therefore, it might be difficult to set up a cross-sectoral funding structure as different supply chain structures also require different approval and certification mechanisms.

- **Different work culture and ethics**

It might be further difficult to merge funding because of different work cultures and ethics in each transport mode. Also this might be considered as a rather manageable risk, it was ranked as an important barrier on various occasions.²⁴

²⁴ D5.3 2nd Industry Workshop, D 3.3 "Analysis of future global competition arenas for the European transport manufacturing industry".

4 Identification of gaps between goals and needs

It can be constituted that several aspects identified within the SCORE expert survey are already addressed by European initiatives. Especially the constantly evolving of advanced manufacturing technologies was rated by industrial experts as one of the most positive aspect and identified as a major strength of European manufacturers. Research, development and implementation of these technologies are already addressed in various initiatives (e.g. STRIA - see Chapter 2, Factories of the Future, etc.).

While several aspects, identified within the SCORE expert survey, are already addressed, it is questionable whether some efforts undertaken are sufficient to secure Europe's competitiveness in the future. For example it is a fact the Europe needs highly skilled employees to manufacture complex, high-added value products and components for the transport sector (e.g. Europe on the Move, STRIA – both described in Chapter 2). However the expert survey illustrates the growing dilemma of the rising need for workforce while already expecting a shortage of qualified workers. The same argument might be true for other aspects like cross-sectoral collaboration or cybersecurity.

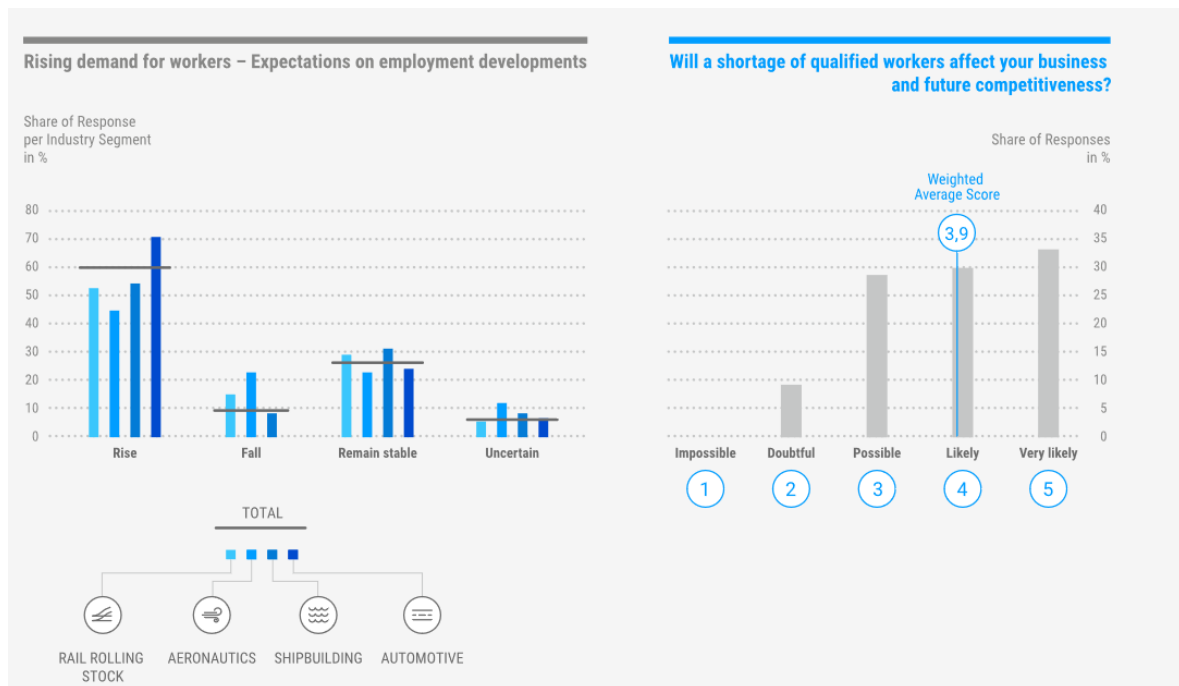


Figure 4: Shortage of qualified workers. Results from the project's expert survey undertaken within the SCORE project.

Of all assessed risks and challenges, competition from Chinese manufacturers in major markets is regarded as the risk most likely to impact the business and competitiveness of European transport manufacturers in the near future, and towards 2030. Interestingly, the risk considered as second most likely is the shortage of qualified workers. This is followed by risks involving competition and market access, namely the risk of new entrants, new business models, in addition to the risk of protectionism in major markets.

Risk Landscape of the European Transport Manufacturing Industry

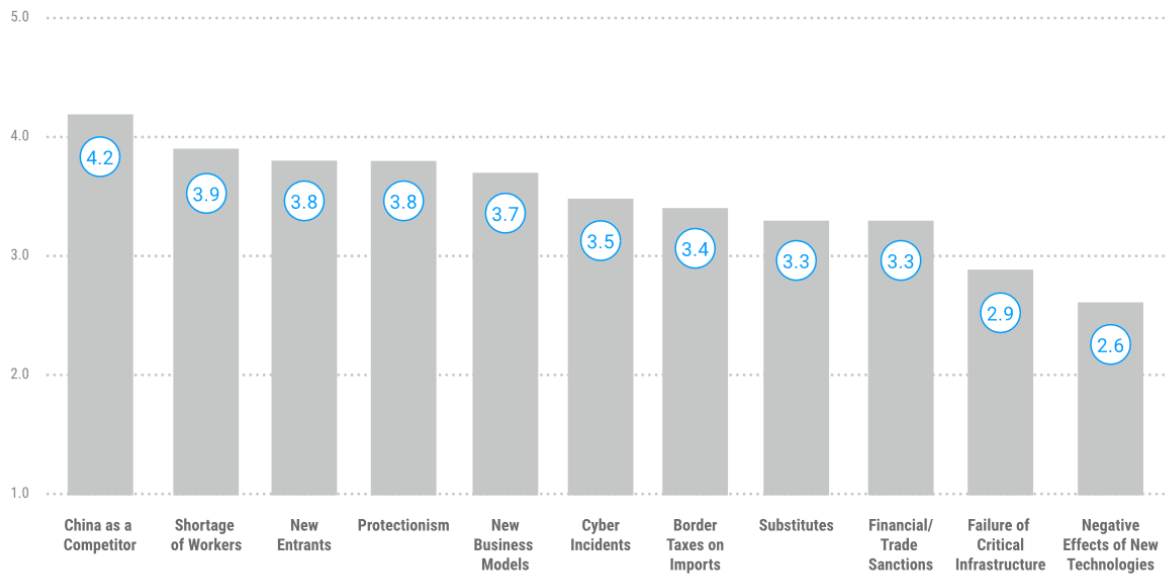


Figure 5: Risk Landscape of the European Transport Manufacturing Industry

Other identified risks and challenges identified and scored by industrial experts within the expert survey or within SCORE deliverables might not be in the spotlight yet. For example the transfer from traditional combustion powertrains to environmentally friendly alternative propulsion technology might also lower the technical barrier for new entrants significantly and therefore increases competition substantially. Within D34.3 Recommendations the conclusions of the gap analysis and the SCORE project are summarized.