Trends, challenges and opportunities in the EU transport labour market

Study

Transport and Tourism

EN

Trends, challenges and opportunities in the EU transport labour market

Study

Abstract

This study provides a comprehensive review of the transport labour market trends in the EU, the challenges and the future prospects that transport workers and undertakings are confronted with, notably for digitalisation, automation and decarbonisation processes.

The study describes the impacts on the EU transport labour market in terms of number of jobs, job structure by age, workers' skills, working conditions, shortage of workers and attractiveness of the occupations. A stakeholder consultation complements the findings of the literature review.

Please use the following reference to cite this study:
Broughton, A. Tanis, J. and Brambilla M. (Ecorys), Voss, E. and Vitols K. (wmp consult) 2024, Research for TRAN Committee – Trends, challenges and opportunities in the EU transport labour market, European Parliament, Policy Department for Structural and Cohesion Policies, Brussels
Please use the following reference for in-text citations:
Broughton, A. et al., (2024) or Ecorys and wmp (2024)

CONTENTS

LIST OF ABBREVIATIONS

ACEA	Association des constructeurs européens d'automobiles (European Automobile Manufacturers' Association)
ACMI	Aircraft, Crew, Maintenance and Insurance
AEA	Association of European Airlines
AFIR	Alternative Fuels Infrastructure Regulation
AI	Artificial Intelligence
ASA	Automotive Skills Alliance
ATO	Automatic Train Operation
BIMCO	Baltic and International Maritime Council
CARES	United States Coronavirus Aid, Relief, and Economic Security
CCNR	Central Commission for the Navigation on the Rhine
CCS	Control Command and Signalling
CEDEFOP	European Centre for the Development of Vocational Training
CER	Community of European Railway and Infrastructure Companies
CESNI	Comité Européen pour l'Élaboration de Standards dans le Domaine de la Navigation Intérieure (European Committee for Drawing up Standards in the Field of Inland Navigation)
CEWS	Canada Emergency Wage Subsidy
CLEPA	European Association of Automotive Suppliers
CO2	Carbon Dioxide
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
Covid-19	Coronavirus disease
DAC	Digital Automated Coupling

DB	Deutsche Bahn (national railway company of Germany)
DG	Directorate-General
DNV	Det Norske Veritas (an international accredited registrar and classification society of merchant vessels headquartered in Norway)
DTL	Danish Transport and Logistics Association
DWT	Deadweight Tonnage
EASA	European Union Aviation Safety Agency
EC	European Commission
ECA	European Cockpit Association
ECSA	European Community Shipowners' Associations
EEA	European Economic Area
EEC	European Economic Community
EMSA	European Maritime Safety Agency
ENSM	École Nationale Supérieure Maritime (Merchant Navy National Academy)
EQF	European Qualifications Framework
ERA	European Union Agency for Railways
ERA	European Regions Airline Association
ERRAC	European Rail Research Advisory Council
ERTMS	European Rail Traffic Management System
ES-QIN	European Standard for Qualifications in Inland Navigation
ESG	Environmental, Social and Governance
ETCS	European Train Control System
ETF	Europan Transport Workers Federation
ETS	Emissions Trading System
EU	European Union

EurECCA	European Cabin Crew Association
FEPORT	Federation of European Private Port Companies and Terminals
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GSE	Ground Service Equipment
HDV	Heavy Duty Vehicles
HR	Human Resource
IACA	International Air Carrier Association
ICAO	International Civil Aviation Organisation
ICE	Internal Combustion Engine
ICS	International Chamber of Shipping
ICT	Information and Communication Technologies
ILO	International Labour Organisation
IMO	International Maritime Organisation
IoT	Internet of Things
IRU	International Road Transport Union
IT	Information Technology
JTM	Just Transition Mechanism
JU	Joint Undertaking
LCV	Light Commercial Vehicles
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MaaS	Mobility-as-a-Service
MINT	Mathematics, Information Technology, Natural sciences, Technology

OECD	Organisation for Economic Co-operation and Development
OSH	Occupational Safety and Health
RMMS	Rail Market Monitoring
R&D	Research and Development
SERA	Single European Railway Area
SAS	Safer Autonomous Systems
SJ	Statens Järnvägar (national railway company of Sweden)
SNCF	Société Nationale des Chemins de fer Français (national railway company of France)
SSDC-MT	Sectoral Social Dialogue Committee in Maritime Transport
STC	Scheepvaart en Transportcollege (Shipping and Transport Academy)
STCW	Standards of Training, Certification and Watchkeeping
STEM	Science, Technology, Engineering and Mathematics
TaaS	Transport-as-a-Service
TEN-T	Trans-European Transport Network
TFEU	Treaty on the Functioning of the European Union
TGAIN	Track Guidance Assistant Systems in Inland Navigation
TRAN	Committee on Transport and Tourism in the European Parliament
TSI	Technical Specifications of Interoperability
UITP	Union Internationale des Transports Publics (International Association of Public Transport)
UK	United Kingdom
ULCS	Ultra Large Container Ships
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development

UNIFE	Union des Industries Ferroviaires Européennes (European Rail Supply Industry Association)
USA	United States of America
USD	United States Dollar
UTM	Unmanned Traffic Management
UTP	Urban Public Transport
UITP	International Association of Public Transport
VET	Vocational Education and Training
eVTOL	electric Vertical Take-Off and Landing
WESS	Working Environment in the Shipping Sector

LIST OF BOXES

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

This study examines the main trends, challenges and opportunities in the EU transport labour market, focusing on the transport modes of road, automotive, rail, maritime, inland waterways and air transport. It is based on a review of relevant literature and statistics as well as 18 interviews with stakeholders, carried out between July and October 2023.

Trends and challenges

- Economic and labour market trends, such as the evolution of new forms of mobility have resulted in transport activities over the past decades experiencing **employment growth across all modes.** Employment in transport is also expected to increase in the future.

- Demographic factors such as the relatively **higher average age** of workers in the sector, **increasing demand for labour** and **lack of attractiveness of jobs** for younger people and women, mean that transport companies across all modes have started to recruit workers from other EU countries. Recruitment has increasingly also **targeted third country nationals**, often with the support of labour intermediaries or agencies.

- This development has also been triggered by **increased competition based on costs** and in particular labour costs. This is particularly the case in international road freight and coach transport, civil aviation and international rail freight transport.

- This increased labour cost-related competition has further worsened the image of transport sectors and the attractiveness of working conditions. It has also had a **detrimental effect on regulation and improvement of working conditions through social dialogue** at EU and national level and collective bargaining.

- **COVID-19 and the Russian war of aggression against Ukraine** have had a significant impact across the entire transport sector. Labour shortages have now worsened in many transport modes after the pandemic and modes such as rail have suffered from higher electricity prices as a result of the war.

- The impact of **digitalisation and automation** is likely to increase during the next 10-15 years as disruptive technologies and processes such as automatic operation and artificial intelligence mature. Digitalisation and automation also have a **significant impact on skills needs and occupational profiles** in transport.

- **Decarbonisation and expected changes in the share of different transport modes** will have a significant impact not only on future workforce requirements, but also on company investment in fleets and infrastructure.

Current and future opportunities

- Decarbonisation and the anticipation of a reduced market share of **road freight transport** provide opportunities to correct market failures and enhance the image and attractiveness of this transport mode by improving pay and working conditions.

- Strong current trends in **urban mobility** and interconnected mobility services bring many new business and employment opportunities. If a strong and pro-active public policy framework is in place, the transport sector could become a strong backbone of smart, sustainable and just mobility.

- The future of **rail transport** is aligned with the EU's policy strategy and future innovations are expected to drive further growth in the rail sector. Digitalisation and interoperability of

technical standards will need a skilled workforce, requiring modern training facilities and attractive working conditions. The railway sector benefits from a strong social dialogue and collective bargaining at both national and European levels.

- The **maritime sector** is undergoing significant transformation, with new greening technologies applied to ships and automation increasingly applied in terminals. The need for transversal skills is growing, but automation and digitalisation will make the profile of maritime worker more appealing and provide opportunities for gender diversity.

- **Inland waterway transport** has potential to enhance multimodal transport and improve environmental performance. However, ensuring sustainable growth requires an adequately trained workforce. The deployment of automated vessels and digital navigation tools can address labour shortages, but stakeholders hold different opinions on the future of automation.

- The **aviation industry** is evolving and its modernisation is key to meeting environmental targets. Future workers will need skills in information technology, data management, cybersecurity, and communication to adapt to new business and operating models. Predictive algorithms will be important for complex systems management, including interactions with lower air space, and maintenance of very high safety levels. Emerging services, such as electric Vertical Take-Off and Landing (eVTOLs) aircrafts and drones, will create employment opportunities.

Best practices

- **Identification of future skills needs** is most prominent among good practice measures addressing major trends and challenges. This focus is closely related to business needs and the need to maintain workforce employability. Accordingly, most transport sectors have created large sectoral Blueprint consortia on the development of future skills needs as co-funded by the Erasmus+ programme.

- **Most good practices at European, national and sector level have been developed in transport modes that are characterised by stronger social dialogue and collective bargaining at sector level**. The agreement of the railway social partners on the promotion of more female workers and the binding agreement to establish company-level diversity and gender promotion policies in 2021 is an example of the **concrete added value of European-level social dialogue**.

- **Increasing the attractiveness of transport jobs and addressing the severe labour shortage of drivers** as well as other occupations so far has only been addressed by company or business-led practices that mainly aim to improve the image of the sector.

Cross-cutting policy recommendations

- Policymakers should look for ways of encouraging and strengthening the prioritisation of **quality in terms of working conditions and working environment.** This could take the form of engaging with the social partners.

- **More ambitious approaches on skills and qualifications** should be developed, in the light of the influence of automation and digitalisation.

- Policymakers should consider putting into place **a framework that encourages active support for job seekers**, with a particular focus on vulnerable groups.

- Given the similarity of the challenges faced by the different transport modes and the trend towards connected mobility, **more intersectoral coordination, exchange and cooperation between sectoral social dialogues in the different transport modes** would be useful. There should be greater **regulation of the employment practices of emerging mobility and logistics services and platforms**.

- The EU should ensure **more effective implementation of existing social rules** and there should be **better regulation of atypical forms of work.** Policymakers should **consider the creation of a chamber system in transport** to find more common ground and joint working between business and worker representative organisations.

Specific recommendations for transport modes

Road transport

- Measures need to be taken to **stop exploitative labour practices in the sector**, which affect in particular workers from Eastern European and third countries. Steps also need to be taken to improve the attractiveness of the sector to the younger generation and to women: **in the case of bus and coach driver jobs, the labour shortage is now urgent.**

- Policymakers at EU and national level should **consider tightening the labour regulation of the sector to improve working conditions.**

Rail transport

- Policymakers and stakeholders at EU and national level should **consider whether the ambitious goals set out by EU policy are achievable within the set timeframes** or even if they are feasible on the basis of current railway policies at EU and national level.

Maritime transport

- Policymakers should also **consider amending EU legislation on social security in order to create a level playing field with shore workers.**

Inland waterways transport

- **The competence framework for the sector needs to be updated in the coming years** as more projects deploying automated and greener vessels will be implemented in the future.

- **An action plan is needed for long-term skills transition.** This action plan should specifically focus on how to increase the attractiveness of the sector to the younger generation and people with the skills which are required in the future.

Air transport

- In the light of new working conditions, **policy makers should continue to monitor employment relationships of pilots and cabin crews that are based on alternative employment and temporary work**, via intermediaries, such as temporary employment agencies.

- Working conditions of ground handlers are not properly regulated at EU level. Policy makers should therefore consider a **dedicated Regulation on minimum levels of working conditions.**

INTRODUCTION

Background to the study

With more than 10 million employees, the different transport modes and related sectors such as warehousing and logistics contribute to around 5% of employment in the EU's labour market. These employees work in a broad variety of transport specific occupations such as drivers, pilots, traffic signallers, controllers, mobile service staff and crews as well as a broad range of other occupations across a range of qualification levels.[1] All transport modes are currently experiencing a profound transformation due to new disruptive technologies related to digitalisation, automation and big data/Artificial Intelligence (AI). At the same time, transport and mobility sectors are a key element of the transition towards decarbonisation and an environmental cleaner mix of different transport modes, including the transition towards electrification.

This twin transformation/transition will have significant effects on the business as well as the workforce, including growth potentials in sectors such as rail that already have favourable carbon footprint and others such as road or air transport expecting a reduced share in the model split in the future.[2]

The Commission's Communication on a [Sustainable and Smart Mobility Strategy](link), published in 2020, recognised that the sustainable and smart transition will not be possible without the support and buy-in of transport workers. According to the Commission, "*credible path is needed for the just transition for transport workers*". The Commission would also "*consider measures (…) to strengthen the legislative framework on conditions for workers and ensure the correct implementation and give more clarity on the applicable social rights*".[3]

Approach and methodology

This study is part of a research project that aims to inform Members of the TRAN Committee on the subject of trends, challenges and opportunities in the EU transport labour market.

The study identifies key trends affecting the transport labour market in different transport modes and describes the challenges and future prospects for transport workers in terms of workforce development, working conditions, skills needs and factors related to the implementation of EU regulation and policy goals. Further, by highlighting good practice experiences, the study identifies opportunities for the transport workforce as a result of the current situation of digitalisation and automation as well as of the transport related climate policy goals at EU and national level.

Covering all transport modes and providing an overview of main trends, challenges and opportunities in a concise manner, the research is based on factual evidence-gathering, both quantitative and qualitative, and includes the views of a range of key stakeholders. These were gathered in the context of structured interviews representatives of employer and business organisations and associations as well as representatives of trade union organisations at EU level.

Interviews focussing on assessments of stakeholders as regards main trends, challenges as well as opportunities and best practices in the transport labour market were carried out between July and October 2023 with 18 interviewees from employer and trade union organisations in eight transport modes (air, maritime, inland waterways, road, rail and urban public transport, logistics and automotive).

---

[1]   According to data of 2020 from European Commission DG MOVE Transport in Figures and Eurostat. See also [here](link).
[2]   See for example: (Schröder-Hinrichs, J. et al., 2019).
[3]   See European Commission 2021, [Sustainable and Smart Mobility Strategy](link) (European Commission, 2020).

Overview of the study

This study is structured into the following chapters.

- **Chapter 1** discusses trends and challenges on a sector-by-sector basis, focussing on economic, technological and social trends and issues in areas such employment and workforce development, working conditions, skills or implementation of EU policies and rules.
- **Chapter 2** discusses current and future opportunities of the different sector modes in relation to the twin change situations of transformation and transition.
- **Chapter 3** presents best practices that were put in place or are planned in order to address challenges as highlighted by stakeholders in the different transport sectors.
- **Chapter 4** provides for a concise overview of EU rules and regulation in the field of social and employment policy in the different transport sectors.
- **Chapter 5** summarises key results and presents key policy recommendations that emerge from the research.

1. RELEVANT TRENDS AND CHALLENGES

KEY FINDINGS

- Due to economic and other trends, as well as the evolution of new forms of mobility, **transport activities** over the past few decades have **experienced employment growth across all modes**. Employment is also expected to increase in the future.

- Due to demographic factors (i.e., high average age of workers), increasing demand for labour and a lack of attractiveness of transport jobs for the younger generation, **transport companies across all modes have started to recruit workers from other EU countries and increasingly also third country nationals**, often with the support of labour intermediaries or agencies.

- This development has also been triggered by **increased competition based on costs**, in particular labour costs. This is the case in segments such as international road freight and coaches, civil aviation and increasingly international rail freight transport. **The increased competition on labour costs has worsened the image of transport sector and the attractiveness** of working conditions, as well as their regulation and improvement by social dialogue at EU and national level and collective bargaining.

- **Digitalisation and automation are strong trends in all transport segments** and are likely to have a strong impact over the next 10-15 years, when disruptive technologies and processes such as automatic operation and artificial intelligence mature.

- **Digitalisation and automation impact strongly on skills needs and occupational profiles** in transport and the competition for young talent in engineering, MINT (mathematics, information technology, natural sciences, technology) and IT jobs will become stronger. At the same time manual workers in technical positions, operation and infrastructure face upskilling needs in relation to IT and transversal skills. Decarbonisation, and the expected change of the share of different modes, will impact on current and future workforce requirements with particularly strong impacts on road transport but also maritime and inland waterways.

- In the **automotive sector, fewer workers will be needed in production** and there is a need for company-related and regional structural policies and measures to organise just transitions. Putting into place measures that implement the goals of sustainable and smart mobility and **organising just transitions for workforces in transport will require stronger coordination, legal frameworks and guidance at EU level**. This need also emerges from recent crises such as Covid-19 and the Russian war of aggression against Ukraine and the related needs of resilience and contingency planning.

1.1. Road transport, including urban public transport, mobility and logistics

Road transport consists of various transport modes: private cars, taxi, bicycles, light commercial and heavy-duty vehicles (LCVs and HDVs), city buses and long-distance coaches. Road transport is essential to the economy in terms of its contribution to GDP as well as employment. As shown in Table 1, the modal share of commercial road transport in 2021 was 54% in freight and 78% in passenger transport. The sector employs around 5.2 million people in the EU and therefore is by far the single largest transport sector in terms of employment. With an employment growth rate of more than 15% between

2012 and 2020, road transport also experienced the strongest growth in terms of employment of all transport modes (Transport in Figures 2022).

Table 1: Commercial road transport in figures

Trends	
Employment	**Enterprises**

Performance			
Mode	**Turnover (2019, EUR million)**	**Transport activities (2021)**	**Modal share (2021)**
Freight	361,109	1.863 billion ton-km	54.3%
Passenger	132,249	3.742 billion pax-km	78.3%
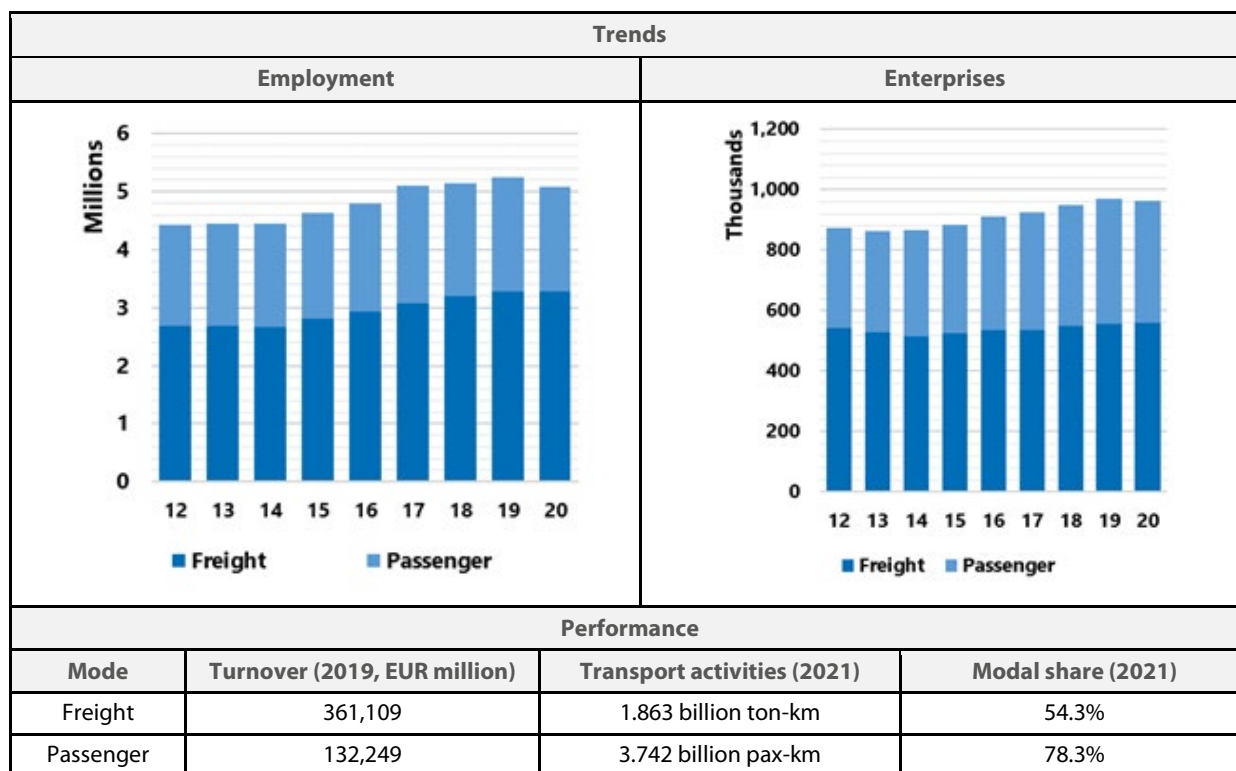
Source: elaboration of the authors based on European Commission Statistical Pocketbook and Eurostat database

Demographic factors such as the increase in the average age of road transport workers, and digitalisation, **automation and electrification are the main trends**, together with changes in urban mobility and the push for a modal shift (e.g., from road to rail, urban public transport, walking and cycling). Changes in consumption patterns (more online shopping) and the resultant increase in demand has accelerated change in urban mobility and logistics or delivery services.

The **average age of truck drivers is high** with more than one third of them being over 55.[4] There is a **low share of young drivers under 25 years of age** (6% for freight and 5% for passenger transport), despite high youth unemployment in many countries ((IRU, 2022c) and (IRU, 2022d)). **Women also make up only a small percentage of truck drivers**, despite significant levels of female unemployment in some countries. Spain, for example, has one of Europe's highest rates of female unemployment (14%), yet one of the lowest shares of female truck drivers (2%), in contrast to a comparable share of female bus and coach drivers (12%) (see also Figure A.1 and Figure A.2). According to data gathered by the International Road Transport Union (IRU), without action to make the driver profession more attractive, the EU could lack over 2 million drivers by 2026, impacting half of all freight movements and millions of passenger journeys.

As shown in Figure A.3, emerging from results of a recent IRU company survey, more than 82% of bus and coach companies in Europe have severe or very severe difficulties to fill in driver positions. For 2023, the IRU estimates that 105,000 bus and coach driver jobs are unfilled in Europe (IRU, 2022b). As highlighted by interviewees and reports by sectoral organisations such as IRU or the International

---

[4]   A study from the World Bank identified other causes that could be related to the shortage of truck drivers. They include the country's level of economic development, the salary offered to the worker and lack of opportunities for vocational training that can be provided by the enterprises (McKinnon, et al., 2017).

Association of Public Transport (UITP), **the challenge of labour shortages was a problem for the sector before 2020 but worsened significantly during the Covid-19 pandemic**. According to IR ((IRU, 2022a) and (IRU, 2022b)), this was particularly relevant for commercial road transport operators and urban public transport, which suffered from the health-related and mobility restrictions enforced by governments. This has resulted in income losses for drivers and workers, who have left the sector and not returned after the pandemic.

Addressing the challenge of driver shortage and making both the passenger and freight sectors more **attractive to young workers and women** will be the most important challenges in the coming years. In this context, the social partners in the road transport sector have highlighted the following challenges-and related tasks as particularly important:

- Attracting young recruits to the road transport and increasing the proportion of female workers in the sector;

- Improving vocational training and skills development in the sector and simplifying access to the profession of driver;

- Improving working conditions and addressing new challenges in relation to the quality of work and working conditions in the rapidly growing urban commercial mobility and logistics sector; and

- Creating a sustainable balance between market interests and social conditions.

According to the European Transport Workers' Federation (ETF), a **key challenge is therefore making the road transport sector more attractive** for those groups that are currently underrepresented (young workers and women)[5]. There is also a need to **improve infrastructure and the lack of proper facilities, long working shifts, precarious work and social dumping**, which mean that the profession of driver is not seen as attractive.

Box 1: Truck drivers protests in Graefenhausen (September 2023)

In September 2023, and for the second time, more than 160 truck drivers took action lasting several weeks in protest at a service station of motorway A5 in Graefenhausen, in the German federal state of Hesse. The drivers of a Polish haulage company, transporting freight and foodstuffs for German companies, including well-known freight and logistics companies, were engaged in the protests. The drivers came from Georgia, Uzbekistan, Tajikistan and Ukraine, among other countries. The workers have been waiting for months for outstanding wages and have stopped working because they were not paid by the employer. As reported by the media, drivers at the end of September went on hunger strike to highlight the desperate situation.

Source: various German press articles (September 2023) and press statement of the German trade union ver.di.

The Graefenhausen case illustrates the prevalence of **abusive working conditions in international road transport** that, according to various research reports and social partners in the sector,[6] have worsened since the beginning of the 2000s. Business models have emerged that play an important role not only in international road transport, but also in other industries, such as seasonal agriculture, the construction industry and domestic care. In this context, the use and exploitation of workers from third countries is playing an increasingly important role.

---

[5]   It needs to be noted that women are much less likely to work in the road transport sector. In 2021, in Europe, less than 3% of women were involved in truck driving, while for bus and coach driving, the percentage dropped from 16% in 2020 to 12% in 2021.

[6]   One example is a report published jointly by the Danish social partners in transport on the issue. See (DTL and 3F, 2015).

During the past decade and triggered by a combination of different societal, technological and other factors (e.g. the Covid-19 crisis), **new services and business models in urban mobility and logistics** have emerged that have created new business and employment opportunities around Mobility-as-a-Service (MaaS) and Transport-as-a-Service (TaaS): digital platforms and apps for existing and new mobility offers, platforms for freight exchange or on-demand ride-hailing services; by car and cycle sharing, ride hailing services, ride-sharing, electric scooters, etc. (EU Commission 2021: Staff Working Document EU Urban Mobility state of play. Staff Working Document accompanying the Communication on The New EU Urban Mobility Framework). As analysed in previous research e.g., by Eurofound and highlighted in the resolution of the European Parliament of May 2023 on the issue, the emergence of new urban mobility services and activities have created new opportunities for business and employment (in particular for young people and disadvantaged groups) and work in urban spaces but also have raised questions regarding the quality of jobs and working conditions (see also Figure A.4).

The emergence of new services in the context of first mile and last mile delivery,[7] transport and logistics in urban spaces more recently have also been addressed by initiatives to foster change in rural public transport as illustrated by the EU Commission's Communication on a long-term vision for Europe's Rural Areas in 2021 or the "Barcelona Declaration" of the informal meeting of EU ministers of Transport under the Spanish EU Council Presidency in September 2023.

These changes and new commercial transport and logistics have also had a strong impact on **public local transport** which has already been impacted strongly by digitalisation and automation in recent years (see for example the results of a joint project of the social partners in the UPT sector UITP and ETF). An even stronger impact on public transport in terms of workforce development and demand is expected because of the implementation of goals and targets related to decarbonisation of urban bus fleets (Clean Vehicle Directive, Clean Bus Deployment Initiative) and the shift toward electromobility in combination with the policy goal of increasing the share of active and collective mobility in urban areas.

Reaching climate neutrality will have a significant impact on road transport. The EU framework as defined in measures and goals set in accordance of the 'Fit for 55' initiative on the ending of ICE driven cars by 2035 and alternative fuels infrastructure deployment targets (AFIR) will result in significant changes in road and urban mobility,[8] new mobility services, promotion of innovation, improved active mobility infrastructure, and better accessibility and affordability. In addition, passenger transport, logistics and delivery services are likely to change radically in the future.

As regards the future labour market in public transport activities, a key question is also related to the respective roles of transport activities carried out by public transport providers and operators versus private, commercial providers. As highlighted in a recent research report, the old dichotomy between private and public transport already has become blurred and may disappear in the future, because automated on-demand services are flexible and more geared to individual needs than conventional public transport services. Thus, also from the perspective of policy making and regulation there might be a need to address a situation where "*private transport becomes public while public transport becomes private*." (Weert & Knie, 2023)

---

[7] In relation to last mile delivery services, it should be noted that there are labour implications for the huge growth in online retailing and food delivery services. The expected speed of delivery and increasing use of cargo cycles for this purpose is reducing labour productivity and drawing large numbers of casual workers into this sector. Moreover, 'crowd shipping' is another phenomenon which has been attracting ordinary citizens as workers in part-time courier roles.

[8] On sustainable urban mobility for TEN-T see here.

When it comes to **logistics, delivery services and platforms**, challenges highlighted by trade unions[9] stem from poor regulation of the sector despite its size, in terms of creating a level playing field for competition and the lack of protection of workers. Interviewees in this context have referred to the practices of many well-known firms that are systematically using outsourcing, agency work and bogus self-employment as an alternative to direct employment to increase profits at the expense of workers' job security and social protection. Furthermore, unions note that logistics workers too often face low wages, precarious work and low levels of representation in the workplace. They also state that the health and safety of workers in this sector is jeopardised by new digital and automation tools that constantly monitor their productivity and increase their workload and stress levels (e.g., by social rating elements and untransparent algorithms).

In the road transport sector, in general, but in logistics in particular, the negotiation of **collective bargaining agreements between trade unions and employers** is a specific challenge in most EU countries, including collective bargaining with large global logistics companies and mobility providers. In order to improve working conditions and inform workers (who often have a migrant background or come from disadvantaged groups) about their rights, train them properly and create motivating working environments, collective bargaining should be considered. A **more active public policy approach** would also be necessary to address the challenge that the rapidly increasing activities in the context of new urban mobility services and logistics business are not regulated by coherent policies at national or EU level.

1.2. Automotive transport

The EU is among the world's largest producers of motor vehicles and the sector represents the largest private investor in research and development (R&D). Around 2.4 million people work in direct manufacturing of motor vehicles, representing 8.5% of total EU manufacturing employment according to the European Automobile Manufacturers' Association (ACEA). **Digitalisation, automation and electrification are the main trends for this sector**, together with changes in urban mobility and the push for a modal shift (e.g., road to rail, to urban public transport, to active mobility such as walking and cycling). There is also a need to look at infrastructure that is poor in terms of meeting the demands of e-mobility or active mobility (e.g., reducing road lanes for cars and car parks in favour of cycle lanes).

Changes in consumption patterns (more online shopping and the resultant increase in demand for accelerated delivery services) **are also having an impact on the automotive sector**. Reaching **climate neutrality** for road transport means following the electrification pathway and exploring energy sources considered more environmentally sustainable. According to estimations, about 100,000 jobs are at risk due to the shift to electric vehicles by 2025 (Tamma, 2022) and up to half of a million of jobs are expected to be lost by 2030.

According to a recent research report, **automotive manufacturing is certainly going to suffer from electrification, automation and robotisation processes**: first, electric vehicles are much less labour-intensive than traditional vehicles. It has been predicted that about 100,000 job losses are expected in the manufacturing industry as electricity and alternative fuels become increasingly widespread, eventually covering 100% of the road market. The **digitalisation of the industry will also strongly impact sales and maintenance personnel**, as operations will increasingly take place online, thus requiring fewer workers and consequently having an impact on future employment. While many new jobs related to battery production, software development and charging infrastructure operations will

---

9   See ETF (2023). Manifesto for Logistics Workers. 18 August 2023. See here.

be created, there is less clarity around the levels of compensation that will be provided for the transition from the internal combustion engine to electric vehicles.[10]

According to the Automotive Skills Alliance (ASA) part of the Pact for Skills, launched in 2020, environmental and digital trends were already impacting around 15 million Europeans in the industry as of that year, due to both Covid-19 and new European environmental requirements. The **demand for a higher level of education and training is particularly striking** when it comes to engineers, software developers and sourcing experts. It has been reported by Cedefop that medium-skilled technical jobs (metalworkers, electro-engineering workers) are decreasing, while highly skilled technical jobs (researchers, engineers, ICT professionals) are increasing.[11]

1.3. Rail transport

The rail sector is of great and growing importance due to a range of environmental, economic, societal and technological factors. Being by far the most environmentally friendly mode, it makes sense to strengthen and expand the rail sector to fulfil the commitments of the European Green Deal; if the EU is to achieve a 90% reduction in transport-related carbon emissions by 2050, the share of rail in passenger and freight transport needs to increase substantially. According to the targets set by the Commission's Sustainable and Smart Mobility Strategy, high-speed rail traffic across Europe should double by 2030 and rail freight transport should double by 2050. Furthermore, by 2050, a fully operational, multimodal trans-European Transport Network for sustainable and smart transport with high-speed connectivity should be in place.

Table 2: Rail transport in figures
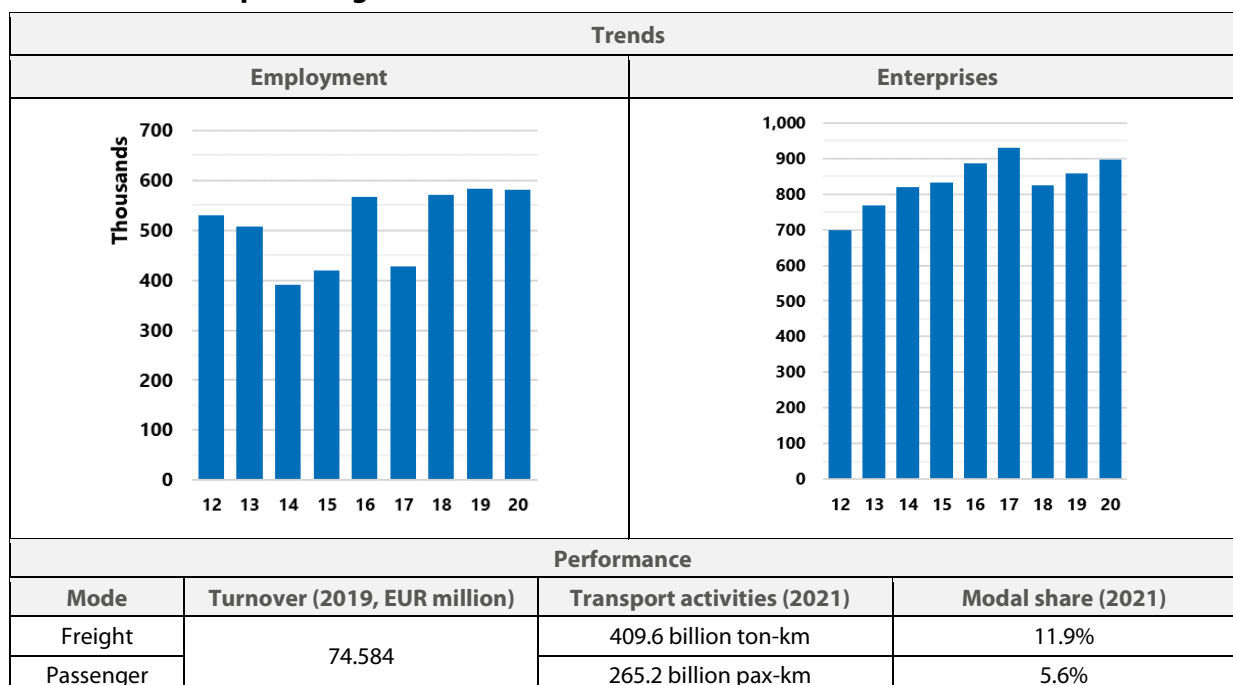
Trends	
Employment	Enterprises

Performance			
Mode	Turnover (2019, EUR million)	Transport activities (2021)	Modal share (2021)
Freight	74.584	409.6 billion ton-km	11.9%
Passenger		265.2 billion pax-km	5.6%

Source: compilation of the authors based on European Commission Statistical Pocketbook (various years)

According to the latest available EU data, there were 910,000 people employed in the EU27 railway sector in 2020[12]. According to data gathered in the context of the EU Rail Market Monitoring (RMMS),

---

[10] CLEPA, IndustriAll Europe et al. (2021). Delivering the Just Transition: the social gap in the Fit for 55 package for automotive workers and workers in the wider mobility eco-system, December 2021 (see here).
[11] See (CEDEFOP, 2021), also available here.
[12] See Commission's market monitoring report on the rail market (page 14). See also from Figure A.6 to Figure A.8.

employment in railways between 2015 and 2020 increased most strongly in France and Germany, more moderately in Austria, Belgium, Sweden, and Norway but stagnated or decreased in 20 of the EU28 Member States (see Figure A.5).[13]

Key trends in railways are related to demographic factors, digitalisation and automation, rail market developments and decarbonisation.

On demographic trends (see Figure A.8), the rail sector is characterised by an ageing workforce and a predominance of male workers: an average of well above 40% of the railway workforce in the EU27 will retire in the next 10 years. Only 21% of the railway workforce are female and in major occupational groups such as train driving or traffic management the share is much lower.

On digitalisation and automation, they will not only substantially affect operational processes and customer relations but will also result in new emerging business models and market areas in the field of future mobility. Research results and stakeholder surveys[14] on the impact of digitalisation and automation in railways show that routine administrative tasks such as accounting, payrolling and other human resource (HR) functions were the first to be replaced by machine work and/or automated processes. With the emergence of digital tools (and the required infrastructure), tasks relating to ticket sales and inspection were also automated. Due to automation, artificial intelligence and machine learning, digitalisation is now increasingly affecting more complex technological tasks in operation, maintenance of rolling stock, and infrastructure development and maintenance. Digital tools may therefore substitute human activities related to wagon inspection, break tests, coupling, and traffic management and control, as highlighted by railway stakeholders.

Rail market liberalisation and Single European Railway Area: In contrast to the aviation and road transport sector and due to the more complex nature of railways, the unbundling of the railway network and opening of passenger and freight rail operation services for competition started later and still is an ongoing issue.[15] The process of liberalisation was initiated by [Directive 91/440/EEC](#) and established the requirement to guarantee non-discriminatory access to the railway track by independent companies. Since then, four legislative packages were adopted between 2001 and 2016 with provisions liberalisation and competition in the rail freight and passenger operation. Besides the market pillars of the railway packages, there have also been provisions on harmonisation of technical and operational rules (technical pillar) that should foster the development of a Single European Railway Area (SERA). It should be noted here that the effects of rail market liberalisation and increased competition on achieving goals in relation to interoperability, efficiency and quality as well as attracting more customers is still a very contested and controversial issue between stakeholders such as the large incumbent railway undertakings, private competitors and trade union organisations.[16]

When it comes to **decarbonisation**, railway stakeholders such as the Community of European Railway Operators and Infrastructure Management Companies (CER) welcomed the reform of the EU Emissions Trading System (ETS) as one important measure of the 'Fit for 55' package. The gradual extension of the ETS to emissions from all transport modes is regarded as helping to create a level playing field across all modes of transport. CER also underlined that ETS revenues must be invested in climate-

---

[13] As noted earlier, there is a lack of reliable and more detailed data on the railway workforce that makes difficult to monitor the railway labour market more accurately. One reason is the fail to reflect the increasing heterogeneity of the railway market due to liberalisation and restructuring. In this new context, the railway undertakings created divisions for different types of services and/or outsourced services to companies operating in other sectors that are not (or only partly) reflected in national data that eventually feed into the European statistics ((Shift2Rail, 2019) and (Voss, 2022)).

[14] EDA Rail Project of ETF and CER as well as surveys in the context of the STAFFER Erasmus Blueprint project.

[15] See also (Scordamaglia & Katsarova, 2016), also available [here](#).

[16] See for (ETF, 2021), also available [here](#).

friendly activities, low-carbon technology deployment and energy efficiency in transport, including in railways. It is also appreciated that the social impact of carbon pricing is addressed by establishing the Social Climate Fund to support vulnerable households, micro-enterprises and transport users. This is also likely to encourage a shift to public forms of transport and improve multimodality and energy-efficient, zero-emission forms of mobility that is affordable.[17]

Key challenges of the railway sector are linked to the expectation of expanding rail transport volumes and extension of high-speed lines, long-distance cross-border railways and digitalisation of command control and signalling (i.e. ETCS and ERTMS) as the key enabling technology for the Single European Railway Area.

First, if the objective is to give the railway sector the strategic role it deserves for the green transition of transport, the **current infrastructure needs to be extended and modernised**. As highlighted by CER[18], the existing infrastructure in freight and passenger rail is not matching the current demand and this is not taking into account the requirements in relation to EU goals of expansion of high-speed railways and rail freight transport or the acceleration of the ERTMS deployment on the TEN-T network. As noted by CER, the experience of strongly increasing passengers on new high-speed railway connections in countries such as Spain, Italy, France or Germany show that high-speed inter-city connections are highly attractive for customers.

However, according to the most recent statistics from the European Commission[19], the total length of railway lines in use in the European Union in 2020 was 200,099 km while it was 204,149 km in 2010. There are also doubts about whether in the current situation public investments in railways will be increased as in recent years the renovation of infrastructure has slowed down. Furthermore, there have been doubts about whether concrete goals in relation to key elements of the Single European Railway Area are feasible in the expected timeframe (e.g., extension of lines that are equipped by a harmonised ERTMS CCS system[20] or the deployment of the digital automated coupling (DAC)). According to railway stakeholders, the significant investments in infrastructure and the digitalisation of railways that will be required in the coming years will not be possible without stronger public support. This is also due to the fact that railways have suffered more than any other transport mode from the Covid-19 crisis, as well as the increase in energy costs due the Russian war of aggression against Ukraine.[21] According to CER, and comparing rail with road transport, the price for electricity due to the war has increased much more than the price for diesel, putting railway in a disadvantaged position.

Appreciating the human factor in railways: Whilst high-level partnerships between the EU and key stakeholders in railway operation, infrastructure, and rail supply industries (including the Shift2Rail Joint Undertaking, now Europe's Rail) have been established to harness the potential of digitalisation and automation and to develop and deliver technical solutions, architectures, and standards on a European scale, there is quite a striking gap in these and other activities to promote digitalisation and automation: the human factor. Indeed, the needs and challenges facing the rail sector's workforce have been largely neglected so far.

---

[17] See also (CER, 2023), also available here.

[18] Based on interview carried out during the study.

[19] See (European Commission, Directorate-General for Mobility and Transport, 2022).

[20] See (IRG-Rail, 2022). In 2020, 16 countries reported ETCS-enabled routes. Luxembourg has the highest share of ERTMS/ETCS-enabled route length as almost all (98%) the network is compatible with ERTMS/ETCS. Besides Luxembourg, there are only four more countries with a share of ERTMS/ETCS-enabled route length higher than 10%: Switzerland, Belgium, Slovenia and Spain. In 2017, the European Court of Auditors commented that the targets set at 2030 for ERTMS deployment were not realistic (see here).

[21] See also (Railway Gazzette, 2022).

Challenges in relation to the railway workforce and current skillsets: From a high-level perspective, the question is how such numbers can be fully achieved while ensuring a smooth transition for the current and future rail workforce, which is going to experience major changes in terms of employment, skills and working conditions.[22]

The railway sector is already **struggling to attract workers with the necessary skills, and this will be intensified by the required green and digital transformations** with a strong need to up/reskill.[23] Skills shortages on the manufacturing side mostly relate to the shift towards the use of ICT systems, materials and production processes, whereas at the level of competence, most of the changes are correlated with Science, Technology, Engineering and Mathematics (STEM) jobs, together with new social, communicative and organisational demands (ETF, 2023).

For railway workers, the increased use of **new train control and operation systems will mean that drivers and other staff groups will have to acquire additional technical, IT and other skills, including for communication and foreign language,** to be able to cope with such developments. In fact, even if some trains will be able to run without drivers, there will still be the need to ensure jobs to manually operate or remote-control the train for security reasons.[24]

In addition, as the up/reskilling process requires huge commitments from employers, it is important to guarantee that those investing in skills are not disadvantaged. A standardised training mechanism could be a solution in this sense, combining the need to up/reskill together with a means of guarantee for companies. A smooth transition should also consider constant contact and integrated approaches with education and training institutions to prepare the future workforce. The above project reports that there are still no concrete mapping exercises for graduates entering the world of work, which means that workforce planning is very difficult.

The railway sector is experiencing significant **shortage of workers**. As in other sectors, this is due to the comparatively high average age of workers, a lack of recruitment initiatives in the past and a low share of female workers. In April 2023, the EFT highlighted a lack of staff for trains, especially with regard to train drivers (ETF, 2023). The ETF notes that this lack of staff is leading to a stressful situation for the remaining workers, who find themselves dealing with situations of psychological burn-out due to the burden of responsibilities to be handled with so few staff. **Working conditions** are crucial, first to create a more attractive sector: work shifts, work during unsocial hours, insecure contracts and low salaries impact negatively on the sectoral image, especially for railway workers, where the lack of work-life balance is even more prominent. (Voss, 2022). In this sense, social conditionality of EU funds should be applied to ensure support of high-quality jobs. If the sector was more attractive, it could focus on promoting a culture of professionalism among young people: new generations want to be specialists in their work and are more likely to commit to their work if they see that it is having an impact.

Another point to be mentioned is the **gender imbalance** in the sector's workforce, both in the case of transport and manufacturing. Currently only 20% of railway workers are women, a low percentage which was even lower before 2013, and which has only slightly increased thanks to awareness-raising activities undertaken by the social partners in railways ETF and CER and their national affiliates for several years. These activities of the social partners cumulated in the landmark agreement on "Women in Rail", which includes binding targets and measures at national level, signed in November 2021.

---

[22] See the deliverables produced so far in the context of the RAILSTAFFER Blueprint for Skills Partnership.
[23] STAFFER, European rail alliance discusses long-term strategy to address skill shortages in the sector (see here), 14 October 2022.
[24] Shift2Rail (2019). Bridging the Skills Gap for the Rail Sector: Analysis of Six Measurements and Recommendations, April 2019. See also STAFFER 2023: Future vision of the rail sector from the point of view of the rail supply industry. DELIVERABLE D2.2

However, lack of attractiveness of the sector and working conditions in railways may also result from of factors of influence. In this context there is a need for more research on the **impact of railway liberalisation on employment and working conditions**. The intensified competition as a result of liberalisation has transformed the railway system from a complex integrated system of providing a public service in the general interest to a competitive market driven by profit orientation. Increased competition has resulted in a worsening of working conditions and the development of practices such as sub-contracting, agency work, bogus self-employment and self-employed drivers. As current research commissioned by ETF shows, there are also developments that are cause for concern in the field of the quality of railway training and in relation to railway safety.

1.4. Maritime transport

Maritime transport is a global industry predominantly focused on freight, being around 80% of the cargos seaborne, according to European Commission and UNCTAD (UNCTAD, 2022). Nowadays, three-quarters of goods are dry cargos (i.e., bulk and containers) and the world's largest flows carried are between China and the USA, and their neighbouring countries. **For the EU's economy, maritime transport fulfils a key role, representing three-quarters of the external trade and one-third of its intra-EU movements** (UN, 2022). Maritime transport also plays a key role for passenger transport, especially to connect island regions, with **400 million passengers embarked and disembarked in EU ports** on annual basis.[25]

Maritime transport involves two economic sectors. Firstly, the public sector for infrastructures, dredging, security, and often port administration (via local authorities). Secondly, the private sector (i) provides commercial activities in the ports, operating specific facilities (e.g., piers, transhipment infrastructures) and (ii) operates the fleet of ships, which are commonly owned by private organisations. **The world's commercial fleet consists of around 100,000 vessels**. Analysis of the ITF shows that **the maritime operations of container shipping lines feature an increasing level of concentration** with four carriers managing 55% of sector's capacity in 2018, compared to 20% in 1998 (ITF, 2018). Alliances between organisations are also common[26], and they now account for almost all market share on the trades between Asia and northern Europe, compared to 50% in 2014. In particular, alliances between carriers have become a prominent characteristic of global container shipping (ITF, 2018).

---

[25] The TEN-T includes 329 seaports in the Core and Comprehensive networks.

[26] The main argument to establish cooperation between the carriers is the high fixed-cost structure of the industry. The provision of a long-distance weekly services (i.e., between continents) requires investment in a fleet that sails regardless of its utilisation rates. Collaboration between carriers mitigates the problem and creates economies of scale and scope (ITF, 2018).

Table 3: Maritime transport in figures

Trends	
Employment	**Enterprises**

Performance[27]			
Mode	**Turnover (2019, EUR million)**	**Transport activities (2021)**	**Modal share (2021)**
Freight	122.743	932.7 billion ton-km	27.2%
Passenger		13.8 billion pax-km	0.3%

Source: compilation of the authors based on Eurostat database and European Commission Statistical Pocketbook

The **population of maritime workers** consists of employees in three sectors. Firstly, the workers employed in maritime transport activities. According to Eurostat data presented in Table 3, they represent four sectors, such as (i) sea and coastal passenger water transport, (ii) sea and coastal freight transport, (iii) renting and leasing water transport equipment and (iv) building and leasing water transport equipment. Over the past decade, their number has **increased from 300,000 to 333,000**.[28] Eurostat data show that the **number of enterprises, across these sectors fluctuated around 24,000**, with the larger increase observed for enterprises providing sea and coastal passenger water transport. The analysis of the four sectors also shows that the population of workers between 40 and 64 years was larger than that between 15 and 39 years and male workers represent the vast majority of the workforce (i.e., 80%). **For the ports**, **European Commission data** report 1.5 million workers directly employed and the same number indirectly employed across 22 Member States operating maritime transport activities. **For the seafarers**, EMSA's statistics of 2021 report a population of 182,000 workers at EU level (see also Figure A.14). As noted by stakeholders interviewed for this study, the ageing of the seafarers is not currently a problem. EMSA's data show an average age of 44.3 years with a relatively even distribution by group, each between 18,000 and 28,000 workers (i.e., 10-15% of the total). In terms of the gender breakdown, seafarers are predominantly male (97.6%).

The review of the technological trends shows for the ports an increasing level of automation and mechanisation, which has led to workers working from secure compartments and control rooms and removal of personnel from the quays, and subsequently creating a lower risk working environment (FEPORT, 2018). For example, since the early 2000s, technological trends have been influenced by container ships gigantism (e.g., Ultra Large Container Ships), which has pushed terminals operators and its workforce to meet the challenges of larger vessels, larger call sizes and required them to adapt

---

[27] Only domestic and intra-EU-27 transport.

[28] The annex provides detailed figures with a breakdown by relevant category. See from Figure A.10 to Figure A.13.

equipment and productivity (Sanchez, et al., 2021) (see also Figure A.16). The **automation trend has involved different types of port terminals**,[29] but the trend for big container terminals has been stronger for unitisation of cargos and highly capital-intensive and complex processes involved ((FEPORT, undated) and (ITF, 2021)).[30] This trend has created a **modern work environment eliminating monotonous manual labour and introducing supervision activities** using sophisticated equipment. According to FEPORT, the transition to automation and digitalisation of the ports is **driving a shift from low-/medium- to high-skilled jobs**.

Training standards of port workers have been improving along with the deployment of modern equipment for port operations. However, training programmes in the EU are still heterogeneous and diverse at national, regional and company level. At international level, the International Labour Organisation (ILO) has two Conventions for training of port workers and health and safety training in port work (i.e. ILO 137 Dock Work Convention and ILO 152 Occupational Safety and Health (Dock Work) Convention, respectively). ILO conventions provide for a basic level of training, which is surpassed by the standards valid in the EU.

Automation and digitalisation trends also enable port operators to perform more sustainably. As automated equipment is usually electrically powered, this reduces environmental factors, such as local pollution and noise. Moreover, the **use of electrical and automated transfer vehicles is an increasing trend**, which is expected to continue, because internal transport in non-automated port terminals is one of the least efficient and costly processes. **The greening of ships is another important trend**. Historically, maritime transport has been powered by low-quality fuels (i.e., 'bottom-of-the-barrel' products). However, the European Commission's initiatives, such as the FuelEU Maritime initiative of the 'Fit for 55' package for a transition to zero carbon emissions are changing the sector's fuel profile. The **uptake of alternative fuels is advancing,** with Liquefied Petroleum Gas (LPG) gaining more acceptance as a viable solution for bridging towards ammonia, and compared to Liquefied Natural Gas (LNG), which is more problematic and expensive. **Electrification of ships for short-distance services seems also promising**. When it comes to the trend for **adjusting the skills for seafarers and ports' workers to cope with environmental goals**, the literature shows that the pace of decarbonising technologies will be gradually accelerating, with a slow uptake of alternative fuels in the 2030s, and a steeper uptake from 2040. In-depth skills for complex systems onboard are becoming more widespread, including new abilities to (i) perform safe vessel and equipment maintenance with more hazardous fuels on board, (ii) master new bunkering methods and (iii) operate hybrid and zero-emission machinery ((SKILLSEA, 2022) and (Kaspersen, et al., 2022)).

In terms of **challenges**, when compared to the other transport modes, **the maritime transport sector does not seem severely hampered by the problem of personnel shortage,** although it should be noted that a substantial share of seafarers comes from non-EU countries and that it increased from 30% to 41% between 2017 and 2021, according to EMSA (see also Figure A.14 and Figure A.15). The stakeholders believe that **the shortage might be more prominent only for highly qualified and educated seafarers**, such as officers, a trend that has been exacerbated by the pandemic (BIMCO and ICS, 2021). The stakeholders interviewed for this study also stressed that, in the current situation, **a key challenge is the decline of qualified EU seafarers**. Ukrainian and Russian seafarers make up 14.5% of the global shipping workforce and EU fleets rely on them heavily. The **Russian war of aggression**

---

[29] The overall technological trend is heading towards a higher level of automation that involves all operations inside and outside the ports. They include the automation of gates, yards, quay cranes, interfaces (e.g. automated ships mooring) and other transport modes (e.g. automatic control systems, signalling and crossings for trains).

[30] Container terminal automation first started developing in the early 1990's in the Port of Rotterdam and the container terminal Altenwerder in Hamburg adopted this technology in 2002.

against Ukraine has created challenges in seafarer supply, with experienced crews that returned home to join military operations. According to (EPRS, 2022), EU sanctions are limiting the employability of these seafarers.

In general, the profession lacks attractiveness and suffers of competition from workers from non-EU countries, which may not enjoy employment conditions and social protection standards that are at a comparable level to those of EU crew members. **The recruitment of seafarers from non-EU countries may therefore lead to a situation of potential social dumping.**[31] The current situation depends on whether shipowners can rely on so-called 'flags of convenience',[32] which allow them to apply the legislation of the flag flown by the vessel.[33] A further challenge linked to this situation is the difficulty to organise (i) proper social dialogue between the parties and (ii) collective bargain to agree on salary and employment conditions.

When it comes to the **European social legislation in force, according to sector's stakeholders** (EFT, 2019)**, the present challenge is how to modernise it.** Initiatives should be considered to (i) reform the system of 'flags of convenience' and (ii) review the Community Guidelines on State Aid to Maritime Transport (Official Journal of European Union, 2004). For the former, the reform should guarantee equal treatment to all crew members regardless of the nationality, place of residence and flag of a vessel. For the latter, governments should limit the eligibility of maritime state aid to ships that are registered in a first registry, but not to those in a second international registry that are declared 'flags of convenience'.

As noted above, the seafarer profession is changing. To maintain its attractiveness, **the following challenges should be considered.** Firstly, operators in the sector should guarantee that levels of education could be improved during the worker's career. Considering that the seafarers' working day is typically not organised as a standard occupation, it is equally important to guaranteed accessibility to training programmes to improve the education, even while the worker is at sea. Secondly, the attractiveness of this profession from the workers' perspective seems to be correlated with contingencies and fluctuation of the economic cycle; in general, people tend to work in this sector only when they are in actual need of work. The sector should be able to maintain its attractiveness regardless of the general trend of the economy, through adequate wage levels and quality of the facilities on board ships. As seafarers cannot leave the workplace at the end of their working day, the availability of proper recreation facilities and good quality connections to communicate with their family and friends have a great significance. Third, the attractiveness of the occupation should be improved for currently underrepresented groups, such as female workers.

---

[31] According to EMSA statistics, between 2014 and 2021, the number of non-EU seafarers increased from 86,633 to 127,452 (i.e. +47%), whereas the number of EU seafarers increased from 161,419 to 182,207 (i.e. +13%) (EMSA, 2023).

[32] Commercial ships are registered under a flag that does not match the nationality of the ship owner. According to UNCTAD, in 2022, 49% of the ships owned by Japanese entities were registered in Panama, for Greek entities, 25% were registered in Liberia and 23% in the Marshall Islands (see Figure A.17 and Figure A.18). In terms of tonnage measured in DWT, Panama (350 million), Liberia (335 million) and the Marshall Islands (290 million) are the leading flags of registration. The size of the register of Panama has remained relatively unchanged over the last decade, whereas Marshall Islands and Liberia increased, especially since 2018.

[33] Public international law established the freedom of the high seas, according to Article 87 of the United Nations Convention on the Law of the Sea (UNCLOS). To balance this freedom with the need to avoid disorder and misuse, international law has provided a framework to regulate shipping. Article 91(1) of UNCLOS acknowledges the right of every State to 'fix the conditions for the grant of nationality and the right to fly its flag.' The article provides also that there 'must exist a genuine link between the State and the ship' to secure more effective implementation of the duties of the flag State under Article 94 of UNCLOS. However, there is no binding international framework to regulate the registration process. Each country sets own laws and regulations. Some register vessels with ties to the country through ownership or crewing (i.e. 'closed registries'), others allow foreign-owned or controlled vessels to use their flag (i.e., 'open registry') and others choose not to allow the use of their flag for international trade.

Recalling the European Commission's strategic policy and initiatives on transport sustainability, the **green transition of vessel technologies, working towards a neutral carbon footprint** poses the important challenge of re-skilling or up-skilling of seafarers and port workers. Maritime education needs to be consistent with the modernisation of the technologies and equipment both on land and sea, via adequate training and curricula. In general, the stakeholders pointed out that an **overarching challenge in maritime transport exists in relation to so-called 'sea blindness'**. That means that little is known about the shipping industry from the perspective of the general public, media, and decision-makers and its issues are underestimated.[34] The lack of awareness is challenging in terms of the sector's ability to attract a new generation to seafaring.

For port workers, the stakeholders interviewed did not reported any problems in relation to labour shortages or ageing of the workforce. However, two other aspects are challenging for terminal operators. Firstly, the attractiveness of the occupation for the new generation of workers, because of a reportedly problem of image of the ports, as outdated and dirty places. Secondly, in relation to the identified trends of (i) establishing alliances between operators for efficiency reasons and (ii) operating ultra large ships (i.e., larger vessels entail higher peaks of work). This trend has had an impact on the approach to organise port terminals, because, as the size of the port calls has increased, their actual number has decreased. For the activities of the quay's workers that means that port operators may have a 24-hour peak followed by a period of inactivity. **The challenge of the terminal operators consists of adapting training programmes** to improve workers' versatility and cope better with a rhythm of cyclical activities.

As noted earlier, **digitalisation is one of the key drivers** of the new economy (EESC, 2017) and it does not come without impacts on the labour market, because new jobs could be created and others may become redundant.[35] Over the long-term, efficiency and safety gains are foreseen from digitalisation, meaning that the **challenge for port operators is twofold**. Firstly, they need to **identify the profiles** to facilitate the evolution and support its port workers in that transition. Secondly, they need to develop interconnections via the Internet of Things, such as computing devices embedded in everyday objects, enabling them to exchange data. The modern terminals work with other operators in the supply chain and having (i) access to real-time data on cargos and (ii) staff that can successfully interpret real time data are key building blocks around which organise operations in a more efficient manner.

1.5. Inland waterways transport

The inland waterway transport sector is a relatively small sector with **around 48,000 employees EU-wide** (CCNR, 2021). The sector is also unique for the geographical scope. **Approximately 65% of the people employed in the sector work in the basin of the Rhine River**.

The Central Commission for the Navigation on the Rhine (CCNR) published a thematic report on the labour market for the European inland waterway sector in 2021 (CCNR, 2021). It notes that employment in the inland waterways transport sector has been historically focused on freight, since approximately **25,000 persons employed in the freight sector**. The report states further that **employment in the passenger sector has been growing due to a boom in river cruising**, with 26,000 people employed in this sector, which is an increase of 26% between 2008 and 2018. Employment in river cruising

---

[34] In this respect, it is worth observing that the concept of 'blindness' in transport is not confined to the maritime sector. The UK's National Infrastructure Commission used the term 'Freight Blindness' to describe mainly local authorities neglect of freight transport (National Infrastructure Commission, 2018).

[35] According to the position paper of FEPORT on port automation (FEPORT, undated), a relatively small portion of jobs of high-skilled workers (i.e. 2%) is at risk of automation. This group has the least estimated job losses resulting from more automation.

experienced a significant decline during the Covid-19 pandemic, although it recovered to its pre-pandemic levels from the first semester of 2022 (CCNR, 2023).

Table 4: Inland waterways in figures

Trends	
Employment	**Enterprises**

Performance			
Mode	**Turnover (2019, EUR million)**	**Transport activities (2021)**	**Modal share (2021)**
Freight	9.155	136.1 billion ton-km	4.0%
Passenger		n. a.	n. a.

Source: compilation of the authors based on European Commission Statistical Pocketbook (various years)

Stakeholders generally recognise **labour shortage and an ageing workforce as the most critical challenges for the employment in inland waterway transport**. Many boatmasters are expected to reach the age of retirement in the next 5-10 years. This trend is even more prominent in the segment of **self-employed barge owner operators**[36]. In addition, the sector has **low levels of attractiveness to younger generations**, especially in western European countries. Many younger people tend to favour land-based jobs with regular working hours and weekends at home. Finally, a trend can be seen in **workers moving from eastern to western European countries** for inland waterway transport, since wages tend to be lower in eastern European countries than in Western European countries (CCNR, 2021). More details can be found in Figure A.19. **Many workers in the inland waterway transport do work cross-border** due to the fact that vessels, for a large proportion of the sector, navigate on long-distance and across borders. **Discrepancies between European countries in applicable labour laws and social security rules can give rise to precarious employment practices**, having a negative impact on the attractiveness to work in this sector (European Commission, 2021).

The sector is expected to change significantly over the coming decades, since it should play a pivotal role in the transition to zero-emission transport and mobility (European Commission, 2021). However, the current inland fleet is relatively old and poorly equipped to facilitate this transition. Approximately 85% of the dry cargo fleet and 48% of the tankers on the Rhine was constructed in the 20th century (CCNR, 2023). Figure A.20 shows the exact commission years for the Rhine fleet over time. Appropriate measures are therefore needed to renew barge fleets and accelerate the transition towards zero-emission inland waterway transport. (CCNR, 2023).

---

[36]   This poses a problem to the Rhine corridor, where 80% of the freight companies in western Europe are owner-operators.

The transition to net zero and low emission propulsion systems and a greener operation of vessels is expected to have an impact on the competence standards and skills required to navigate a vessel. The exact direction and impact of this transition remains undecided, since battery electric, fuel cells and hydrogen, ammonia and methanol are all being researched as potential alternative fuels to diesel. The CCNR developed a roadmap in 2022 for transition pathways of several alternative fuels by 2035 and 2050 (CCNR, 2022). Another key factor changing the nature of employment in the sector is the automation of IWT vessels, meaning a move to remotely controlled and remotely assisted vessel operations. The CCNR adopted an international definition for levels of automated navigation in 2018, which can be found in Figure A.21. The current situation of automation in the sector corresponds with automation levels 1 and 2, whilst pilot projects are being implemented in relation to automation levels 2 and 3.

Digitalisation affects both the navigation of vessels and training schemes. Digital tools for navigational assistance support the boatmaster in nautical tasks, especially for automation levels 2 and 3. In addition, digital tools also facilitate a more interactive approach in IWT curricula and courses and for practical on-the-job experience. **Higher-skilled workers are also needed in the lower levels of automation and digitalisation**, since digital tools will help in navigation, but do also require different type of skills than currently needed. This is a major challenge for the sector, especially in the context of the ageing workforce and low levels of attractiveness to the younger generation. Finally, a trend towards the **need for 'softer skills' such as communication and awareness skills** are expected in the longer run as more mature levels of automation are reached. Stakeholders in the sector draw comparisons with the maritime and air transport sector, where such changes in skills needs are already visible.

1.6. Air transport

From an **economic perspective**, air transport is a complex ecosystem of private and public organisations ((Steer Davies Gleave, 2015) and (SkillFull, 2020)). It consists of sub-sectors including (i) airlines and (ii) their providers of goods and services, both operating in very competitive markets, (iii) airports acting as nodes of the air transport network, and natural monopolies, and (iv) air navigation service providers acting as traffic managers and legal monopolies (see Figure A.22). According to Eurostat data, in 2020, **the total number of workers was around 900,000** for the four sectors classified by the European database as linked to air transport, namely (i) air passenger, air freight and space transport, (ii) service activities incidental to air transport, (iii) renting and leasing of air transport equipment and (iv) manufacture of air and spacecraft and related machinery. Table 5 shows that, **over the past decade, the number of workers has fluctuated between 700,000 and 900,000**, with different trends across the sectors. The stakeholders interviewed for this study believe that the number of workers has either not changed or decreased, due to the application of digitalisation and automation.

Table 5: Air transport in figures
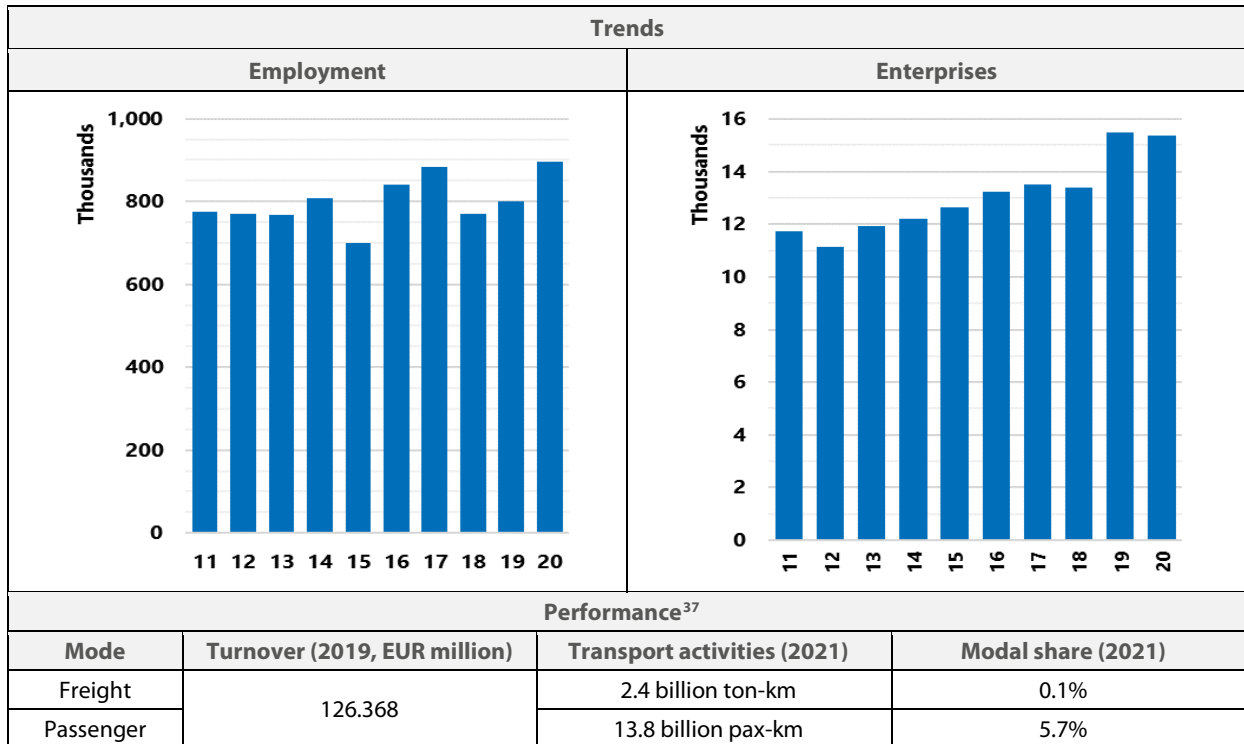
Trends			
Employment		**Enterprises**	

Performance[37]			
Mode	**Turnover (2019, EUR million)**	**Transport activities (2021)**	**Modal share (2021)**
Freight	126.368	2.4 billion ton-km	0.1%
Passenger		13.8 billion pax-km	5.7%

Source: compilation of the authors based on European Commission Statistical Pocketbook (various years)

Eurostat data also show that **the number of enterprises, in the four main sectors, increased** from 11,721 to 15,378 units between 2011 and 2020 (i.e., +31%). The larger increases is observed for enterprises providing (i) air passenger, air freight and space transport and (ii) service activities incidental to air transport (i.e., 63% and 92%, respectively, see also Figure A.24).[38] As far as airlines are concerned, **the liberalisation packages (see also section 4.6**) **impacted on the economy and structure of the sector** (Steer Davies Gleave, 2015). The business model and the mix of airlines have changed significantly, with **three low-cost airlines** expanding networks and fleets to operate short-haul intra-EU routes and extra-EU routes with neighbouring countries.

For long-haul routes, the most significant structural trend has been a gradual consolidation process of **full-service airlines in three large transnational groups**.[39] They have developed to (i) create synergies and interoperability of workers between airlines of the same group, (ii) integrate the networks of routes and (iii) combine supporting operations. All in all, and compared to 10 years ago, the **airlines are mostly transnational across the EU** and show different extents of integration and centralised management. That means that, in the current situation, the airlines and different branches of the airlines' groups **tend to operate in the EU's commercial aviation market under different national legislations and employment and labour laws**.

---

[37] Only domestic and intra-EU-27 transport.

[38] Figure A.4 shows the trend of the turnover of enterprises in the air transport sector, which peaked at EUR 360 billion in 2019.

[39] Three low-cost airlines and three groups of full-service airlines gained a significant market share of European air transport over the past two decades. For the low-cost, they are Ryanair, EasyJet and Wizz Air. For the full-service segment, they are Air France-KLM (with low-cost airlines Transavia, Hop and Martinair), the International Airlines Group (IAG) (including British Airways and Iberia as founding partners, plus British Midland Airways, Iberia Express, Vueling, Aer Lingus and low-cost long-haul airline brand LEVEL) and Lufthansa (LHAB) (with Austrian Airlines, Swiss International Airlines, Eurowings and Brussels Airlines).

The liberalisation packages increased competitive pressure on the airlines to **minimise operating costs, including personnel**.[40,41] Moreover, where airlines can choose the supplier (e.g., ground handler), a similar pattern of merges and concentrations has been emerging, which also **creates pressure on suppliers** to reduce costs. The air navigation service providers and airports appear to be impacted to a lesser extent, as they do not operate in competitive markets. The stakeholders interviewed for this study agree with the relevance of these impacts for the sector. They remarked also the impact of Covid-19, especially for airlines, airports and ground handlers, which were negatively affected by a shortage of personnel laid off for the pandemic. The stakeholders emphasised that the **airlines that opted for protection schemes of the workers laid off resumed more quickly to normal operations after the pandemic**, particularly those that negotiated temporary deals and re-negotiated them when the situation resumed to normality.

In relation to the **impact of the Russian war of aggression against Ukraine**, the civil aviation activities in Ukraine ceased, as the airspace closed (ITF, 2022) and Russia's airspace is inaccessible for airlines from 36 countries. Airspace closures and sanctions have forced airlines to reroute flights, which has added significant travel time and CO2 emissions on 80% of the routes between Asia and Europe. Roughly 3.3% of air passenger traffic in Europe have stopped, in addition to the passenger flights between Russia and Europe, which accounted for 5.7% of total European traffic in 2021. Although Ukraine is a small market, the impacts extend beyond it. Following the war, the price of jet fuel increased up to USD 141 per barrel in March, 27% more than the previous month. According to estimates (EPRS, 2022) the costs for an extra hour of flight is EUR 3,600-15,000 depending on the aircraft and fuel price, which has made some routes uneconomic. IATA concludes that it is difficult to predict how the war will unfold, and there are no specific studies yet on its impact on EU air transport labour market, but the implications for aviation are significant even if the impact on the direct market is limited. As labour and fuel are the two biggest operating costs for the airlines, the current situation suggests that repercussions on the workers are likely to persist for various categories in the sector, including pilots, cabin crews and ground staff that may eventually experience reduced job opportunities.

Moreover, among the sanctions, the EU banned the sale of aircrafts, parts and equipment to Russian airlines, including insurance and maintenance services. The Russian airlines have about 980 jets in service, of which 777 leased, mostly from companies based in Ireland. The sanctions have made it hard for Russian airlines to pay the lessors. More than 500 commercial aircraft owned by western companies and leased to Russia are stranded in Russia. These consequences show the extent to which the war is impacting on the EU air transport labour market has also stretched to the workers employed for aircrafts' maintenance and supply value chain.[42]

---

[40] Confidential information on the outsourcing trend via wet-leasing shows that it has become more often utilised by European airlines also for long-term solutions. Wet leasing addresses seasonal peaks and short-term fixes and consists of the leasing of an aircraft to a customer airline, along with a crew to fly the plane and provide onboard service. The technical term for wet leasing is ACMI, which stands for aircraft, crew, maintenance and insurance. The customer airline is responsible for paying the operating costs, such as catering and fuel, as well as fees such as airport fees, ground handling charges and navigation fees.

[41] Another option to reduce the operating costs is the so-called single pilot operation. With adequate standards in place, EASA is considering allowing for single-person operation for parts of the flight. There exists uncertainly still about when the change might be introduced, but 2 pilots could fly during the demanding parts of the flight (i.e., take-off and landing), but solo during the less demanding cruise phase. For long-haul flight the pilots could be reduced from 3 or 4 to 2.

[42] See the case of the Italian company Superjet based in Tessera (Venezia) and owned, in joint venture with the Italian company Leonardo (10%), by the Russian group Yakovlev (90%). For the sanctions on Russian companies, the management and workers at Superjet dealt with a severe and uncertain situation, when it comes to production and maintenance of the aircrafts. According to press (Giudone, 2023), and months of negotiation, the most likely solution envisages that the share owned by the Russian company could be bought by a new partner based in the Unites Arab Emirates.

Air transport is a global industry that relies heavily on stable geopolitical conditions for its smooth functioning. A persisting conflict will result in a generally heightened uncertainty, impacting on the overall workforce of the EU air transport labour market.

On the societal side, the demographic trend of the workforce deserves consideration. Elaborations based on Eurostat show that for workers employed in commercial air transport, since 2010, the population from 40 to 64 years is bigger compared to that from 15 to 39 years (see also Figure A.26). For the composition of the workforce by gender, the proportion of male and female employees has been relatively unchanged over the past decade. Figure A.27 shows that the shares of males and female workers have been fluctuating around 60% and 40%, respectively.

As regards **technological trends**, the aviation sector is widely and historically recognised to be **at the forefront of research and development** and, for that reason, far more advanced compared to other transport modes, also considering the importance given to safety. The aviation sector and its workforce have constantly been **able to adapt to digitalisation and automation of functions and processes** (Thums, et al., 2023). The stakeholders agreed that there is still room for more digitalisation and automation in commercial aviation (see also Figure A.28), however they also stressed that unmanned vehicles (i.e., drones)[43] and vertical take-off and landing (VTOL) vehicles for the lower air space (i.e., flying taxis) should be regarded as emerging sectors for job opportunities. They are becoming test beds to develop and implement other new technologies.

For the greening aspect, CO2 emissions from aviation have been included in the [EU Emissions Trading System (ETS)](#) in 2012. In October 2016, the International Civil Aviation Organization (ICAO) agreed on a [resolution](#) for a global market-based measure to address CO2 emissions from aviation as of 2021 (ICAO, 2016) and the [Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)](#) aimed at stabilising CO2 emissions at 2020 levels requiring airlines to offset the emissions after 2020 (Official Journal of the European Union, 2017). In addition to ETS, measures focussed on modernising the fleet and procedures for air traffic management (ATM) are contributing to CO2 reduction (Airbus and Boeing, undated). Equally important for greening air transport is the **[ReFuelEU Aviation initiative](#)**; in this respect, the Commission set out a **framework for the use of aviation fuels** to ensure a level playing field for sustainable air transport, as part of the 'Fit for 55' package.[44] Although a sector's position paper reported an **inconsistent approach to sustainability in commercial aviation** (CAT, 2021) **and interviewed stakeholders believe that they are lagging behind compared to other transport modes**, the newer aircrafts will be compliant with stricter requirements for traffic management and fly with novel concepts of operation. In parallel, the ATM system and its workers are adapting to handle more complexity and support growth and innovation, notably in relation to the emerging aviation sectors.

As regards the **major challenges in air transport**, the analysis of the trends and the opinions gathered consulting the stakeholders indicate that air transport has experienced profound changes over the past decades. In addition, the socio-economic context has changed and the combination of these factors has made some of the occupations less attractive for new generations. For the future, **the first challenge will be the likely shortage of personnel**. Currently, the issue of personnel shortage affects the sectors of air transport to different extents: it looks more prominent for workers employed by

---

[43]   See also [(Steer, 2023)](#) and the [European Drone Strategy 2.0](#) (European Commission, 2022).
[44]   See also the [Renewable Energy Directive](#).

ground handlers and air traffic controllers,[45] whereas it seems less severe for occupations, such as pilots and cabin crew.

For the ground handling sector, the stakeholders stressed a lack of attractiveness and retention of the occupation as major challenges.[46] The competition in this sector means that the jobs tend towards being precarious and temporary as employers compete on costs. Moreover, the sector is not yet properly regulated at international level and, in the current situation, the market relies on (i) own industry standards[47] and (ii) Directive 96/67/EC on access to the ground handling market at airports. The stakeholders expressed the need for a dedicated Regulation on minimum levels of working conditions. Another challenge for the ground handling sector is the retention of workers; in particular, young workers change jobs more quickly than was previously the case, because these occupations need low-skilled personnel and is organised in day and night shifts in all-weather conditions.

A second challenge relates to the impacts on the employment conditions of highly mobile workers, such as pilots and cabin crew, in the wake of the liberalisation of the market. New business models have triggered a pattern of change with regard to working conditions and more widespread use of **atypical forms of employment.[48]** This has become a new phenomenon, in contrast to permanent contracts, and includes bogus self-employment,[49] fixed-term work, work supplied by temporary work agencies[50] and pay-to-fly scheme[51] ((Jorens, et al., 2015), (ACP, ECA and EurECCA, 2019a), (European Commission, Directorate-General for Mobility and Transport, Molina, C., Levin, S., Castillo, L. et al., 2019) and (Turnbull, 2020)).

Other challenges emerge for the **tight competitive pressure originating from the liberalisation, such as the need for more adaptation of the aviation industry and creation of new employment status for its workers**. Firstly, there is a need for clearer rules to determine the applicable labour law and social security legislation, a situation which has been partially addressed by the European 'home base rule' of Regulation (EC) No 883/2004 on the coordination of social security systems (ACP, ECA and EurECCA, 2019b). Secondly, European legislation does not properly fit with the increasing volume of outsourced services (e.g., wet leasing practice), opening the door to social dumping, subcontracting chains and fiscal engineering of the airlines. Article 13 of Regulation (EC) No 1008/2008 provides that intra-EU wet leased can be used without a limit in time. However, the legislation does not provide for the social protection of workers or the safety aspects of the wet leasing practice.

The need for green air transport activities will pose other challenges, notably for the ground handling sector. The process of implementing the environmental, social and governance (ESG)

---

[45] According to (European Commission, Directorate-General for Mobility and Transport, Dhondt, S., Oprins, E., Zon, R. et al., 2021), during 2010-2018, nearly all air navigation service providers suspended recruiting new air traffic controllers, despite an overall increase of air traffic. Over the long-term, the effect of this policy is the ageing of the workforce.

[46] A recent IATA survey concluded that 37% of ground handlers shortages until 2023 and beyond, and 60% of them reported they do not have enough qualified staff for smooth operations. 27% feared that the employees would leave soon.

[47] The employment contracts are typically at company level and developed on employers' own policies. However, there are examples of collective bargaining agreements in airports in Italy and Spain.

[48] According to (European Commission, Directorate-General for Mobility and Transport, Molina, C., Levin, S., Castillo, L. et al., 2019), 18% of pilots and 20% of cabin crews worked via atypical employment. The survey concluded that 9-19% of the cabin crews and 8% of the pilots are employed via intermediary agency, a practice more frequent for low-cost carriers and younger crews.

[49] Bogus self-employment means a worker that works as freelancer or self-employed professional. However, it might be a situation of false self-employment or disguised employment. The worker is registered as entrepreneur, but he/she works for a company, in order to reduce tax liabilities or employers' responsibilities (OECD, 2000). An analysis (European Commission, Directorate-General for Mobility and Transport, Molina, C., Levin, S., Castillo, L. et al., 2019) concluded that for self-employed pilots, they could not be considered as genuinely self-employed since, in most cases, they were working only for a single airline.

[50] See also Directive 2008/104/EC on temporary agency work (Official Journal of the European Union, 2008).

[51] The pay-to-fly scheme relates to the training of a pilot to operate a commercial aircraft. A pilot pays an airline to gain flight hours and may or may not have a contract with the organisation.

methodology applies to ground handlers' services in relation to cutting CO2 emissions as a social responsibility. The emerging challenge for ground handlers is to find the balance between the provision of services to airlines at competitive prices[52] and accommodate airports' needs to invest in equipment that make the infrastructure compliant with the ESG. According to stakeholders, ground handling operating costs are 80% for the personnel and 20% for the ground service equipment (GSE). As the sector is labour-intensive, an emerging challenge will be finding a new balance between cost components, which likely might be less staff and more GSE cost.

New emerging air transport services will pose another challenge, notably when it comes to drones and new flying vehicles, such as (electric) vertical take-off and landing (eVTOL) vehicles for short-haul or urban transport. Innovative air mobility services, such as air taxis, are being developed to provide regular services for passengers, initially with a pilot on board, but then fully automated and for autonomous operations. According to stakeholders, it is likely that this will put more pressure on air space, because of the growing number and activities. The new emerging air transport services require a **different approach to traffic management** to ensure (i) a proper interface with low-level air space and (ii) the development of Unmanned Traffic Management.[53]

It is important to anticipate that the new air transport services will impact on the performance of the air traffic controllers, for the level of complexity and increase of pressure from working in the future densely utilised air space (Airbus and Boeing, undated). Safety and security aspects will become more complex to manage for humans and will require a higher level of automation of operations, based on Artificial Intelligence. The deployment of new technologies is likely to unfold over the next 5-10 years in lower air space, as the environment in which to learn about practical applications. The profile of the workers will change with an increasing demand for engineers to develop applications on a larger scale, which means that the likely resistance of the current generation of workers to a change will be another challenge to address.[54]

---

[52]   According to stakeholders' information, ground handling services are 8-10% of an airline's operating costs.
[53]   See also Commission Implementing Regulation (EU) 2021/664 (Official Journal of the European Union, 2021).
[54]   ASPERD is a group dedicated to discuss new regulations and established involving a number of stakeholders (e.g., Commission Implementing Regulation (EU) 2017/373 on air traffic controllers fatigue (Official Journal of the European Union, 2017)).

2.   CURRENT AND FUTURE OPPORTUNITIES

KEY FINDINGS

- Decarbonisation and the anticipation of a reduced market share of **road freight transport** provides opportunities to correct market failures and improve the image and attractiveness of the occupation by improving pay and working conditions.

- The strong current trends in **urban mobility** and interconnected mobility services bring many new business and employment opportunities. If the twin transition is shaped by a strong and pro-active public policy framework, the sector could become a new and strong backbone of smart, sustainable and just mobility.

- The future of **rail transport** is aligned with the EU's policy strategy. Future innovations are expected to drive further opportunities for growth. The transition, involving digitalisation and interoperability of standards, will necessitate a skilled workforce, modern training facilities and attractive working conditions. The railway sector benefits from social dialogue and collective bargaining at both national and European levels.

- The **maritime sector** is undergoing a significant transformation, with new greening technologies applied to ships and automation increasingly applied in terminals. The need for transversal skills is growing, but automation and digitalisation will make the occupations more appealing and provide opportunities also for gender diversity.

- **Inland waterway transport** has potential to enhance multimodal transport and improve environmental performance. Ensuring a sustainable growth requires an adequately trained workforce. The deployment of automated vessels and digital navigation tools may address labour shortages, but the stakeholders hold different opinions on the future of automation.

- The **aviation industry** is evolving and its modernisation is key to meet environmental targets. Future workers need skills in IT, data management, cybersecurity, and communication to adapt to new business and operating models. Predictive algorithms will be important for complex systems management, safety and interactions with lower air space. eVTOLs and drones will create employment opportunities.

2.1. Road transport

Road transport in general will see **significant changes in the coming years** that are related to various drivers of change: The current dramatic shortage of drivers in road freight and the bus and coach passenger sector will require a **rethinking on business models** that are mainly related to the competition factor of costs rather than quality of the services, reliability and quality of performance. As reported by stakeholders, the current staff crisis will force the sector to **make working conditions more attractive** for those groups that today are massively underrepresented – the younger generation and female workers. The workers shortage in transport as well as in other sectors may also result in creative thinking and policies on the question how to integrate people that today are not integrated in the labour market due to migration background, low educational attainment or lack of work experience.

Also, **decarbonisation and the ambition to shift in particular freight transport activities from road to rail** – at least in the medium and longer term will change the sector significantly. The vision is to have a highly efficient fleet trucks powered by electricity or clean fuels such as hydrogen, equipped with systems of automated assistance or driving that will require new skills and will change the job of

the driver significantly. From the perspective of road freight and bus and coach transport, decarbonisation and electrification will bring risks to those business model that are solely based on low cost as the main competition factor. However, for those who are oriented towards quality, efficiency and operational intelligence, it may bring **new opportunities for correcting market failures** with negative impacts on working conditions, job quality and terms and conditions of employment. However, such opportunities for a smaller road freight and passenger transport sector in Europe that is characterised by clean trucks and buses and coaches will also depend on **ambitious European and national policies as regards to adjust and develop infrastructures**. The key issue here is here social infrastructure for drivers that facilitates the needs and expectations for female drivers or the younger generation.

Turning to **urban public transport**, the sector is the backbone of sustainable and clean mass transport in urban areas. According to the representative social partners UITP and ETF, this role needs to be supported by public investments in transport infrastructure, urban design, clean vehicles and improvements in linkage to other urban transport modes and mobility services. Furthermore, there is clear evidence that working conditions and change processes regulated and framed by collective bargaining agreements provide a clear added value when it comes to attractiveness and avoiding recruitment problems.

Considering the **rapidly emerging services in urban - and increasingly rural - mobility services**, there are significant opportunities for the road sector in terms of job creation, entrepreneurship and new innovative business models that bear a huge employment potential as is visible already today (e.g., jobs in 'soft' or 'active' mobility services and related manufacturing, repair and maintenance activities). Also here, public policies and local authorities however need to provide strategic visions, orientations as well as a sound and sustainable strategy of infrastructure development. This in particular relates to the area of **rural public transport**, that has been largely neglected over the last decades (in favour of individual transport by cars).

2.2. New urban mobility and logistics

Although **robust employment data are missing** at EU and national level, business activities in the context of developing new business models in urban mobility of individuals (much less in the field of new forms of collective passenger mobility) and the delivery of goods (beside parcels, food, drinks, meals, etc.) have **increased rapidly in recent years**, triggered significantly by the change of consumer behaviour during the Covid-19 crisis.

Driven also by global digital tech companies, employment in urban mobility and logistics has also resulted in **employment creation** and in particular **jobs that are highly flexible** in terms of working hours and contractual characteristics, i.e., direct employment, self-employment, service contracts, temporary and seasonal work or employment or employment of third country nationals via agencies, intermediaries, platforms or gangmasters.

Triggered by new consumer needs as well as digital technologies and also decarbonisation of urban transport, there are **many opportunities of job creation and business development i**n the field of new mobility services and operation.[55] However, the creation of **new business and employment opportunities should be framed and regulated by clear urban policies**, strategies and programmes. This has been demanded in May 2023 by the resolution of the European Parliament on the New EU Urban Mobility Framework highlighting the need to develop urban mobility in planned and integrated way with the objective to serve public interests, meeting people's needs and

---

[55] See data on the rapid increase in the bicycle industry and trend towards e-bikes or cargo bikes (Heinrich-Böll-Stiftung, 2021).

supporting the economic and social development of Member States and building more sustainable cities with better quality of life through a variety of affordable, accessible, efficient, smart and sustainable transport solutions.[56]

2.3. Rail transport

Rail transport both of passengers and freight is expecting **huge opportunities.** Rail has a key role to play in the decarbonisation pathway of the mobility ecosystem it is currently at the forefront of the political agenda, which is aiming for a future '**rail renaissance**'. If the goals and targets of the EU strategy of smart and sustainable transport will be implemented consequently, a significant increase in rail transport activities is expected based on the modernisation and expansion of rail infrastructure, harmonised standards of interoperability and latest digital technology (e.g. deployment of ERTMS on main lines, DAC and ATO in certain services) that will require a significant employment increase. Future opportunities of rail are also related to innovations in the field of rail as a connected mode of transport and mobility of spaces, including door-to-door services in freight and passenger transport as well as related full-services for individuals and companies (e.g. digital capacity management) (ERRAC, 2017).

As already evidenced by larger surveys, and initiatives such as the RAILSTAFFER blueprint, the railway specific twin transition – consisting of **digitalisation and implementing interoperability of technical, operational and infrastructure-related standards** – will require a better and **higher skilled workforce** both in terms of hard and soft skills, knowledge and competences. Therefore, the existing opportunities of the future employment potential of railways as a clean and high-tech transport sector should be supported by modern and state of the art training facilities and programmes, as well as attractive working conditions that reflect the high requirements in terms of railway safety and security.

A further opportunity of the railway sector certainly is the still **strong role of social dialogue and collective bargaining at national and European level**. As illustrated by concrete outcomes at both level (see the section on good practices), there is a clear added value of social dialogue and collective bargaining when it comes to addressing challenges and current and future needs in fields such as training, working conditions, attractiveness or the impact of the twin transition. In this regard, it is quite striking that the railway sector currently is characterised by a **gap of good functioning social dialogue** at national and EU level driven mainly by public owned incumbent companies, on the one hand, and associations representing private 'competitors', on the other hand. Any perspective to **overcome this schism** would provide opportunities of successfully addressing social and other challenges and needs.

2.4. Maritime transport

The analysis of trends and challenges highlighted that the professions of the maritime sector will be different soon with respect to the skills and profiles demanded in the current situation. The EU-funded SKILLSEA project (SKILLSEA, 2022) concluded that new ships will smarter, data driven, connected and greener. Automation is applied in liquid bulk terminals and large container terminals across the world (i.e. around 53 container terminals are either fully or partially automated, 4% of total). Previous studies predicts that 90% of docks' workers might disappear by 2040 because of automation ((Schröder-Hinrichs, J. et al., 2019), (Esser, et al., 2020) and (ITF, 2021)). There is an upcoming **need of transversal skills on both sea and land side**. Maritime activities are going to **integrate workers and digital technologies** in a way that soon will deeply transform the current operations and interactions between

---

[56] See European Parliament (2023) on the [New EU Urban Mobility Framework](#).

terminals and ships. Therefore, there is a concrete opportunity for an operational shift to meet the challenges.

On the sea side, the seafarers will not work as traditional navigators anymore, for the need to upskill the profiles towards more IT proficiency (ECSA and ETF, 2022).[57] And more opportunities will arise also for the shipowners and port operators for relying on **more educated workers**. Equally important is that new career paths could be created in maritime transport, including the opportunity to improve the current gender balance (Pike & Terpilowsk, 2022).[58]

As introduced earlier, the greening of shipping activities is going to be a prominent feature with relevant implications for the work force. **Several technologies are likely to improve (e.g., hydrodynamics), new fuels and energy sources will be introduced, and the organisation of logistic operations will change for more efficient harbour activities.** Currently, the alternative to standard fuels are the liquefied natural gas (LNG) and advanced biofuel, but the electrification looks promising for (i) application to ships (Saether & Moe, 2021) and (ii) systems to reduce emissions in ports and proximities to cities will be also important (i.e., cold ironing)[59] (Abu Kabar, et al., 2023). Det Norske Veritas (DNV), an international accredited registrar and classification society of merchant vessels, developed scenarios to estimate the seafarers working on ships equipped with alternative fuel technologies, such as LNG and LPG (Kaspersen, et al., 2022). The number of seafarers working on ships fuelled by LNG and LPG would increase by approximately 100,000 units every two years until 2038. In 2050, the number of seafarers working on ships equipped with alternative fuels would be 310,000-1,775,000. As regards the electrification of ships and connections to the shores, new curricula should include knowledge about electric technology and electrical system architecture (Nagler, 2021).[60]

On the land side, the automation of ports has impacted already the employment dynamics, raising issues on labour organisation and leading to more quality training to improve the skills of the workers. Firstly, the biggest opportunities for ports automation related to **substituting low-skilled profiles (labour-intensive, based on routine activities).** Secondly, an increased level of automation will **demand new profiles**, like for example remote controllers for operations and maintenance and Mobility-as-a-Service (MaaS) providers. It is likely that the demand of work force will change, however, the analysis of Eurostat data shows that despite increasing levels of technology introduced over the past decade, the number of workers has been increasing pushed by increasing maritime transport activities (see Figure A.10).[61] The evolution and upskilling of ports' workers technical knowledge will follow the complexity of the tasks to be carried out. For example, shifting the control of the operations from the docks to a control room needs a combination of skills, such as the technical knowledge of the equipment on the ground and IT. **Because new technologies can generally be more easily acquired by who is younger, highly skilled and educated, the demand for such workers is going to be high and follow the increasing technology patterns**[62]**.** Automation should be regarded as an opportunity, also for senior workers to work in safer and less physically demanding environments.

---

[57] The social impact of digitalisation has been addressed in studies by HSBA (HSBA, 2018) and World Maritime University's (WMA, 2019). The study of the European Commission on the social aspects within the maritime sector (European Commission, Directorate-General for Mobility and Transport, 2020) covers a broad range of issues, including digitalisation.

[58] See also WESS project.

[59] Cold ironing consists of switching ship generators from on board diesel engines to shore-supplied electricity during berthing.

[60] A qualitative assessment of the impact on employment of the uptake of sustainable alternative fuels in maritime transport is available in the study of the European Commission (European Commission, Directorate-General for Mobility and Transport, 2021).

[61] See also projections of the Reference Scenario 2020 (European Commission, Directorate-General for Climate Action, Directorate-General for Energy, Directorate-General for Mobility and Transport, De Vita, A., Capros, P., Paroussos, L. et al, 2021).

[62] For example, the European Maritime Single Window Environment Regulation (EU) 2019/1239 (Official Journal of the European Union, 2019) represents a step forward that will stimulate the transformation of the port systems into real data-sharing platforms.

In modern work at port, the supervision and operations of complex and sophisticated equipment will be more common. The port sector will continue to (i) adapt to new training opportunities for the years to come and (ii) invest in efficient and safe terminal operations. A widespread deployment of digitalisation and automation tools, combined with less physically demanding tasks, will make the port worker profile more appealing also for other workers, including women. The future changes will give more opportunities to social partners and dialogue, which could change how the maritime sector is now. For collective bargaining, the employment contracts, based on trilateral agreements between employers, unions and employers will provide opportunities to include developments stemming from new characteristics of workers and work. It will be the opportunity to improve from the minimum conditions set by the international legislation (i.e., pay and standards of the Maritime Labour Convention).

2.5. Inland waterways transport

The inland waterway transport has a potential to contribute to a **greater use of multimodal transport and improve the environmental performance of transportation**. European policy therefore aims to boost the role of inland waterway transport in the transport system.[63] The capacity of inland waterways should be increased to meet these objectives. A crucial prerequisite for sustainable growth of inland waterways transport is the **availability of sufficient and well-trained personnel** (see also Box 2).

Box 2: NAIADES III Boosting future-proof European inland waterway transport

'A stronger inland navigation sector needs to be able to offer quality jobs, career opportunities and high social, safety and security standards to attract well-trained people.'

Source: (European Commission, 2021)

The further deployment of automated vessels and digital navigational tools can help to alleviate bottlenecks caused by labour shortages, although there seems to be a gap between the retirement age for a large group in the current workforce and the widespread deployment of vessels that have a higher degree of automation. Stakeholders in the sector are generally divided when it comes to the future opportunities of automation. Some stakeholders see a widespread deployment of autonomous vessels as a distant future. These stakeholders see digitalisation as an opportunity to facilitate the work of the boatmaster and crew on board, whereas another segment of the sector sees automation as part of the solution to address staff shortages.

2.6. Air transport

The previous chapter highlighted the trends and challenges, outlining the future skills that will be necessary for the industry and workers. To cope with the increasing level of complexity and transformations, the industry must take concrete steps to adapt, educate and cultivate the skills of the workers across all sectors ((SKILL-UP, 2021) and (4QD, 2022)). Although the development and roll out of advanced technologies looks at the early stages for now, over a medium- or long-term, they will create new opportunities and occupations. The role of the workers will remain pivotal, but in a digitalised and automated environment the roles and responsibilities of the workers in the global airspace community will evolve. **There will be opportunities for profiles, owning skills and competencies in complementary areas such as IT, data and cybersecurity and communications**.

---

[63] The European Green Deal established the ambition to shift a substantial part of the freight transport by road to inland navigation and rail (European Commission, 2019). The Sustainable and Smart Mobility Strategy emphasized that inland waterway transport should increase by 25% by 2030 and by 50% by 2050 (European Commission, 2020).

The future evolution of the air transport sector, via new business and operating models, will make it accessible to a diversified range of workforce (CAT, 2021).

Literacy in automation and data management are nowadays already top priorities for the industry. **Analytics and information management will be new skills for future air traffic controllers**, in particular, with expertise in designing algorithms and machine learning. As safety and security will be paramount still, the need to design new protocols will produce job opportunities in data security, cyber protection and digital identity. They will be important to maintain the quality and integrity of the future integrated airspace system at the highest level. The air navigation services will migrate from service provision relying on human resources to organisations based on advanced technologies, greater scalability, resilience and support to an advanced and intelligent airspace system. Automated systems can significantly reduce the workload and allow air traffic controllers and pilots to focus on higher-level system management, where controllers and system engineers will work in real time to refine or change parameters to ensure optimal system performance. Automation and predictive algorithms applied to air traffic management will create opportunities to manage point-to-point flights and trajectories and improve on anticipating confliction detections. The role of air traffic service providers will morph from tactical to strategic management air traffic and UTM, including the technology, data and software that underpins it.

According to industry stakeholders, the modernisation of air traffic management will be gradual (Airbus and Boeing, undated). The human capital will continue to fulfil key roles over the coming years, with controllers and pilots working closer to make sure that intermediate levels of autonomy do not compromise the safety of the integrated air traffic management and UTM systems. However, it is worth observing that UTM is being implemented today in a patchwork of different standards and regulatory frameworks. It will require a global approach to achieve full scale interoperability and make it as a missed opportunity. A modernised aviation system will be also **important for meeting environmental targets and reduce the carbon footprint** by 50% by 2050 (based on 2005 levels). The [Commission's impact assessment of the ReFuelEU aviation initiative](#) estimates that the production of sustainable aviation fuels could create 5,300-17,600 FTE in 2030. Moreover, **new technologies will provide opportunities to optimise flight paths, air traffic and airports' capacity**. For example, the Trajectory Based Operation (TBO) will enable strategic planning of fights by air traffic controllers, providing them with decision support tools to deconflict flows using time-based management. This technology requires specific competences and skills for the next generation of air traffic controllers to reduce the need for manual deconfliction and rerouting of aircrafts.

New transport services will create also employment opportunities. Firstly, to design and manufacture eVTOL. To make eVTOL services competitive with other vehicles (e.g., helicopters), manufacturing and operating them at a cheaper cost will be key. Research and development of lightweight materials and components (e.g., batteries), plus technologies for fully autonomous eVTOL will provide opportunities for additional employment.[64] According to stakeholders, European manufacturers currently working to design and manufacture eVTOLs employee more than 1,000 workers and are expanding the workforce. Other estimates of the employment of eVTOL are available for the USA (i.e., 10,000 additional engineers and 1,000 employees for the certifications (HYSKY, 2022)) and Canada (i.e., 16,967 FTE for the period 2021-2040 (CAAM, NEXA Advisors and CROWN, 2020)). **Also drones will provide automated services with an impact on employment**. Transport operators or business organisations may decide to replace manned tasks for safety reasons (e.g., inspection of

---

[64] eVTOLs will be used for short-distance flights, on routes of 100-200 km, and up to 500 km. eVTOLs are expected to produce a significant impact to tourism destinations, and especially islands, and improve mobility between cities. According to stakeholders, the price of an eVTOL service might be at around EUR 100 per person, compared to EUR 1,200 of a helicopter (Rowland, 2022).

dangerous or remote installations). Over the coming years, a combination of both workers and drones will be more often utilised, a transition that will need technological changes and learning or reskilling programmes for the workers. The new business models based on drones will create new tasks and a study estimated 100,000-200,000 direct jobs for software development, automation, telecommunications and data management.[65] Extending the assessment to wider effects, the direct and indirect additional jobs at EU level would raise to 200,000-600,000 in 2030 (European Commission, 2022).

---

[65] Data on drones in EU envisages a fleet of 100,000-200,000 in 2020 and 400,000-800,000 in 2030. See also (SESAR JU, 2016) here.

3. BEST PRACTICES

KEY FINDINGS

- **Identification of future skills needs is the most prominent topic**, when it comes to good practice measures addressing major trends and challenges. This focus is closely related to business needs and the need to maintain the employability of the workforce. This is illustrated by the fact that most transport sectors have created larger sectoral Blueprint consortia on the development of future skills needs as co-funded by the Erasmus+ programme.

- When it comes to maintaining good working conditions and attractiveness of transport jobs, **most good practices at European, national and sector level have been developed in those transport modes that are characterised by stronger social dialogue and collective bargaining** at sector level. EU level sectoral social dialogue is an important forum of the exchange of good practices, the development of a joint understanding of employers and workers and the discussion of joint sectoral policy recommendations for sectoral decision makers at EU, national and local level.

- The agreement of the railway social partners on the **promotion of more female workers** and the binding agreement to establish company-level diversity and gender promotion policies in 2021 is an example of concrete added-value of European level social dialogue.

- **Increasing the attractiveness of transport jobs and addressing the severe labour shortage of drivers** as well as other occupations so far has only been addressed by company or business-led practices that mainly aim to improve the image of the sector. More research on the linkage between working conditions, pay and work-life balance on the one hand and collective bargaining on the other would be needed.

3.1. Road transport, including automotive, logistics and platform work

The following examples of best practices have been identified in the context of our research based on desk research as well as highlighted by stakeholders during interviews. The **Automotive Skills Alliance** aims to put into place an up/reskilling framework to maximise the competitiveness of the industry, job retention and job opportunities. The plan is to present a roadmap for the transformation of skills in order to achieve a full recovery of the industry from the Covid-19 pandemic and to meet future requirements towards greater eco-sustainability. The aim is to upskill and reskill 5% of the workforce each year. The **European Battery Alliance Academy** aims at training, reskilling and upskilling approximately 800,000 workers by 2025 to meet the demands of the skills shortages in the rapidly growing European battery value chain.

There are examples of **collective agreements addressing the logistics sector and platform workers**, for instance agreements made in Spain, Austria and Germany.

- Several agreements have been made in **Spain**. For example, a manifesto of intentions has been agreed between UGT (Unión General de Trabajadores) on the one side and Uber and Cabify on the other side. In addition, sectoral agreements on best practices have been established for, inter alia, Deliveroo and Uber Eats (Lamannis, 2023).

- In 2019, a **national sectoral collective agreement** has been agreed in **Austria** for bike and food couriers between the labour union, Vida, and the Association for Freight Transport.[66]

There are initiatives from several cities and several countries to **promote the attractiveness of work in the urban public transport sector**. A very relevant example is **Urban public transport 4.0**, which is a collaborative project co-financed by the ESF that provides a toolkit of guidance of managing the digital change in the public passenger transport sector in a social manner. This project is overseen by the regional branch of the trade union Ver.di and the toolkit was developed based on measures from six public transport operators in the German state of North Rhine-Westphalia (Voss & Vitols, 2020). Academies established by sector organisations representing the industry at the European and at the global level can provide sector organisations at national level and individual companies with the tools they need to support their employees with courses and curricula for upskilling. A very good example illustrating this point is the **UITP Academy for (urban) public transport companies**. The 2021 Training Calendar of the UITP Academy does address several topics in relation to automation, digitalisation and greening, such as ITS and IT technologies and electric bus operations. Another relevant example is the for **IRU Academy for road transport companies**. Courses offered by the IRU Academy also aim to contribute for the sector to adapt to new challenges, for instance in relation to eco-driving.

A further good practice at EU level carried out by the International Association of Public Transport, UITP between 2021 and 2023 has targeted the promotion of social dialogue between workers and urban public transport providers on the deployment of clean buses in Europe, focusing very much on the issue of addressing new emerging requirements in different domains such as procurement, infrastructure development, operation, maintenance and other areas and their impact on employment and occupational skills needs, workplace environments and working conditions as well as health and safety (Voss, forthcoming).

3.2. Rail transport

The following examples of best practices have been identified in the context of our research, based on desk research as well as highlighted by stakeholders during interviews. They also illustrate the strong role of European Sectoral Social Dialogue in railways.

The ETF and CER have carried out joint studies and decided, in 2018, to enter negotiations to establish an **autonomous agreement aimed at promoting employment of women in the rail sector**. The Autonomous Agreement on Women in Rail was officially signed in November 2021. This agreement aims to attract more women to the rail sector, give women more protection and guarantee equal treatment in the workplace thanks to measures agreed under the headlines of general gender equality policy, which cover areas such as, targets, how to attract more women to the sector, reconciliating work and private life, promotion and career development, equal pay, health and safety and work environment and prevention of sexual harassment and discrimination based on gender. The agreement is the first of its kind in transport and has a binding character: it entered into force upon signing and companies had 24 months to establish a gender and diversity policy at the company level. The agreement will be reassessed by ETF and CER in 2024/2025.

In March 2020, CER and ETF also started a social dialogue project on the topic of **employability in the railway sector in the light of automation and digitalisation** (EDA Rail). The project followed-up of previous recommendations on the concept of employability in rail and consisted of two phases. First, it developed desk research and interviews with undertakings and trade unions. Secondly, it elaborated

---

[66] See vida website here.

a detailed understanding of the issues linked to employability in the light of digitalisation and automation organising dedicated workshops (Voss, 2022).

The EDA Rail project identified 30 cases of good practices throughout Europe. These cases ranged across all domains and directly addressed the multiple dimensions of employability, including attractiveness, equal opportunities, and diversity. Many of the good practices were related to new approaches in skills development, training, and learning. The CER and ETF project also found that social partners had, jointly or through their own initiatives, addressed the social and employment-related impacts of automatic train operation, digital automatic coupling, predictive railway maintenance, digital rail traffic control and management, as well as the development of new digital services for customers. As a result of the joint project, joint recommendations on maintaining and improving employability in the rail sector have been elaborated that consist of four dimensions and strategic orientations for policies and practices at company and beyond (see Figure A.9). In 2022, UNIFE, the European umbrella association of the rail supply industry, announced the Gender Equity Policy in 2022. The **policy is aimed at increasing equity** to raise sectoral performance, reiterating suppliers' obligation to address these divides.

The **EU-funded RAILSTAFFER Blueprint project** that was launched at the end of 2020 by more than 30 railway partners (including CER and UNIFE, railway operating companies and infrastructure managers, railway suppliers, several national employer associations and vocational education and training institutions) is aimed at developing training and education paths for the current railway workforce, as well as curricula for students based on current and future skills and competence needs for the whole rail sector. In the context of the four-year project, a number of pilot activities in the context of skills development targeting different occupational profiles and staff groups have been developed and will be implemented until October 2024. Furthermore, the project will develop an integrated long-term skills strategy and action plan for the rail sector that is going to be published in 2024.

Finally, it is worth mentioning examples of **good practices identified at national level in** (Voss, 2022).

- Collective agreement on the future of work in railways at Deutsche Bahn and the **German railway** trade union EVG that include the establishment of a social fund for re- and upskilling measures and activities to maintain employability.
- Establishment of a solidarity employment Programme and territorial social dialogue at **SNCF** to support workers whose jobs are at risk as a result of digitalisation and automation implementation of blended and virtual learning in vocational education and training at **Deutsche Bahn** and **SJ**.
- National collective agreements in railways in **Spain**, **Italy** and **Sweden** that foresee a strong role of workers representatives in workforce planning and the identification of skills related requirements and measures in the context of digitalisation and maintaining good working conditions and employability of workers in railways.

3.3. Maritime transport

The analysis of the trends and challenges highlighted the changes in the profiles of the maritime transport sector's workers, because of widespread digitalisation and automation. Although new profiles are not expected to emerge in the short- or medium-term (SKILLSEA, 2023), new ones might be necessary over a long-term period. This section presents good practices to develop and improve the skills and working conditions. Two EU-funded projects focussed on research activities for future

developments, whereas the review of the literature and consultation activities allowed to identify examples of trainings and employment agreements.

The **EU-funded SkillSea project**[67] analysed the new trends in the maritime industry and designed a toolbox for upskilling and reskilling the workforce, considering the European Qualifications Framework (EQF). New training needs, such as occupational safety and health (OSH) and security, are considered and the toolbox developed a lifelong learning approach and fostered intra-sectoral mobility. SkillSea identified future needs focussing on digital, green and soft management and elaborated the skills strategy to increase the size of the workforce. SkillSea identified career paths and broadened the research towards other profiles that will be necessary in the future, considering industries complementary to or outside the maritime sector. The purpose was to attract a diversified pool of professionals to prevent seafarers' shortages or qualification mismatches. Moreover, SkillSea established the Maritime Education and Training Network (MET-NET), a collaboration of 11 European providers, and developed the European Maritime Skills Forum (E-MSF), a multi-stakeholder forum in maritime education and training. The project provided opportunities to improve the collaboration between education providers; the Scheepvaart en Transportcollege (STC) and École Nationale Supérieure Maritime (ENSM) signed a memorandum of understanding.

The **EU-funded Working Environment in the Shipping Sector (WESS)**[68] project shows that the maritime transport sector has the potential to improve gender balance. The research identified instances of best practice that should be applied more broadly to enhance recruitment and retention of women. WESS concluded that women, and especially young women, are often unable to visualise themselves in the EU's maritime and shipping industry and recommended to design a framework in which potentially interested women could gain access to career information and make informed decisions. The development of a good information framework depends on 'how and when' it provides the data, in addition to 'what' data it provides.

As regards **good practices on training for terminal workers**, the literature shows a number of examples in EU Member States. Training requirements vary significantly among ports, not only for the specialisation of activities and size of the infrastructure, but also for legal and contractual requirements (Hinkka, et al., 2016). In general, European ports need workers who are expert in certain tasks, able to work efficiently and use automation. **Good practices developed for up-skilling or re-skilling at port level** are illustrated below (FEPORT, 2018).

- In **Germany**, employees working in commercial and technical areas in seaports (i.e., logistics and operations) obtain a vocational qualification from the Chambers of Commerce and Industry via the **Maritimes Kompetenzzentrum**, an organisation supported by port employers' associations and the trade union ver.di.

- In **Italy**, Assiterminal, an association of port operators, **trains employees and users on the 'paperless' procedures** that involve complex operations and require specific training.

- In **Lithuania**, the workers of BEGA terminal in the port of Klaipeda, specialised in dry and liquid bulk cargoes, receive **additional training on automated locomotives**. Wagon shunting at loading/unloading stations is carried out by machines controlled remotely.

- In **the Netherlands**, ECT in the port of Rotterdam **has automated and remotely controlled operations since the 1990s.** ETC has developed its own training department for continuous training and works closely with training schools and institutes.

---

[67] The project received funding from the European Union's Erasmus+ programme. See also https://www.skillsea.eu/.
[68] See also https://wessproject.eu/women-in-shipping/.

- In **Poland**, the port of Gdansk introduced **container cranes for handling unitised cargo of megaships** (e.g., Super Post-Panamax).[69] Crane operators receive training for theory and practice to carry out tasks on this equipment.

- In **Spain**, the workers of the BEST terminal of Barcelona, a terminal with a mix of automatic staking and manual cranes, received **training sessions for the transition from manual to new semi-automated operations**.

Finally, the following good practices describe **legislative initiatives introduced to improve working conditions of the workers in the maritime sector**.

Firstly, the dismissal without notice of 786 seafarers in March 2022 by P&O, a ferry company operating between France and the UK, based on the decision to replace the seafarers with other staff from third countries, reportedly paid GBP 5.15 per hour, triggered initiatives from the French and UK governments. In France, the Assemblée Nationale approved a proposal for a **law on social dumping and block low-wage ferry companies to French ports**. The law Le Gac (i.e., Loi n° 2023-659) introduces, as of 1 January 2024, minimum wages on scheduled ferry services that include a French port, plus time on shore at least equal to time on board. A similar initiative on the remuneration of seafarers not qualifying for the national minimum wage was introduced in March 2023, by the **UK Government** (the Seafarers' Wage Act).

Secondly, the **Government of Norway promotes fair and decent working conditions** in Norwegian waters, in the Norwegian exclusive economic zone, and on the Norwegian continental shelf, by ensuring that workers on board of ships are provided by Norwegian wage and working conditions. As main rule, the flag state principle governs which pay and working conditions apply to vessels sailing in Norwegian waters and on the Norwegian continental shelf. The panel appointed by the Norwegian Government (i.e. Holmefjordutvalget) concluded in a report that a substantial share of the shipping along the coast of Norway was operated by foreign ships, and that salary and working conditions were circumvented, because the shipping operators chose cheaper foreign seafarers, compared to Norway's seafarers.

3.4. Inland waterway transport

The inland waterway transport sector is still at an early stage in relation to many of the developments described in this report, whereas other sectors have already reached higher levels of technological maturity and innovation. There are therefore not many best practices in relation to employment which pave the way for others to follow.

Developments for inland waterway transport in relation to automation and alternative fuels are currently mostly tested in **pilot projects**. CCNR keeps an **inventory of pilot and research projects** that test on-board systems allowing for automation of inland navigation vessels. These projects largely focus on the technological dimension of these trends. 3 of the 41 projects in the list include aspects in relation to what is needed to update skills needs and ensure a highly skilled workforce in the future. These 3 projects are shortly described below:

- A **Feasibility study in relation to autonomous sailing was completed in 2018 in Germany**. The study analysed how (partly) autonomous navigation can help nautical personnel in the future and help to relieve the shortage of skilled personnel.

---

[69] Super-post-Panamax is the largest and modern container crane capable of lifting 2 20-foot-long containers, under a telescopic spreader, and with lifting capacity of 65 tonnes. Newer cranes have a 120-tonne load capacity and lift up to 4 20-foot containers.

- **A project called [Safer Autonomous Systems (SAS)](#) that ran from 2018 to 2022** carried out research on the **safety credentials of autonomous systems**. The main objective was to identify ways to establish people's trust in autonomous vessels by making these autonomous systems safer. **One of the case studies in this project addressed autonomous vessels**.

- The [AUTOBARGE project](#) does research on autonomous barges for smart inland shipping addressing, among others, how to build up a highly skilled workforce for the autonomous inland waterway transport sector.

[**The Platina3 Research Project**](#) studied jobs and skills as one of the four research fields. The research builds the basis for an update of competence standards for nautical staff on inland vessels. The researchers of Platina3 have taken the findings of the CCNR inventory of projects to understand the **need to adapt, update or propose new standards for competences** in view of developments in the short and the long run (Platina 3, 2021). They have made an assessment for competence standards along **three transition paths** reflecting the key challenges as also described in this report: (i) track guidance assistant systems in inland navigation (TGAIN); (ii) remotely operated or remotely supported vessels; and (iii) developments towards fully autonomous inland vessel concepts.

3.5. Air transport

The **good practices** identified for the air transport sector **focus on three aspects**. Firstly, on the development and maintenance of the skills of the workers. Secondly, on actions undertaken at Member State level to tackle the practice of bogus self-employment. Thirdly, on economic measures to protect the workforce during, and in the wake of, the Covid-19 pandemic.

The [**EU-funded skill-UP**](#) project analysed the societal changes, how they affect the transport system and the extent to which they impact on air transport workers. The project (i) identified the knowledge, skills and competences of future employers necessary to match the trainings offered in different occupation profiles and (ii) fostered synergies between educational institutions and labour market. The project supported the elaboration of vocational and educational training (VET) programmes, based on innovative teaching and training methodologies for skilling, upskilling and reskilling of pilots, air traffic controllers and airport operators.

The [**Pact for Skills in Aerospace and Defence**](#) has established a cooperation between universities, VET organisations and regional clusters. The aim of the partnership is to **ensure continuous and sustainable supply of skills** with quality and diversity of training opportunities for around 600,000 employees in the EU, considering (i) the challenges in the wake of the Covid-19 pandemic and (ii) the objectives of carbon neutrality, Industry 4.0, digital transformation and (iii) European aerospace and defence programmes. **The Pact for Skills aims to develop and identify solutions for three aspects.** Firstly, skills forecasting to anticipate future gaps, considering industry's skills needs and demographic forecasts for next 5-10 years. Secondly, the upskilling and reskilling programmes set up to identify and implement solutions to upskill and reskill around 200,000 employees (i.e. 30% of the workforce) in EU by 2026 in emerging and transforming jobs. Third, engage and develop talent to develop partnership programmes to boost attraction and ensure talent retention, considering the estimated need for 300,000 people by 2030.[70]

A specific example of practice in place in air transport is the **training passport concept in ground operations** (IATA, 2023). The stakeholders highlighted a big problem of retention of the workforce employed by ground handlers. The turnover of the staff can be very high, meaning that there is a need

---

[70] According to estimations, the budget is EUR 1 billion, based on an average cost of EUR 2,000 per person.

to find replacements, hire and train workers on a rolling basis. In general, the staff of ground handlers undergo regular training. However, in the current situation, there is no systemic structure to recognise the levels of employee's training and competences that are accomplished during the career. The problem is two-fold. First, employees may not be rewarded for their level of competency. Secondly, employers may have to invest in remedial training instead of retention programmes to make the occupation attractive. The training passport concept focuses on the retention of qualified ground personnel when they move between sector's organisations. This concept is intended to (i) facilitate the employment of the workforce, relying on harmonised training standards and (ii) enable optimisation of the operating costs of the organisations, taking into account the very high level of competition.

The review of relevant trends and challenges in air transport highlighted that **bogus self-employment** has emerged as new phenomenon. At national level **good practices have been developed to tackle a practice** that hampers personal taxation and social security aspects. They consist of sensitising and regularisation campaigns. In **Spain**, the labour inspectorate sent some 50,000 letters to companies in which indications of labour fraud were detected; the measure was the first step in the plan for decent work that the Spanish government started in 2019 (El Pais, 2018). **Germany** carried out investigations in 2017, concerning pilots hired in the UK through intermediaries to work as self-employees in Germany. **Slovenia** introduced amendments to laws in 2018 to fight bogus self-employment and concerning (i) labour inspections, (ii) employment relationship and (iii) labour market (ACP, ECA and EurECCA, 2019a).

The **Covid-19 pandemic** was also an economic and social crisis[71] and the recovery of air transport demand to the pre-pandemic levels will take some years still. In the effort to contain the pandemic, governments enforced lockdowns and travel restrictions, measures that led air travel to collapse. In response, specific agreements and support measures were applied to protect the workforce and **two practices can be reported for EU and non-EU countries, respectively**.

In **Spain**, due to the slow recovery of air transport after the pandemic, the flag carrier airline agreed to extend the Expedientes Temporales de Regulación de Empleo (ERTE) for force majeure that the Government and social partners previously negotiated for the air transport sector to safeguard employment. The flag carrier airline agreed the negotiation with unions on grounds of operational reasons and the parties recognised the application of the ERTE for force majeure as a fundamental measure to safeguard the workforce during the aviation crisis.

In **the Netherlands**, Schiphol airport, a major European hub, dealt with a period of cancelled flights and long queues of passengers in the wake of the pandemic. In order to incentivise the workforce to stay, the airport offered an extra hourly allowance. A standardised bonus of EUR 5.25 per hour was offered to 15,000 workers employed in security, baggage handling, transport and cleaning services (i.e. 50% increase of the minimum wage) (Kazda, et al., 2022). The airport capped also the departing passengers (until March 2023) and worked with security staff and trade unions to solve the capacity issues. The parties agreed also to reduce the maximum number of times a security officer can start a shift (i.e. to ten per day), as of January 2023, a solution that made rosters more transparent and improved work-life balance.

In **the USA**, the Coronavirus Aid, Relief, and Economic Security (CARES) Act included USD 78 billion in financial support for the aviation sector, of which USD 32 billion of grants for employees' wages and benefits. The CARES Act required employers to maintain the employment level of March 2020 to the

---

[71] The International Civil Aviation Organization (ICAO) estimated that in 2020, passenger traffic fell by 60% at global level, namely 2.7 billion passengers compared to 2019 (ICAO, 2020). The reduction of traffic heavily impacted the airlines' revenues by USD 370 billion and produced losses for airports and air navigation service providers by USD 115 billion and USD 13 billion, respectively.

extent feasible, and in any case not to reduce the employment by more than 10% from the levels on that date, until September 2020.

In April 2020, the government of **Canada** introduced the [Canada Emergency Wage Subsidy (CEWS)](#) to encourage employers to keep and return employees to payroll. The CEWS programme was put in place until June 2021 and the government paid up to 75% of wages to eligible employers, whereas the employer remained responsible for pension and other benefits.

4. OVERVIEW OF EU RULES

KEY FINDINGS

- The EU has a long history of regulating **road transport** to ensure fair competition and uphold social standards. Various directives and regulations cover working time, driving hours, and safety in the sector. Reforms in 2020 (Mobility Package I) addressed issues like posting of workers and digital tachographs. A 2023 proposal seeks to introduce a digital driving license and facilitate cross-border traffic rule enforcement.

- The EU has implemented several packages to liberalize and enhance the **rail sector**, with a focus on competition, safety, and harmonization. Recent initiatives aim to increase railway freight and passenger transport to align with EU goals. Measures include improving cross-border rail traffic, high-speed rail, and interoperability. Harmonization of social rules has been achieved through minimum standards for workers and train driver qualifications.

- EU Directives and Regulations in the **maritime sector** have established working time standards, implemented global minimum standards for working conditions, and introduced training requirements based on the STCW Convention. The FuelEU maritime initiative aims to reduce GHG emissions and requires new skills for handling alternative fuels. Contingency measures during the Covid-19 pandemic recognized maritime workers as critical and provided health and repatriation guidelines.

- EU **inland waterways transport** policy aims to enhance its role in the transport system by promoting sustainability and job creation. Directive (EU) 2017/2397 establishes standardized qualifications for inland water transport deck crew members, facilitating cross-border work and improving safety. CESNI is developing standards for skills in alternative fuels operations and environmentally friendly vessel operation.

- The EU **aviation sector** underwent significant changes due to the introduction of the single market in 1987. The transition led to liberalization and allowed for more competition. Key Regulations address various aspects of the industry, including personnel safety, working conditions, and qualifications. The REFuelEU aviation initiative focuses on increasing sustainable aviation fuels to reduce GHG emissions. The EU also implemented measures to address the impact of Covid-19 on air workers.

4.1. Introduction

Transport is one of the European Community's first common policy areas, with the Treaty of Rome stressing the importance of a common transport policy by devoting a separate title to this. For more than three decades, transport policy has been one of the EU's common policies, focusing on the opening of transport markets, developing TEN-T Networks to facilitate the free movement of goods and citizens and – more recently, the implementation of common goals and measures to decarbonise transport to achieve the Climate goals agreed upon in Paris 2015.

4.2. Road transport

Attempts to guarantee fair competition and uphold social standards in road transport through EU regulation have a long history. As early as 1969, attempts were made in the European Economic Community to work towards minimum social standards by means of provisions on working hours, driving time and breaks. Since then, the EU has established a framework of social rules for road

transport operators with the three goals of guaranteeing fair competition between companies while improving road safety and providing an adequate social protection for road transport workers.

Regarding social conditions of professional drivers in the road transport sector, Directive 2002/15/EC focuses on working time, night work and breaks. Further, the Directive gives a concrete definition of "working time", thus closing a previous legal loophole on what is to be understood as working time. According to the Directive, working time not only includes the driving of vehicles but also other activities such as loading and unloading trucks, the technical maintenance and the cleaning of vehicles. Regulation (EC) No 561/2006 establishes common requirements related to daily and weekly driving times as well as breaks and rest periods. The Regulation also aims to improve road safety by stating that carriers shall not give a bonus or wage supplement related to distances travelled or amount of goods carried if that payment could lead to endangering safety on the road or the safety and health of workers.

In reaction to an insufficient implementation of these social regulations, Directive 2006/22/EC, which is known as the Enforcement Directive for Regulation (EC) No 561/2006, contains a set of provisions to enforce compliance with the regulations on driving time. It establishes minimum levels of roadside checks and controls at the premises of transport companies to be carried out every year by Member States. Unfair competition, and social fraud, is a long-standing problem in the road freight transport sector ((Broughton, et al., 2017) and (Vitols & Voss, 2019)) and therefore legal reform of the regulation of Posting of Workers has also been highly relevant for the road transport sector. In 1996, the Posting of Workers Directive 96/71/EC established a set of mandatory terms and conditions of employment, which need to be observed in the case of employees being sent abroad by their employer for a temporary period. The provisions cover issues such as maximum work periods and minimum rest periods; minimum rates of pay, including overtime rates; minimum paid annual holidays; health, safety and hygiene at work and provisions on non-discrimination.

In relation to the posting of workers regime, implementation proved to be unsatisfactory in relation to guaranteeing fair competition and an additional enforcement mechanism was introduced by Directive 2014/67/EU, including for example the establishment of the Internal Market Information system (IMI) to improve the cooperation among national authorities to better identify abuse, such as workers falsely declared as self-employed. In 2021, Regulation (EU) 2021/2179 aimed at improving the effectiveness and functioning of the IMI system. Responding to increasing evidence about social challenges, systematic practices of circumventing European rules and other unfair or fraudulent practices, the framework of social rules in road transport was amended in 2020 by a series of legislative acts in the context of the so-called "Mobility Package I" consisting of a set of new or revised rules in relation to posting of workers in transport, cabotage , driving and rest times and the digital tachograph amending and revising existing Directives or Regulations. The road transport mobility package included new so-called "market rules" which addressed cabotage transport and requirements as regards the return of the vehicle.[72]

In order to exercise their profession in the EU, professional drivers of lorries and buses need to hold a driving licence according to Directive 2006/126/EC, that regulates minimum requirements for theoretical knowledge – e.g., rules of the road – and practical driving skills necessary for driving a vehicle on public roads. In addition, professional drivers also need a certificate of professional training ("initial qualification") and should undergo periodic training courses in line with the Professional Drivers Qualification Directive 2003/59/EC which go beyond the requirements of the Driving Licence

---

[72]   Article 5(1)b of Regulation (EC) No 1071/2009 as amended by Regulation (EU) 2020/1055 requires truck drivers to return to their home countries at least once every eight weeks. This rule could exacerbate the truck driver shortage in the EU, partly by removing the time taken for the return journey from the available working time, but also by reducing the attractiveness of this work.

Directive and include knowledge about, for example, load securing, driving and rest periods, fuel-efficient driving and rules on the carriage of goods and passengers. In March 2023 the EU Commission published a proposal to revise the driving licence rules, including the introduction of a digital driving licence valid throughout the EU, and new provisions to facilitate the enforcement of traffic rules across borders. The proposal also includes the introduction of an accompanied driving scheme from the age of 17 (EPRS, 2023).

4.3. Rail transport

Following Directive 91/440/EEC on the development of the Communities railways, the Commission adopted **four railway packages** between 2001 and 2016:

- In 2001, the first railway package ('rail infrastructure package') allowed rail operators to access the trans-European network on a non-discriminatory basis for the purpose of operating international freight services.

- In 2004, the second railway package liberalised the rail freight market from 1 January 2007, introduced common procedures for investigating accidents, and established safety authorities in the Member States as well as the European Union Agency for Railways (ERA).

- In 2007, the third railway package introduced open access rights for international rail passenger services, a European train driver licence and strengthened passengers' rights.

- In 2016, the fourth railway package was adopted to complete the single market for rail services and to make it more competitive with other transportation modes.

More recently, there have been a number of activities and initiatives, including new regulations to increase the attractiveness and share of railway freight as well as passenger transport in line with the EU's transport, energy, environment and climate change ambitions. Examples include the plan to adopt a regulation with measures of better management and coordination of cross-border rail traffic. At the end of 2021, the Commission adopted an action plan on boosting long-distance and cross-border passenger rail. The aim is to improve rail infrastructure and increase high-speed rail capacity and investment support for rail to achieve the EU's objective of doubling high-speed rail traffic by 2030 and tripling it by 2050.

Further regulation measures aiming at supporting interoperability in the European rail system relate to phasing out rear-end signals of freight trains, improving data collection for railway markets in the Member States and the revision of the TSI specifications, which repeal the previous Regulation (EU) 2016/919. Revised TSI specifications were published in September 2023 and are expected to speed up the harmonisation of technical rules and the deployment of ERMTS that according to a report of the European Court of Auditors are behind schedule and will not be completed by 2030 as planned. In relation to the harmonisation of social rules in railways, common European minimum standards so far have been set in the field of certain aspects of working conditions of rail mobile workers by Directive 2005/47/EC and in relation to defining European minimum requirements of train drivers' licences by Directive 2007/59/EC. Both Directives are based on agreements of the social partners in railways, the European Transport Workers Federation ETF and the Community of European Railway and Infrastructure Companies, CER. As highlighted in a joint evaluation report by ETF and CER, the agreement on cross-border mobile workers had the intention to strengthen the rail sector and make cross-border railways easier while at the same time protect employees by defining common minimum requirements as regards working time and rest periods.

Further, Directive 2007/59/EC aims to harmonise the minimum qualification requirements and the certification of locomotive and train drivers in the EU. It stipulates that all train drivers must hold

a licence and a harmonised further training certificate. On that basis, the Directive provides for mutual recognition of documents. Since October 2011, certificates or licences have been issued to drivers performing cross-border services, cabotage services or freight transport services in another Member State or working in at least two Member States. In 2022. the Commission started to review the Train Drivers' Directive 2007/59/EC to improve the mobility of train drivers between companies, as well as between Member States, and reduce the administrative burden on all actors involved. However, the discussion between stakeholders about the revision of the Directive and related policy measures was still ongoing in January 2024.

4.4. Maritime transport

Directive 1999/63/EC implemented the agreement reached between maritime employers and labour at EU level in 1998 (Official Journal of the European Communities, 1999). The agreement stipulated working time for seafarers working on ships registered in EU Member States and ordinarily engaged in commercial maritime operations. The Directive sets minimum standards and provides that more favourable working time is possible at the national level by collective agreement.[73] Directive 1999/63/EC was amended by Directive 2009/13/EC. The new legislative text had the most substantial impact on social aspects of seafarers through the implementation of the minimum global standards for seafarers' working conditions set in 2006 by the International Labour Organisation's Maritime Labour Convention.[74,75] The Convention was signed in 2008 also by the European Community Shipowners' Associations (ECSA) and the European Transport Workers' Federation (ETF), to ensure its application in the EU.

Directive (EU) 2022/993 provides for a minimum level of training of seafarers and incorporates the minimum standards of training, certification and watchkeeping on board EU ships (Official Journal of the European Union, 2022). The standards were fixed in 1978 by the adoption of the Convention on Standards of Training, Certification and Watchkeeping for seafarers (STCW Convention) of the International Maritime Organisation (IMO, 1978).[76,77] Under the STCW Convention, seafarers must receive basic training before working on board a vessel and they must hold a valid certificate of competency to take on specific duties. The STCW Convention also sets regulations for safety training on board and stipulates minimum hours of rest for seafarers.

Directive 2009/16/EC provides rules for inspection of foreign ships in EU ports. This legislative text is relevant because it addresses pollution prevention and living and working conditions of workers on board substandard ships visiting waters under the jurisdiction of Member States.[78] The Directive stipulates that the responsibility for monitoring the compliance of these ships with respect to the international standards for safety, pollution prevention and on-board living and working conditions lies primarily with the flag State. The European Commission published a proposal for amending

---

[73] The working hours standard for seafarers under the European agreement is 8-hour day, with 1 day of rest per week and rest on public holidays. The limits on hours of work or rest are either (i) maximum hours of work which shall not exceed 14 hours in any 24-hour period and 72 hours in any 7-day period or (ii) minimum hours of rest which shall not be less than 10 hours in any 24-hour period and 77 hours in any 7-day period. There are exceptions to these provisions in the case of an emergency at sea.

[74] Under the new provisions, the minimum annual leave for EU seafarers is 2.5 calendar days per month of employment.

[75] The Directive was amended in 2018 through Directive (EU) 2018/131 in accordance with the amendments of 2014 to the Maritime Labour Convention on the financial security of seafarers.

[76] Its purpose was to undertake a codification of Directive 2008/106/EC, superseding the various acts incorporated in it. Directive 2008/106/EC was subsequently amended by Directive 2012/35/EC. Directive 2015/1794/EU amended 5 pieces of social legislation to apply to seafarers. These amendments focussed on workers protection in the case of employer insolvency, information and consultation of employees, standards for collective redundancies and workers' rights in cases of mergers and acquisitions. Directive (EU) 2019/1159 amended Directive 2008/106/EC on the minimum level of training of seafarers and repealed Directive 2005/45/EC on the mutual recognition of seafarers' certificates issued by the Member States.

[77] The STCW Convention entered into force on 28 April 1984, with a number of revisions carried out between 1991 and 2018.

[78] Directive 2013/38/EC (Official Journal of the European Union, 2013b) amended Directive 2009/16/EC on port State control.

Directive 2009/16/EC in June 2023, as part of the **maritime safety package** focusing on proposals to modernise and improve the maritime safety rules. The proposals also included a revision of [Directive 2005/35/EC](#) on a system of penalties for ship-source pollution; the proposal to amend this specific legislative text is relevant for the protection of workers involved in the prevention and response to such pollution accidents.

From a greening perspective, the recently adopted **FuelEU maritime initiative**, amending [Directive 2009/16/EU](#) and part of the 'Fit for 55' package, aims to increase the use of renewable and low-carbon fuels and reduce GHG emissions from ships. The use of new fuels will affect maritime workers, as they will need the right skillset to handle hybrid and zero-emission systems. The new EU legislation requires new competences and programmes of proper training. Also relevant for workers employed in the maritime industry is [Regulation (EU) No 1257/2013](#). The purpose of this Regulation is to prevent, reduce, minimise and eliminate accidents, injuries and other adverse effects on human health (and on the environment) caused by ship recycling activities. The rules aim to enhance safety, protection of human health and EU's marine environment throughout a ships life cycle to ensure that hazardous waste from such ship recycling is properly managed. These provisions apply to ships flying the flag of an EU Member State. The EU rules for maritime transport addressed also the contingencies of the Covid-19 crisis. From a labour-focused perspective, the rules addressing the pandemic included (i) the maritime workers among the [workers exercising critical occupations](#) (Official Journal of the European Union, 2020a) and (ii) dedicated [guidelines on protection of health, repatriation and travel arrangements for seafarers on board ships](#) (Official Journal of the European Union, 2020b).[79]

4.5. Inland waterways transport

The inland waterway transport sector plays a crucial role in European policy despite its relatively small size, mostly since it can contribute to the greening ambitions of the EU. **The European Commission tabled a [35-point action plan, NAIADES III,](#) in 2021 to boost the role of inland waterway transport in the transport system**, focussing on shifting cargo from road to inland waterways (European Commission, 2021). **NAIADES III aims to create more attractive and sustainable jobs** and a number of actions have been defined to achieve this ambition. The implementation of the policy in relation to the NAIADES III action plan is regularly discussed between the Commission and experts at the expert group meetings.

[Directive (EU) 2017/2397](#) recognises professional qualifications in IWT and sets a harmonised system for recognising qualifications applying to all deck crew members. It allows crews to exercise their profession in a cross-border environment in an easier way as the certificates of qualification are valid across the EU. Certificates, service record books and logbooks are issued in accordance with the regulations for Rhine navigation staff, which lay down requirements that are identical to those of the Directive, are also valid on all IWT of the EU[80]. The Directive builds on a modern competence-based system that will increase safety and improve work attractiveness. Member States had to implement the Directive by January 2022.

The European Commission has provided CESNI with a **mandate to prepare standards for skills for alternative fuels operations** and for environment-friendly and efficient vessel operations. An update of the **[European Standard for Qualifications in Inland Navigation (ES-QIN)](#)** is being discussed within the framework of the **[CESNI working group for professional qualifications (CESNI/QP)](#)**. Safety risks in relation to new sources of energy and required skills to ensure safety are a focus therein.

---

[79] See also (Official Journal of the European Union, 2020c).
[80] Any non-EU country may apply to the European Commission for recognition of their certificates issued by its authorities.

The European Commission will perform a market access fitness checks to evaluate EU social security (European Commission, 2021). The European Commission also aims to assess the need for **legislative initiatives to facilitate the exchange of information between crews and vessels**, and to better harmonise legislation at EU level. Finally, the Commission wants to **update crewing requirements** to make them fit for purpose new technologies and changes to the fleet that impact the skills required aboard the vessel.

4.6. Air transport

The introduction of the European single market had a significant impact on the EU's aviation sector, as before 1987 this sector was highly regulated, rigid and dominated by bilateral agreements between Member States, which prevented non-flag airlines from entering the civil aviation market.[81] The **first liberalisation package** started a deregulation process in 1987. However, it was limited to intra-national operations and did not result in effective free competition for airline operations. For the workers, the first general legislative text at EU level was Directive 89/391/EEC on measures to encourage improvements in health and safety and encompassing obligations to employers.

Regulation (EEC) No 3922/91 was adopted after the **second liberalisation package** in 1990, which allowed further deregulation and more flexibility to set fares. While focusing on the harmonisation of technical requirements and administrative procedures, the Regulation is important in relation to the conditions of employment of crews. It contained provisions for flight and duty time limitations and the need to nominate a 'home base' for crew members. The Regulation was further developed and amended by Regulation (EU) No 965/2012 and Regulation No 83/2014. Directive 2000/79/EC provides norms on the protection of workers' health and safety in the EU's aviation sector. The Directive is based on an agreement negotiated by the social partners in the sector, the Association of European Airlines (AEA), the European Transport Workers' Federation (ETF), the European Cockpit Association (ECA), the European Regions Airline Association (ERA) and the International Air Carrier Association (IACA). The Directive provides on maximum annual working time, including standby for duty assignments, and minimum standards for mobile staff paid annual leave. The Directive provides that mobile staff may have free access to health assessments before the assignment to work and follow-up check-ups on regular basis.

As a result of the **third liberalisation package** that came into effect in 1993 and introduced free competition, Regulation (EC) No 1008/2008 provides a single market for aviation and eliminates all remaining commercial restrictions for European airlines operating in the EU. Regulation (EC) No 216/2008 provided common rules in the field of aviation in the EU, applicable to personnel involved in design, production and operations of aircrafts. It served as a starting point for developing the qualifications and licencing requirements of pilots and cabin crews and the need for adequate rest periods for all crew members to minimise the deterioration of task achievement or decision-making hampering flight safety. In 2018, it was repealed by Regulation (EU) 2018/1139, which has consolidated the scope of the European Union Aviation Safety Agency (EASA) to cover the full spectrum of the aviation landscape and with the possibility for EASA and Member States to work closer together. Regulation (EU) No 1178/2011 dealing with technical requirements and administrative procedures for pilots and cabin crew is relevant in relation to the conditions of employment and notion of flight time to ensure social protection of the workers.

---

[81] Before the introduction of the European single market, relevant rules at EU level were provided by Directive 97/81/EC concerning the Framework Agreement on part-time work and which was of relevance for the aviation industry in Europe.

From a greening perspective, the recently adopted **REfuelEU aviation initiative**, as part of the 'Fit for 55' package, aims to increase both demand for and supply of sustainable aviation fuels, with lower GHG emissions than kerosene, while ensuring a level playing field across the EU. The EU rules for air transport addressed the contingencies of the Covid-19 crisis. From a labour-focused perspective, the rules addressing the pandemic included air workers among the workers exercising critical occupations (Official Journal of the European Union, 2020a).

5. POLICY RECOMMENDATIONS

KEY FINDINGS

Cross-cutting policy recommendations:

- EU policymakers should look for ways of encouraging and strengthening the prioritisation of **quality in terms of working conditions and the working environment.** This could take the form of engaging with the social partners.

- **More ambitious approaches on skills and qualifications** should be developed, in the light of the influence of and automation and digitalisation.

- European policymakers should consider putting into place **a framework that encourages active support for job seekers in the employment process**, with a particular focus on vulnerable groups.

- Given the similarity of the challenges faced by the different transport modes, **more intersectoral coordination, exchange and cooperation between sectoral social dialogues in the different transport modes** would be useful.

- There should be greater **regulation of emerging mobility and logistics services and platforms**.

- The EU should ensure **more effective implementation of existing social rules** and in particular there should be **better regulation of employment practices related to atypical forms of work.**

- EU-level policymakers should **consider the creation of a chamber system in transport** in order to find more common ground and foster joint working between business and worker representative organisations.

Policy recommendations for individual transport modes:

- **Air transport:** Monitoring of employment relationships of pilots and cabin crews that are based on **alternative employment and temporary work,** the use of **cross-border crew** in the EU and beyond, an investigation into **applicable EU employment law and enforcement**, the **sharing of best practices** in order to improve performance, training options for air traffic controllers, and the **regulation of working conditions for ground handlers**.

- **Road transport: Stopping exploitative labour practices**, **improving the attractiveness of the sector**, **tightening labour regulation** and **encouraging collective bargaining** to support the improvement of working conditions.

- **Rail transport:** Urging the EU to **consider the feasibility of the timetable for reform**, **reviewing skills programmes** for this sector's workforce, **addressing skills shortages**, partly by exchanging good practices, and **improving the gender balance** in the sector.

- **Maritime transport: Supporting the bottom-up approach to training** via the European social dialogue, **amending EU legislation on social security** to create a level playing field, **considering more flexible labour arrangements,** and **improving data gathering** in order to support initiatives.

- **Inland waterways transport: Updating the competence framework**, **updating curricula and mandatory examinations**, and **developing an action plan for long-term skills transition**.

The previous chapters of this report have highlighted key trends, persisting and emerging challenges and opportunities and good practices in the different transport modes. Further, some key considerations of the [Just Transition Mechanism (JTM)](#) are also relevant here. Aimed at leaving nobody behind and ensuring the wellbeing of workers, the JTM has defined a number of priorities and objectives in relation to citizens and workers as policies at European, national and regional/local level that are either directly or indirectly linked to transport, such as: facilitating employment opportunities in new sectors and those in transition modes; offering re-skilling opportunities; creating new jobs in the green economy; and investing in public and sustainable transport. These considerations, along with the issues that have been raised by this report, form the basis for the cross-cutting and sectoral policy recommendations set out in this chapter.

5.1. Cross-cutting policy recommendations

- There is a need to increase the attractiveness of the different modes of transport and to attract a younger workforce in order to ensure that each sector has a workforce that can cope with the challenges of the changing environment in which the transport sector will operate. EU policymakers should therefore look for ways of encouraging and strengthening the prioritisation of **quality in terms of working conditions and the working environment.**

- Linked to this and more widely, **the social dialogue and collective bargaining** should be promoted and strengthened, particularly in those transport modes in which it is robust, in order to support good quality jobs in the sector.

- **More ambitious approaches on skills and qualifications** should be developed. Many jobs are changing, and automation and digitalisation are opportunities for safer and less demanding tasks. Continuity of the ERASMUS+ programme and the Blueprint project for sectoral cooperation on skills would ensure the monitoring of the skills needed.

- **European policymakers should consider putting into place a framework that encourages active support for job seekers in the employment process**, alongside support for workers already employed in the sectors affected by the green transition. This would provide added value in terms of providing a uniform EU-level framework. There should be a particular focus on women, people with disabilities, older people and people with low levels of skills.

- Given the similarity of the challenges and needs that the different transport modes are facing, **more intersectoral coordination, exchange and cooperation between sectoral social dialogues in the different transport modes** would be useful. This could cover the dissemination of good practices and policy recommendations.

- There should be greater **regulation of new mobility and logistics services and platforms**. National and European policy makers should engage more actively in the rapidly increasing activities of new urban mobility services, platforms and logistics.

- The EU should ensure **more effective implementation of existing social rules**. Post-adoption work of the Mobility Package setting new market and social rules both for passenger and freight transport needs to be supported by concrete legally-binding implementation measures and guidance on how rules should be applied and enforced.

- There should be **better regulation of atypical forms of work.** Precarious work creates huge challenges in most transport modes and should be regulated more efficiently in order to avoid abuse and exploitation. Regulation should be streamlined and made more transparent.

In order to achieve this, common EU rules and provisions are needed to protect workers' rights and to identify illegal subcontracting.

- EU-level policymakers should **consider the creation of a chamber system in transport**. There is a need to find more common ground and joint working between business and worker representative organisations that are represented and actively engaged in the European sectoral social dialogue. There should also be more synergies between organisations outside of this social dialogue structure. A joint structure or body focusing on key and common issues of policy concern would help to enable this to take place.

5.2. Specific recommendations for transport modes

In addition to the cross-cutting recommendations set out above, specific recommendations for individual transport modes are set out below.

Road transport

- Measures need to be taken to **stop exploitative labour practices in the sector**, which affect in particular workers from Eastern European and third countries. This would help with the image of the sector and also put an end to damaging industrial action.

- The road transport sector suffers severely from **labour shortages,** which are having a negative effect on operational performance and functioning of businesses in the sector. Steps need to be taken to improve the attractiveness of the sector to the younger generation and to women. In the case of bus and coach driver jobs, the labour shortage is now urgent. Cooperation between Member States to try to find a solution to this issue may be a way forward, along with the inclusion of the social partners in efforts to resolve this issue.

- Other ways of **improving the attractiveness of the sector** include improving infrastructure, putting into place proper facilities for drivers, and ending long working shifts and precarious work. Policymakers at EU and national level should consider ways in which to achieve this.

- This sector is relatively poorly regulated, which means that employment practices such as outsourcing, agency work and bogus self-employment can flourish as an alternative to direct employment. Policymakers at EU and national level should therefore **consider tightening the labour regulation of the sector** to improve working conditions.

- **Collective bargaining** should be encouraged more actively by public policy as a means of providing better care of the sector's workers. Further, **a more active approach in terms of public policy** should also be considered, as the rapidly increasing activities in the context of new urban mobility services, platforms and logistics business are currently not regulated by coherent policies at national or European level.

Rail transport

- Policymakers and stakeholders at EU and national level should **consider whether the ambitious goals set out by EU policy are achievable within the timeframes set or even if they are feasible** on the basis of current railway policies at EU and national level.

- In particular, **levels of investment and infrastructure renovation need to be considered and reviewed** if the railway sector is to be given the strategic role it deserves for the green transition of transport.

- The **skills of the rail sector workforce need to be reviewed** and upskilling/reskilling programmes need to be put into place to enable the workforce to adapt to developments such

as the increased use of new train control and operation systems. Given the acceleration of deploying common standards and rules for technical standards in rail operation and infrastructure, there is also the need to develop more harmonised training approaches and common standards for interoperability at EU level.

- The **severe shortage of train drivers, mobile staff as well as traffic controllers and dispatchers** are already today hampering operational efficiency and quality. More activities of exchange on good practices and working conditions that increase the attractiveness of the sector for young talents, female workers or other groups (e.g. migrants, workers from other sectors, etc.) are needed.

- There should be an increased focus on **improving the gender balance in the sector**. Awareness-raising activities undertaken by the social partners in railways - ETF and CER - and their national affiliates could serve as a basis for further activity in this regard.

Maritime transport

- Policymakers should continue to **support the bottom-up approach to training via the ongoing European Social Dialogue for ports** (i.e., the Sectoral Social Dialogue Committee in Maritime Transport, SSDC-MT), because a potential exists to contribute to enhance living and working conditions of seafarers and promote career prospects of the profession. Important legislation for the sector is defined internationally, in line with its global nature (i.e., IMO and ILO frameworks). However, its global nature acts as a barrier to what could be achieved at the EU level. **EU-level solutions should consider the interaction with international legislation on employment and working conditions.**

- **Policymakers should consider amending EU legislation on social security** in order to create a level playing field with shore workers. **A review of the Community Guidelines on State Aid to Maritime Transport** should also be considered in order to make maritime professions more attractive and improve recruitment and retention of seafarers.

- European ports are specialised and have developed diverse training programmes. Policy makers should **consider flexible labour arrangements** to fit with different paces in automation and digitalisation. Equally important for ports is the European Maritime Single Window Environment Regulation, which constitutes a step forward in terms of transforming port community systems into real data-sharing platforms. However, the transformation should be supported with a **clear framework on data ownership and rules on data-sharing**.

- One of the problems is lack of quantitative data. **Quantitative and regular data gathering** should be pursued to keep policymakers and stakeholders updated on problems and trends, and to assess suitable policy interventions.

Inland waterways transport.

- **The competence framework for the sector needs to be updated** in the coming years as more projects deploying automated and greener vessels will be implemented in the future. Discussions for this should take place within the framework of the CESNI working group for professional qualifications (CESNI/QP).

- **Refresher classes**, **an update of curricula and mandatory examinations** should be organised for the future workforce and regularly updated. This will become increasingly important with the introduction of digital navigational tools. Innovations could facilitate

a more interactive approach and reduce the need for the boatmaster and the crew to participate in such courses.

- **An action plan is needed for long-term skills transition**. This action plan should specifically focus on how to increase the attractiveness of the sector to the younger generation and people with the skills which are required in the future. The action plan should also pay attention to the transitional phase, towards 2035 and 2050, since these years have been defined as milestones for key policy objectives in terms of the development of the sector. Finally, the plan should also describe actions that contribute to the competitiveness of the sector, both in the employment market for skilled talents, as well as in terms of cost-competitiveness in relation to other modes of transport.

Air transport

- In the light of new working conditions, policy makers should **continue to monitor employment relationships of pilots and cabin crews that are based on alternative employment and temporary work,** via intermediaries, such as temporary employment agencies. This situation makes it difficult to generalise for all concerned workers, because the practices of temporary agencies across the EU differ.

- It should also be noted that **Directive 2008/104/EC on temporary agency work does not cover workers who are (i) self-employed** and engaged via intermediary agencies, and (ii) workers employed by other intermediaries that are not classified as a temporary employment agency.

- Considering the mobility of the airlines, airplanes and workers, **the cross-border use of aircrew in the EU and beyond creates challenges for determining the applicable labour law, taxation and social security**. Working conditions should be monitored, and there should be a focus on the level of use by EEA licensed airlines, of (i) third country (non-EEA) crews on flights between the EEA and third countries and/or on internal EEA flights, and (ii) EEA-national crews working from bases outside the EEA.

- **Another area for investigation that should be considered is the applicable employment law and its enforcement at EU level.** Policymakers should consider making binding recital 9 of Regulation (EC) 1008/2008 on the principal place of business[82] or applying a stricter enforcement of the current legislation, for example in compliance with the 'home base' principle in Regulation 465/2012 on the coordination of social security systems. Other proposals should be considered in collaboration with the European Sectoral Social Dialogue Committee for Civil Aviation.

- For air traffic management workers, performance improvement could be achieved by **sharing 'best practices', access to better information** and a greater willingness to share mitigating measures and their effectiveness. Policymakers should consider **supporting closer cooperation between the air navigation service providers and their staff**.

- **For future air traffic controllers, there should be an assessment of different training scenarios.** The first assumption is whether they should keep a comprehensive set of functions. The second assumption is whether their function should be split into (i) limited and highly specialised tasks (receiving more training, high selection requirements, and with high skill levels) and (ii) other less complex tasks (executed by support staff).

---

[82] This Regulation was further developed and amended by Regulation (EU) No 965/2012 and Regulation No 83/2014.

- **One of the problems for air traffic controllers is lack of quantitative data.** Quantitative and regular data gathering should be pursued to collect data on human and social aspects that are not easily retrievable. This data collection strategy should consist of a combination of desk research, interviews and scenario workshops.

- **Working conditions of ground handlers are not properly regulated at EU level**, as the job market relies on (i) industry standards and (ii) Directive 96/67/EC on the access to the ground handling market at airports. **Policy makers should consider a dedicated Regulation on minimum levels of working conditions**.

REFERENCES

4QD, 2022. *The Future of the Air Transport.* Available at https://airportscouncil.org/wp-content/uploads/2022/07/2022FutureofWorkforceFinal.pdf ed. Prepared for Airport Council International - North America (ACI - NA): 4QD Strategy Consulting LLC.

Abu Kabar, N. N., Bazmohammadi, N., Vasquez, J. C. & Guerrero, J. M., 2023. *Electrification of onshore power systems in maritime transportation towards decarbonization of ports: A review of the cold ironing technology.* 178 (2023) 113243 ed. s.l.:Renewable and Sustainable Energy Reviews.

ACP, ECA and EurECCA, 2019a. *ACP - ECA - EurECCA common views on (bogus) self-employment in aviation.* Available at https://www.eurocockpit.be/positions-publications/bogus-self-employment-aviation-acp-eca-eurecca-common-views ed. Brussels: 02/12/2019.

ACP, ECA and EurECCA, 2019b. *Common views on the enforcement of the applicable law to aircrew.* Available at https://www.eurocockpit.be/sites/default/files/2019-12/ACP_ECA_EurECCA_joint%20 views_applicable%20law_F.pdf ed. Brussels: 02/12/2019.

Airbus and Boeing, undated. *A New Digital Era of Aviation: The Path Forward for Airspace and Traffic Management.* Avaialbe at https://www.infrastructure.gov.au/sites/default/files/migrated/aviation/ technology/files/submission-41-2-airbus-boeing-new-era-of-digital-aviation-002.pdf ed. s.l.:s.n.

BIMCO and ICS, 2021. *Seafarer Workforce Report, The Global supply and demand for seafarers in 2021.* Available at https://www.bimco.org/news/priority-news/20210728---bimco-ics-seafarer-workforce-report ed. Bagsværd: BIMCO.

Broughton, A. et al., 2017. *Employment conditions in the international road haulage sector.* Brussels: European Parliament, Policy Department A: Economic and Scientific Policy .

CAAM, NEXA Advisors and CROWN, 2020. *Economic Impact of Advanced Air Mobility, New air mobility options will benefit great Vancouver, creatign jpbs and energising GDP growth.* Availalbe at https://www.pnwer.org/uploads/2/3/2/9/23295822/economic_impact_assesment_-_caam_-_v1.0.pdf ed. November 13, 2020: AAM White Paper Series Part II.

CAT, 2021. *Our shared vision for 2045.* 1ST Edition, October 2021 ed. s.l.:Complete Air Traffic System (CATS) Global Council.

CCNR, 2018. *First international definition of levels of automation in inland navigation,* Available at https://www.ccr-zkr.org/files/documents/cpresse/cp20181219en.pdf: s.n.

CCNR, 2021. *Thematic Report: The European Inland Navigation Sector Labour Market,* Available at https://inland-navigation-market.org/wp-content/uploads/2021/02/Thematic-report_EN_web_BD.pdf: European Commission and CCNR.

CCNR, 2022. *CCNR Roadmap for reducing inland navigation emissions,* s.l.: s.n.

CCNR, 2023. *Annual Report 2023 Inland Navigation in Europe: Market Observation,* Available at https://www.ccr-zkr.org/13020800-en.html: Strasbourg .

CCNR, 2023. *Market Insight: Inland Navigation in Europe,* s.l.: s.n.

CEDEFOP, 2021. *Automotive Industry at a Crossroad.* Availalbe at https://www.cedefop. europa.eu /en/data-insights/automotive-industry-crossroads ed. s.l.:European Centre for the Development of Vocational Training.

CER, 2023. *Rail sector welcomes Parliament Plenary vote on reform of Emissions Trading Scheme.* Press Release ed. Brussels: CER The Voice of European Railways.

DTL and 3F, 2015. *Byways in Danish Transport. Pay, working conditions and living standards of Bulgarian, Romanian and Macedonian lorry drivers in Denmark and western Europe. A report on the movement of labour in the transport sector.* s.l.:Danish Transport and Logistics Association and 3F Transportgruppen.

ECLAC, 2020. *Ongoing challenges to ports: the increasing size of container ships.* Available at https://repositorio.cepal.org/items/6af45e89-7e2f-4f6f-acf6-138184db4cf6 ed. Number 3, 2020: United Nations.

ECSA and ETF, 2022. *Investigating the Increased Use of Digitalisation On board and Possible Benefits/Improvements to Shipboard Safety and Welfare.* WESS project, Final report, March 2022 ed. Brussels: ADSInsight for ECSA and ETF.

EESC, 2017. *Impact of digitalisation and the on-demand economy on labour markets and the consequences for employment and industrial relations.* Final study, Available at https://www.eesc.europa.eu /sites/default/files/resources/docs/qe-02-17-763-en-n.pdf ed. Brussels: CEPS and European Economic and Social Committee.

EFT, 2019. *A European Maritime Space for Socially Sustainable shipping, Concept Note.* Available at https://www.etf-europe.org/wp-content/uploads/2019/11/FairShippingConceptNoteFinal_All.pdf ed. Brussels: European Transport Workers' Federation.

El Pais, 2018. *La Inspección de Trabajo envía 50.000 cartas a empresas con indicios de fraude laboral.* Available at https://elpais.com/economia/2018/08/09/actualidad/1533814136_361559.html ed. Madrid: El Pais.

EMSA, 2023. *Seafarers' Statistics in the EU, Statistical Review (2021 data from the STCW-IS as provided by 31 December 2022).* Available at https://www.emsa.europa.eu/newsroom/latest-news/item/4950-seafarer-statistics-in-the-eu-statistical-review-2021-data-stcw-is.html ed. Lisbon: European Maritime Safety Agency, 5 May 2023.

EPRS, 2022. *Russia's war on Ukraine: Implications for EU transport.* Available at https://epthinktank.eu /2022/03/14/russias-war-on-ukraine-implications-for-eu-transport/ ed. s.l.:European Parliament Research Service.

EPRS, 2023. *European Parliamentary Research service 2023: Briefing Revision of the Driving Licence Directive.* Briefing EU Legislation in Progress ed. Brussels: European Parliament Research Service.

ERRAC, 2017. *Rail 2050 Vision, Rail - The Backbone of Europe's Mobility.* Available at https://errac.org/wp-content/uploads/2019/03/122017_ERRAC-RAIL-2050.pdf ed. s.l.: European Rail Research Advisory Council.

Esser, A., Sys, C., Vanelslander, T. & Verhetsel, A., 2020. *The labour market for the port of the future. A case study for the port of Antwerp.* 8 (2020) 349-360 ed. Department of Transport and Regional Economics, University of Antwerpen: Case Studies on Transport Policy.

ETF, 2021. *Lessons learned from three decades of liberalisation in European Railways.* Available at https://www.etf-europe.org/wp-content/uploads/2021/06/Lessons-learned-from-three-decades-of-liberalisation-of-the-European-Railways-1.pdf ed. Brussels: ETF.

ETF, 2023. *Rail industry worker shortage crisis: Why better working conditions are vital.* Available at https://www.etf-europe.org/rail-industry-worker-shortage-crisis-why-better-working-conditions-are-vital/ ed. s.l.:s.n.

European Commission, Directorate-General for Climate Action, Directorate-General for Energy, Directorate-General for Mobility and Transport, De Vita, A., Capros, P., Paroussos, L. et al, 2021. *EU

reference scenario 2020 – Energy, transport and GHG emissions – Trends to 2050. Available at https://data.europa.eu/doi/10.2833/35750 ed. Brussels: Publications Office.

European Commission, Directorate-General for Mobility and Transport, Dhondt, S., Oprins, E., Zon, R. et al., 2021. Study on Air Traffic Controller (ATCO) and Engineering Staff (ATSEP) social issues and working conditions. Final Report, Available at https://data.europa.eu/doi/10.2832/68679 ed. Brussels: Publications Office.

European Commission, Directorate-General for Mobility and Transport, Molina, C., Levin, S., Castillo, L. et al., 2019. Study on employment and working conditions of aircrews in the EU internal aviation market. Final report ed. s.l.:Publications Office.

European Commission, Directorate-General for Mobility and Transport, 2020. Study on social aspects within the maritime transport sector. Avilable at https://data.europa.eu/doi/10.2832/49520 ed. Brussels: Publications Office.

European Commission, Directorate-General for Mobility and Transport, 2021. Assessment of impacts from accelerating the uptake of sustainable alterantive fuels in maritime transport. Available at https://op.europa.eu/en/publication-detail/-/publication/22cf5bae-0b95-11ec-adb1-01aa75ed71a1 ed. Final report: Publication office.

European Commission, Directorate-General for Mobility and Transport, 2022. EU transport in figures – Statistical pocketbook 2022. Available at https://data.europa.eu/doi/10.2832/216553 ed. Brussels: Publications Office of the European Union, 2022.

European Commission, 2019. The European Green Deal. Brussels: COM(2019) 640 final.

European Commission, 2020. Sustainable and Smart Mobility Strategy - putting European transport on track for the future. SWD(2020) 331 final ed. Brussels, 9.12.2020: COM(2020) 789 final.

European Commission, 2021. Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and The Committee of the Regions, NAIADES III. Brussels: 24.6.2021, COM(2021) 324 final.

European Commission, 2022. A Drone Strategy 2.0 for a Smart and Sustainable Unmanned Aircraft Eco-System in Europe. COM(2022) 652 final ed. Brussels: 29.11.2022.

European Commission, 2023. Report from the Commission to the European Parliament and the Council Eigth monitoring report on the development of the rail market under Article 15(4) of Directive 2012/34/EU of the European Parliament and of the Council. Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023DC0510 ed. Brussels, 13.9.2023: COM(2023) 510 final.

European Journal of the European Communities, 1992c. Council Regulation (EEC) No 2409/92 of 23 July 1992 on fares and rates for air services. Available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992R2409 ed. Brussels: No L 240/15.

FEPORT, 2018. Training in Terminals, How Terminals Invest in Training. June 2018 ed. Brussels: Federation of European Private Port Companies and Terminals.

FEPORT, undated. FEPORT Position Paper, Automation and Digitalisation. s.l.:s.n.

Giudone, P., 2023. SuperJet, dai russi a un fondo arabo: Venezia salirà fino a 550 addetti. Available at https://corrieredelveneto.corriere.it/notizie/venezia-mestre/economia/23_dicembre_14/superjet-dai-russi-a-un-fondo-arabo-venezia-salira-fino-a-550-addetti-af30b133-3802-463f-aca3-b76e64920xlk.shtml?refresh_ce ed. Milano: Corriere della Sera online, 14 December 2023.

Heinrich-Böll-Stiftung, 2021. *European Mobility Atlas, Facts and Figures about Transport and Mobility in Europe 2021*. Available at https://eu.boell.org/sites/default/files/2021-07/EUMobilityatlas2021 _2ndedition_FINAL_WEB.pdf ed. Brussels: Heinrich-Böll-Stiftung, 2nd edition.

Hinkka, V., Eckhardt, J., Permala, A. & Mantsinen, H., 2016. *Changing training needs of port workers due to future trends.* April 18-21, 2016 ed. s.l.:6th Transport Research Arena .

HSBA, 2018. *Seafarers and digital disruption, The effect of autonomous ships on the work at sea, the role of seafarers in the shipping industry.* Available at https://www.ics-shipping.org/wp-content/ uploads/2020/08/ics-study-on-seafarers-and-digital-disruption-min.pdf ed. Hamburg/London: Hamburg School of Business Administration, October 2018.

HYSKY, 2022. *2022 Vertical Flight Workforce Report: Diversity, Equity and Inclusion is Vital.* Available at https://vtol.org/files/dmfile/hysky-vfs_workforcereport_nov2022.pdf ed. Published Oct. 11, 2022: Updated: Nov. 3, 2022: Study for the Vertical Flight Society.

IATA, 2023. *Training Passport Concept in Ground Operations.* White Paper ed. s.l.:IATA.

ICAO, 1944. *Convention on International Civil Aviation done at Chicago on the 7th day of December 1944.* Available at https://www.icao.int/publications/documents/7300_orig.pdf ed. Chicago: International Civil Aviation Organisation.

ICAO, 2016. *Resolutions adopted by the Assembly, Assembly 39th Session.* International Civil Avaition Organization ed. Montréal: 27 September—6 October 2016.

ICAO, 2020. *Guidance on economic and financial measures to mitigate the impact of the coronavirus breakdown on aviation.* Version 1.2 ed. s.l.:International Civil Aviation Organisation.

ILO, 2006. *Maritime Labour Convention.* Available at https://www.ilo.org/wcmsp5/groups/public/--- ed_norm/---normes/documents/normativeinstrument/wcms_090250.pdf ed. s.l.:International Labour Organisation.

IMO, 1978. *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers.* Available at https://www.imo.org/en/OurWork/HumanElement/Pages/STCW-Convention. aspx ed. s.l.:International Maritime Organisation.

industriAll, CLEPA et al., 2021. *Deliring the Just Transition: the social gap in the Fit for 55 package for automotive workers and workers in the wider mobility eco-system.* Available at https://news.industriall-europe.eu/documents/upload/2021/12/637740394623969551_JT%20coalition%20briefing_EN_30.1 1.21.pdf ed. s.l.:December 2021.

IRG-Rail, 2022. *Tenth Annual Market Monitoring Report.* April 2022 ed. s.l.:IRG-Rail Independent Regulators' Group - Rail.

IRU, 2022a. *Driver Shortage Global Report.* Availalbe at https://www.iru.org/news-resources/ newsroom/global-driver-shortages-2022-year-review#:~:text=In%20June%202022%2C%20after%20surveying,over%202.6%20million%20professio nal%20drivers. ed. s.l.:s.n.

IRU, 2022b. *IRU: Driver shortage in Europe to triple by 2026 if no action taken.* Avaialble at https://trans.info/en/driver-shortage-in-europe-to-triple-by-2026-313260 ed. s.l.:s.n.

IRU, 2022c. *The truck driver profession in Europe, Access and attractiveness.* Available at https://www.iru.org/news-resources/newsroom/europe-driver-shortage-triple-2026-if-no-action-new-iru-

report#:~:text=Access%20and%20attractiveness%20key,costs%20are%20also%20an%20obstacle. ed. s.l.:IRU Intelligence Briefing.

IRU, 2022d. *The bus and coach driver profession in Europe. Access and attractiveness.* Available at https://www.iru.org/system/files/IRU%20Intelligence%20briefing%20-%20The%20bus%20and%20coach%20driver%20profession%20in%20Europe%20access%20and%20 attractiveness%20-%20Executive%20summary.pdf ed. s.l.:IRU Intellingence Briefing.

ITF, 2018. *The Impact of Alliances in Container Shipping, Case-Specific Policy Analysis.* Paris: Intenrational Transport Forum.

ITF, 2021. *Container Port Automation: Impacts and Implications.* OECD Publishing, Available at https://www.itf-oecd.org/sites/default/files/docs/container-port-automation.pdf ed. Paris: International Transport Forum Policy Papers, No 96.

ITF, 2022. *Transport Policies Responses to the War in Ukraine.* No. 3, 22 December 2022 ed. s.l.:International Transport Forum.

Jorens, Y., Gillis, D., Valcke, L. & De Coninck, J., 2015. *Atypical Forms of Employment in the Aviation Sector.* European Commission ed. s.l.:European Social Dialogue.

Kaspersen, R. A. et al., 2022. *Insights into seafarer training an skills needed to support decarbonised shipping industry.* 2022-11-04 ed. s.l.:DNV.

Kazda, A., Badanik, B. & Serrano, F., 2022. *Pandemic vs. Post-Pandemic Airport Operations: Hard Impact, Slow Recovery.* Available at https://www.mdpi.com/2226-4310/9/12/810 ed. Academic Editor: Miguel Mujica Mota: Aerospace.

Lamannis, M., 2023. *Collective bargaining in the platform economy: a mapping exercise of existing initiatives,* s.l.: European Trade Union Institute (ETUI).

McKinnon, A., Flöthmann, C., Hoberg, K. & Busch, C., 2017. *Logistics Competencies, Skills, and Training: A Global Overview.* Available at https://openknowledge.worldbank.org/entities/publication/6a22b22f-2254-521a-bea1-a1dcb69135cc ed. Washington: World Bank Studies.

Nagler, A., 2021. *White Paper, Electrifying the maritime and port sectors.* 2021, ABB ed. Washington D.C.: ABB Inc.

Nastali, I., Bartlet, C., Williams, A. & Abrahams, S., 2022. *Women in maritime, Survey 2021. A study of maritime companies and IMO Member States' maritime authorities.* May 2022 ed. s.l.:Coordinated by International Maritime Organisation and WISTA International.

National Infrastructure Commission, 2018. *Future of freight.* Available at https://nic. org.uk/ app/uploads/Future-of-Freight-Interim-Report-2.pdf ed. Interim Report: National Infrastructure Commission.

OECD, 2000. *Employment outlook 2000.* Paris: Organisation for Economic Co-operation.

Official Journal of European Communities, 1991. *Council Directive of 16 December 1991 on mutual acceptance of personnel licences for the exercise of functions in civil aviation.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31991L0670 ed. Brussels: No L 373/21.

Official Journal of European Union, 2004. *Commission communication C(2004) 43 — Community guidelines on State aid to maritime transport.* 17/01/2004 ed. Brussels: P. 0003 - 0012.

Official Journal of the European Communities, 1989. *Council Directive of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work.* Available at

https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31989L0391 ed. Luxembourg: No L 183/1.

Official Journal of the European Communities, 1991. *Council Regulation (EEC) No 3922/91 of 16 December 1991 on the harmonisation of technical requirements and administrative procedures in the field of civil aviation.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31991R3922 ed. Brussels: No L 373/4.

Official Journal of the European Communities, 1992a. *Council Regulation (EEC) No 2407/92 of 23 July 1992 on licensing of air carriers.* Avaialble at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992R2407 ed. Brussels: No L 240/1.

Official Journal of the European Communities, 1992b. *Council Regulation (EEC) No 2408/92 of 23 July 1992 on access for Community air carriers to intra-Community air routes.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992R2408 ed. Brussels: No L 240/8.

Official Journal of the European Communities, 1997. *Council Directive 97/81/EC of 15 December 1997 concerning the Framework Agreement on part-time work concluded by UNICE, CEEP and the ETUC.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31997L0081 ed. Brussels: L 14/9.

Official Journal of the European Communities, 1999. *Council Directive 1999/63/EC of 21 June 1999 concerning the Agreement on the organisation of working time of seafarers concluded by the European Community Shipowners' Association (ECSA) and the Federation of Transport Workers' Unions in the European Union.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31999L0063 ed. Brussels: L 167/33.

Official Journal of the European Communities, 2000. *Council Directive 2000/79/EC of 27 November 2000 concerning the European Agreement on the Organisation of Working Time of Mobile Workers in Civil Aviation concluded by AEA, ETF, ECA and IACA.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32000L0079 ed. Brussels: L 302/57.

Official Journal of the European Union, 2003. *Directive 2003/42/EC of the European Parliament and of the Council of 13 June 2003 on occurrence reporting in civil aviation.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003L0042 ed. Luxembourg: L 167/23.

Official Journal of the European Union, 2004. *Regulation (EC) No 883/2004 of the European Parliament and of the Council of 29 April 2004 on the coordination of social security systems.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A02004R0883-20140101 ed. Brussels: 30.4.2004.

Official Journal of the European Union, 2005a. *Directive 2005/35/EC of the European Parliament and of the Council of 7 September 2005 on ship-source pollution and on the introduction of penalties for infringements.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32005L0035 ed. Strasbourg: L 255/11.

Official Journal of the European Union, 2005b. *Directive 2005/45/EC of the European Parliament and of the Council of 7 September 2005 on the mutual recognition of seafarers' certificates issued by the Member States and amending Directive 2001/25/EC.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32005L0045 ed. Strasbourg: L 255/160.

Official Journal of the European Union, 2008a. *Regulation (EC) No 1008/2008 of the European Parliament and of the Council of 24 September 2008 on common rules for the operation of air services in the Community (Recast).* Available at https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008: 293:0003: 0020:en:PDF ed. Strasbourg: L 293/3.

Official Journal of the European Union, 2008b. *Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri= celex%3A32008R0216 ed. Strasbourg: L 79/1.

Official Journal of the European Union, 2008c. *Directive 2008/106/EC of the European Parliament and of the Council of 19 November 2008 on the minimum level of training of seafarers (recast).* Available at https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:32008L0106 ed. Strasbourg: L 323/33.

Official Journal of the European Union, 2008. *Directive 2008/104/EC of the European Parliament and of the Council of 19 November 2008 on temporary agency work.* L 327/9 ed. Strasbourg: 5.12.2008.

Official Journal of the European Union, 2009a. *Council Directive 2009/13/EC of 16 February 2009 implementing the Agreement concluded by the European Community Shipowners' Associations (ECSA) and the European Transport Workers' Federation (ETF) on the Maritime Labour Convention.* Available at https://eur-lex.europa.eu/eli/dir/2009/13/oj ed. Brussels: L 124/30.

Official Journal of the European Union, 2009b. *Directive 2009/16/EC of the European Parliament and of the Council of 23 April 2009 on port State control.* Avaialble at https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32009L0016 ed. Strasbourg: L 131/57.

Official Journal of the European Union, 2011. *Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02011R1178-20191221 ed. Brussels: L 311.

Official Journal of the European Union, 2012a. *Consolidated version of the Treaty of the Functioning of the European Union.* Available at https://eur-lex.europa.eu/LexUriServ/LexUriServ.do? uri=CELEX: 12012E/TXT:en:PDF ed. Brussels: s.n.

Official Journal of the European Union, 2012b. *Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008.* Available at https://eur-lex.europa.eu/legal-content/EN /TXT/PDF/?uri=CELEX:32012R0965 ed. Brussels: L 296/1.

Official Journal of the European Union, 2012c. *Directive 2012/35/EC of the European Parliament and of the Council of 21 November 2012 amending Directive 2008/106/EC on the minimum level of training of seafarers.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012L0035 ed. Strasbourg: L 343/78.

Official Journal of the European Union, 2013a. *Regulation (EU) No 1257/2013 of the European Parliament and of the Council of 20 November 2013 on ship recycling and amending Regulation (EC) No 1013/2006 and Directive 2009/16/EC.* Available at https://eur-lex.europa.eu/LexUriServ/LexUriServ.do? uri=OJ:L:2013: 330:0001:0020:EN:PDF ed. Strasbourg: L 330/1.

Official Journal of the European Union, 2013b. *Directive 2013/38/EC of the European Parliament and of the Council of 12 August 2013 amending Directive 2009/16/EC on port State control.* Available at https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32013L0038 ed. Brussels: L 218/1.

Official Journal of the European Union, 2014a. *Commission Regulation (EU) No 83/2014 of 29 January 2014 amending Regulation (EU) No 965/2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008.* Available at https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2014:028:0017:0029:EN:PDF ed. Brussels: L 28/17.

Official Journal of the European Union, 2014b. *Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation.* Avaialble at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014R0376 ed. Brussels: L 122/18.

Official Journal of the European Union, 2015. *Directive 2015/1794/EU of 6 October 2015 amending Directives 2008/94/EC, 2009/38/EC and 2002/14/EC of the European Parliament and of the Council, and Council Directives 98/59/EC and 2001/23/EC, as regards seafarers.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015L1794 ed. Strasbourg: L 263/1.

Official Journal of the European Union, 2016. *Regulation (EU) 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008R0216 ed. Strasbourg: L 79/1.

Official Journal of the European Union, 2017. *Commission Implementing Regulation (EU) 2017/373 of 1 March 2017 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight.* Avaialble at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R0373 ed. Brussels: L 62/1 .

Official Journal of the European Union, 2017. *Regulation (EU) 2017/2392 of the European Parliament and of the Council of 13 December 2017 amending Directive 2003/87/EC to continue current limitations of scope for aviation activities and to prepare to implement a global market-based measure from 2021.* 29 December 2017 ed. Brussels: L 350/7.

Official Journal of the European Union, 2018a. *Council Directive (EU) 2018/131 of 23 January 2018 mplementing the Agreement concluded by the European Community Shipowners' Associations (ECSA) and the European Transport Workers' Federation (ETF) to amend Directive 2009/13/EC.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32018L0131 ed. Brussels: L 22/28.

Official Journal of the European Union, 2018b. *Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R1139 ed. Strasbourg: L 212/1.

Official Journal of the European Union, 2019. *Directive (EU) 2019/1159 of the European Parliament and of the Council of 20 June 2019 amending Directive 2008/106/EC on the minimum level of training of seafarers and repealing Directive 2005/45/EC on the mutual recognition of seafarers' certificates.* Available at https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32019L1159 ed. Brussels: L 188/94.

Official Journal of the European Union, 2019. *Regulation (EU) 2019/1239 of the European Parliament and of the Council of 20 June 2019 establishing a European Maritime Single Window environment and repealing Directive 2010/65/EU.* L 198/64 ed. Brussels: 25.7.2019.

Official Journal of the European Union, 2020a. *Communication from the Commission Guidelines concerning the exercise of the free movement of workers during COVID-19 outbreak.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020XC0330%2803%29 ed. Brussels: s.n.

Official Journal of the European Union, 2020b. *Communication from the Commission Guidelines on protection of health, repatriation and travel arrangements for seafarers, passengers and other persons on board of ships.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1587372584657&uri=CELEX%3A52020XC0414%2801%29 ed. Brussels: s.n.

Official Journal of the European Union, 2020c. *Communication from the Commission on the implementation of the Green Lanes under the Guidelines for border management measures to protect health and ensure the availability of goods and essential services 2020/C 96 I/0.* Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1587479657296&uri=CELEX:52020XC0324(01) ed. Brussels: s.n.

Official Journal of the European Union, 2021. *Commission Implementing Regulaiton (EU) 2021/664 of 22 April 2021 on a regulatory framework for the U-space.* L 139/161 ed. Brussels: 23.4.2021.

Official Journal of the European Union, 2022. *Directive (EU) 2022/993 of the European Parliament and of the Council of 8 June 2022 on the minimum level of training of seafarers.* Available at https://eur-lex.europa.eu/eli/dir/2022/993/oj ed. Strasbourg: L 169/45.

Pike, K. & Terpilowsk, S., 2022. *Enhance participation of women in European shipping, The opportunity to increase gender balance in the EU maritime sector.* Project WESS, Working Environment in the Shipping Sector ed. Brussels: ETF, ECSA.

Platina 3, 2021. *Report on competences needed to operate on board systems allowing for automation of inland navigation vessels D3.3,* s.l.: s.n.

Railway Gazzette, 2022. *Rail industry calls for action on rising energy costs.* Available at https://www.railwaygazette.com/policy/rail-industry-calls-for-action-on-rising-energy-costs/62544.article ed. 13 September 2022: Railway Gazzette International.

Rowland, R., 2022. *eVTOL Aircraft and the Impact on Commercial Aviation.* Available at https://www.oag.com/blog/evtol-and-the-impact-on-commercial-aviation ed. 20 April 2022: OAG.

Saether, R. S. & Moe, E., 2021. *A green maritime shift: Lessons from the electrification of ferries in Norway.* 81 (2021) 102282 ed. s.l.:Energy Research and Social Science.

Sanchez, R. J., Perrotti, D. E. & Gomez Paz Fort, A., 2021. *Looking into the future ten years later: big full containerships and their arrival to south American ports.* (2021) 6:2 ed. s.l.:Journal of Shipping and Trade.

Schröder-Hinrichs, J. et al., 2019. *Transport 2040: Automation, Technology, Employment - The Future.* Available at https://commons.wmu.se/lib_reports/58/ ed. Malmö: World Maritime University.

Scordamaglia, D. & Katsarova, I., 2016. *The Fourth Railway Package, Another step towards a Single European Railway Area. In Depth Analysis.* March 2016 — PE 579.088 ed. European Union: EPRS European Parliamentary Research Service.

SESAR JU, 2016. *European Drones Outlook Study.* s.l.:s.n.

Shift2Rail, 2019. *Socio-economic aspects of human capital Assessment of the state of play in employment in the railway sector.* Shift2Rail Joint Undertaking ed. s.l.:s.n.

SkillFull, 2020. *Current and future occupations in the aviation domain.* Available at https://skillfulproject.eu/ajax/DownloadHandlerFM.php/downloadFile?id=15223 ed. s.l.:European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement number 723989.

SKILLSEA, 2022. *Future Skills and Competence Needs.* Deliverable 1.1.3 ed. s.l.:April 29, 2022.

SKILLSEA, 2023. *Summary of SkillSea strategy, key findings and recommendations.* Available at http://skillsea.eu/images/Public_deliverables/aug2023/SkillSea_strategy_summary_final_DIGITAL-version_24-May-2023.pdf ed. Rotterdam: SKILLSEA.

SKILL-UP, 2021. *D1.1 Skills, needs and future work scenarios: Air Sector Skills Transformation Map.* Available at https://www.skillup-air.eu/wp-content/uploads/2021/04/D1.1-Skills-needs-and-future-work-

scenarios-Air-Sector-Skills-Transformation-Map_v01.00.00.pdf ed. March 2021: Partner responsible: Deep Blue, Contributors: all partners.

Steer Davies Gleave, 2015. *Study on employment and working conditions in air transport and airport.* Available at https://transport.ec.europa.eu/system/files/2016-09/2015-10-employment-and-working-conditions-in-air-transport-and-airports.pdf ed. Report for European Commission DG MOVE: Final Report, October 2015.

Steer, 2023. *Research for TRAN Committee – Unmanned Aircraft Systems integration into European airspace and operation over populated areas,.* Brussels: European Parliament, Policy Department for Structural and Cohesion Policies.

Tamma, P., 2022. *Will the Green Deal be a job drain? The car industry's transformation shows how decarbonization can cause seismic shifts in the workforce.* Available at https://www.politico.eu/article/green-deal-job-drain/ ed. 16 March 2022: Politico.

Thums, J. et al., 2023. *Future air transportation and digital work at airports - Review and developments.* 19 (2023) 100808 ed. s.l.:Transportation Research Interdisciplinary Perspectives.

Turnbull, P., 2020. *Tacking undeclared work in the air transport sector, with special focus on bogus self-employment of aircrews: a learning resource.* 19 February 2020 ed. Brussels: University of Bristol, UK.

UN, 2022. *Handbook of Statistics 2022.* Publication issued by the United Nations Conference on Trade and Development ed. New York: United Nations.

UNCTAD, 2022. *Review of Maritime Transport 2022, Navigating Stormy Waters.* Publication issued by the United Nations Conference on Trade and Development ed. New York: United Nations.

Vitols, K. & Voss, E., 2019. *Social conditions in logistics in Europe: Focus on road transport.* Final report ed. Hamburg/Brussels: ETF, ver.di and EVA.

Voss, E., 2022. *Employability in the rail sector in the light of digitalisation and automation.* Available at https://www.etf-europe.org/activity/employability-in-the-railway-sector-in-the-light-of-digitalisation-and-automation/ ed. Final Report: EDA Rail project commissioned by CER and ETF.

Voss, E., forthcoming. *Social Dialogue on the Deployment of Clean Buses in Europe: Analysis of current practices, added value and recommendations.* Final report ed. Brussels: UITP and EFT.

Voss, E. & Vitols, D. K., 2020. *Digital Transformation and Social Dialogue in Urban Public Transport in Europe: Final Report,* Berlin: EVA – Europäische Akademie für umwelt orientierten Verkehr gGmbH.

Weert, C. & Knie, A., 2023. *The Future of Mobility. Winners and Losers and New Options in the Public Space.* WZB ed. Berlin: WZB Discussion Paper, SP III 2023-601.

WMA, 2019. *Transport 2040, Automation Technology Employment - The Future of Work.* Available at https://commons.wmu.se/lib_reports/58/ ed. London: World Maritime University and International Transport Workers' Federation.

ANNEX 1 – SUMMARY TABLE OF THE STAKEHOLDER CONSULTATION

**Table A.1: Summary table of the stakeholder consultation activities**

Transport mode	Organisation
Air	• Civil Air Navigation Services Organisation (CANSO) • Airport Services Association (ASA) • European Cockpit Association (ECA) • European Transport Workers' Federation (ETF)
Urban public transport	• International Association of Public Transport (UITP) • European Transport Workers' Federation (ETF)
Road	• World Road Transport Organisation (IRU) • European Transport Workers' Federation (ETF)
Rail	• European Rail Research Advisory Council (ERRAC) • Community of European Railway and Infrastructure Companies (CER) • European Transport Workers' Federation (ETF)
Maritime	• Federation of European Private Port Companies and Terminals (FEPORT) • European Transport Workers' Federation (ETF)
Inland waterways	• European Transport Workers' Federation (ETF)
Automotive	• IndustriAll Europe trade union
Logistics and intermodal	• European Association for Forwarding, Transport, Logistics, and Customs Services (CLECAT) • European Transport Workers' Federation (ETF)
Cross-cutting	• European Transport Workers' Federation (ETF)

Source: compilation of the authors

ANNEX 2 – SUPPORTING EVIDENCE TO THE ANALYSIS

Road transport

Figure A.1: Persons employed by age groups in road transport (2008-2023)
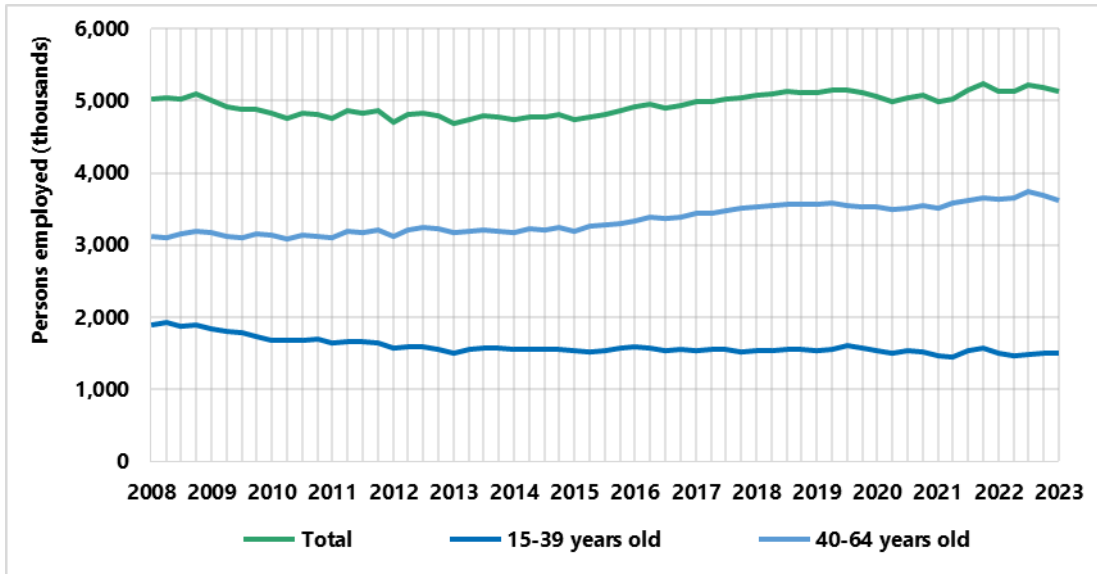
Source: elaboration of the authors based on Eurostat data

Figure A.2: Persons employed by gender in road transport (2008-2023)
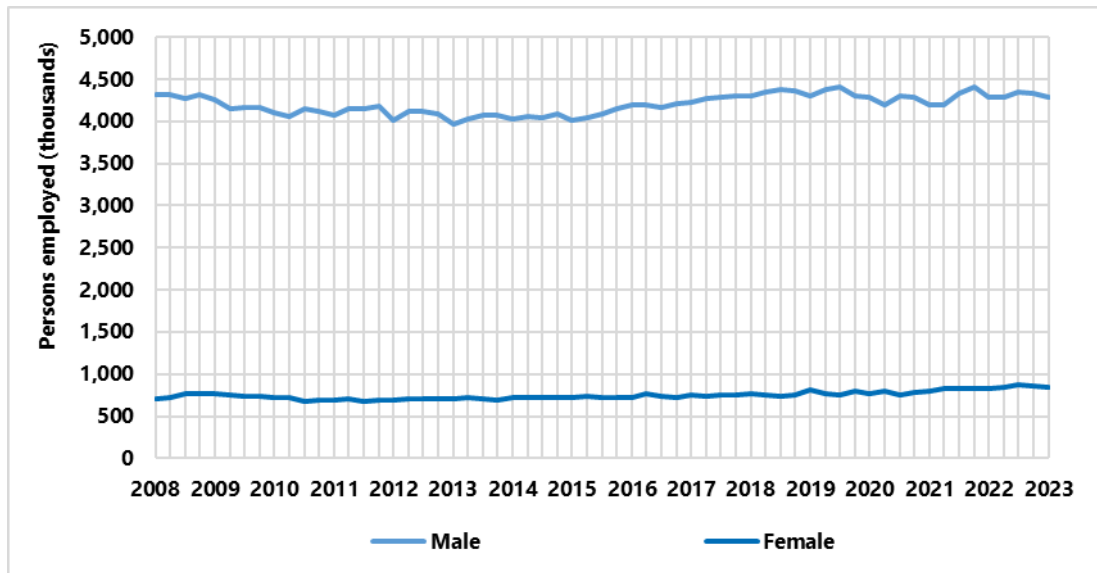
Source: elaboration of the authors based on Eurostat data

Figure A.3: Driver shortage in bus and coach transport

How much difficulty are bus and coach companies having to fill driver positions due to the shortage of drivers? (% companies)
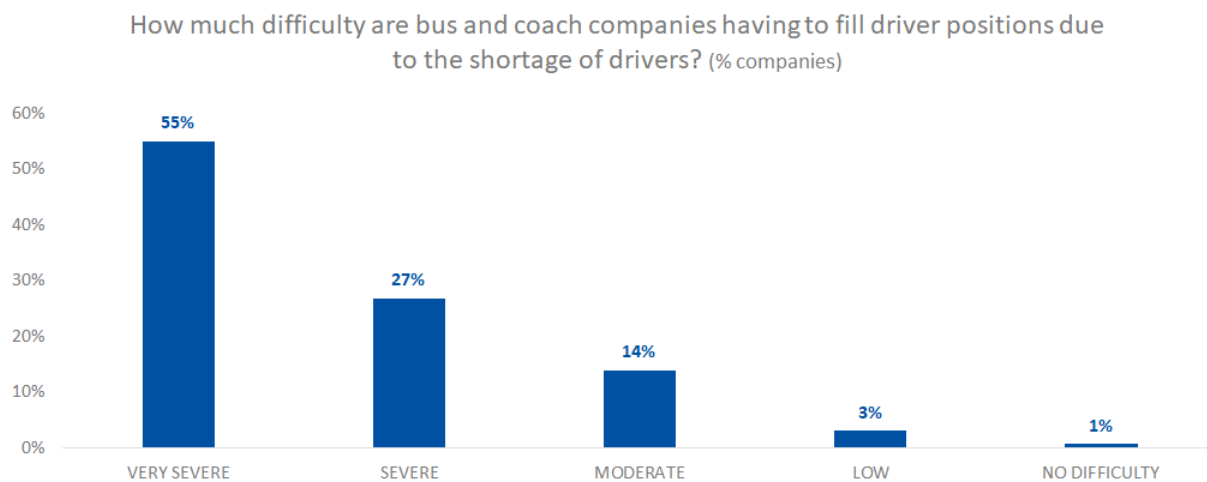
Source: IRU survey 2023, based on the question: *"How much difficulty are you having to fill driver positions due to the shortage of drivers?"*

Figure A.4: The New European Urban Mobility Network

Source: European Commission, The New European Urban Mobility Framework (see also <u>here</u>)

Rail transport

Figure A.5: Total number of employees in the rail market (infrastructure managers plus railway undertakings) per country (number, 2015 and 2020)
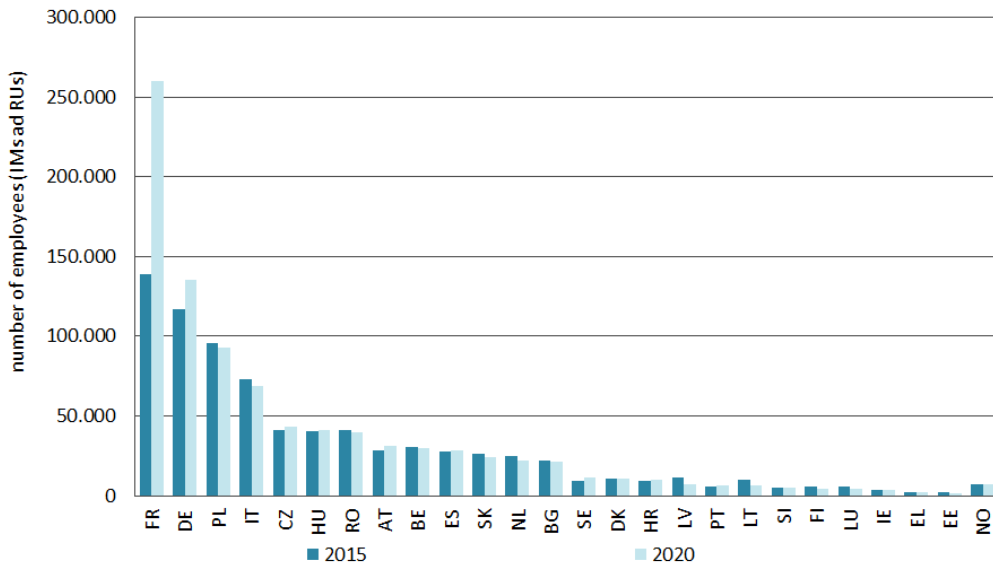
Source: (European Commission, 2023)

Figure A.6: Number of train drivers of main and other railway undertakings per country (number, 2015 and 2020)
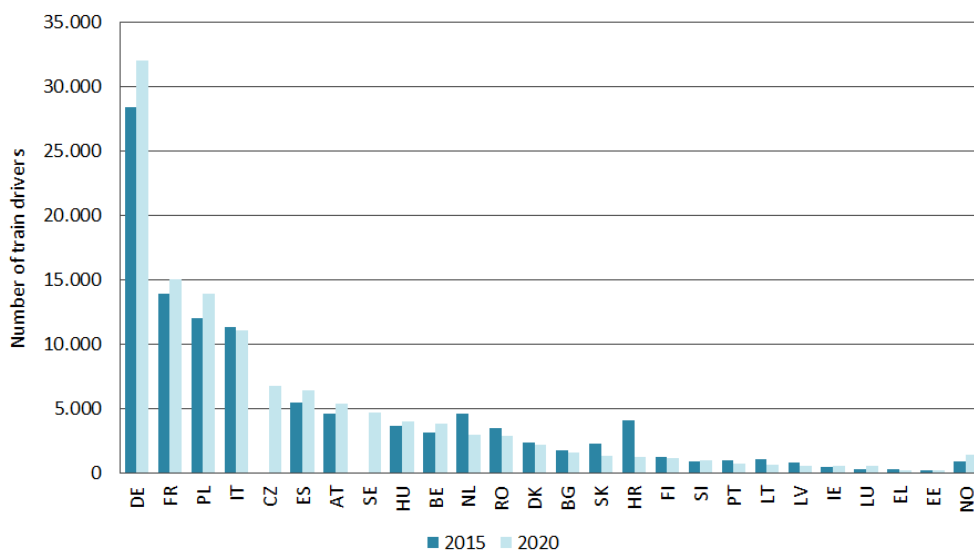
Source: (European Commission, 2023)

Figure A.7: Total employees (main infrastructure managers plus railway undertakings) by gender structure, (% in 2020)
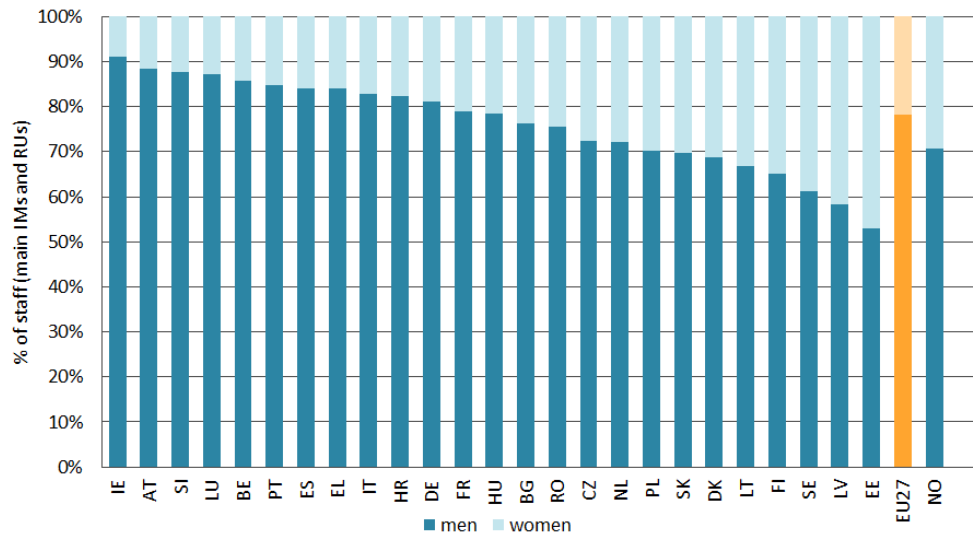
Source: (European Commission, 2023)

Figure A.8: Employees by age group, main railway undertakings and infrastructure managers (%, 2015-2020)
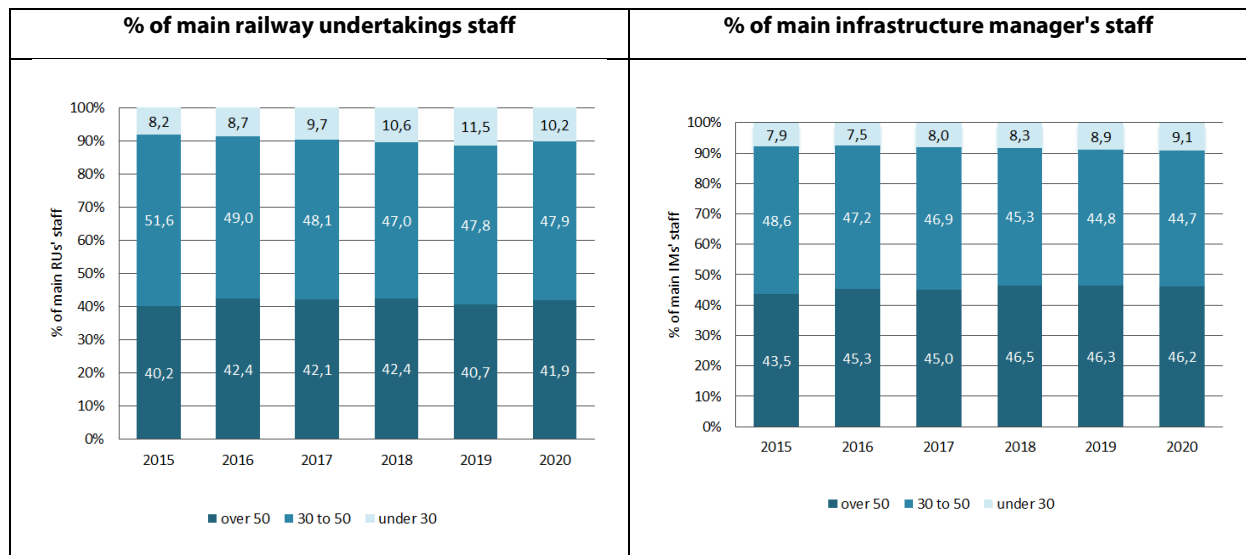
Source: (European Commission, 2023)

Figure A.9: EDA Rail – Employability in the light of digitalisation and automation

| Dimensions of Employability	Policies	Measures
Employability in light of digitalisation, automation and other trends and drivers	• Raise awareness of the social impact of digitalisation and automation in the rail sector • Engage in dialogue regarding both opportunities and risks pertaining to the impact on employability • Introduce and implement change management plans to facilitate the transition process and manage the social impacts • ...	Measures should be based on the good practices identified in the different countries
Work, working conditions and work organisation, leadership	• Improve working conditions and mitigate the risks that stem from digitalisation and automation • Establish a work-life balance policy that contributes to the requirements and expectations of workers and employees over their working life cycle • Develop a new leadership culture that takes new requirements and needs into account • Attract a broader and more diverse workforce to the rail sector, including groups that are currently underrepresented in many occupations (e.g. women, disabled workers), by seizing the opportunities provided by automation and digitalisation • Attract young people to the rail sector and address the shortage of workers in certain occupations • ...	
Values, attitudes, and motivation	• Adopt policies and commitments to diversity, equal opportunity and participation • Ensure the compatibility of work and private life • ... • ...	
Skills, competences, learning	• Establish a system and policy of lifelong and continuous learning • Develop new forms of education and learning with digital tools and implement them only in close consultation with trade unions/workers representatives • Establish a career development policy •	Measures should be based on the good practices identified in the different countries
Health and functional capacity	• Establish socio-psychological risk assesment policies relating to the impacts of digital and automated workplaces and working environments • ...	

Source: (Voss, 2022)

Maritime transport

Figure A.10: Number of workers in the maritime transport sector (2008-2020)
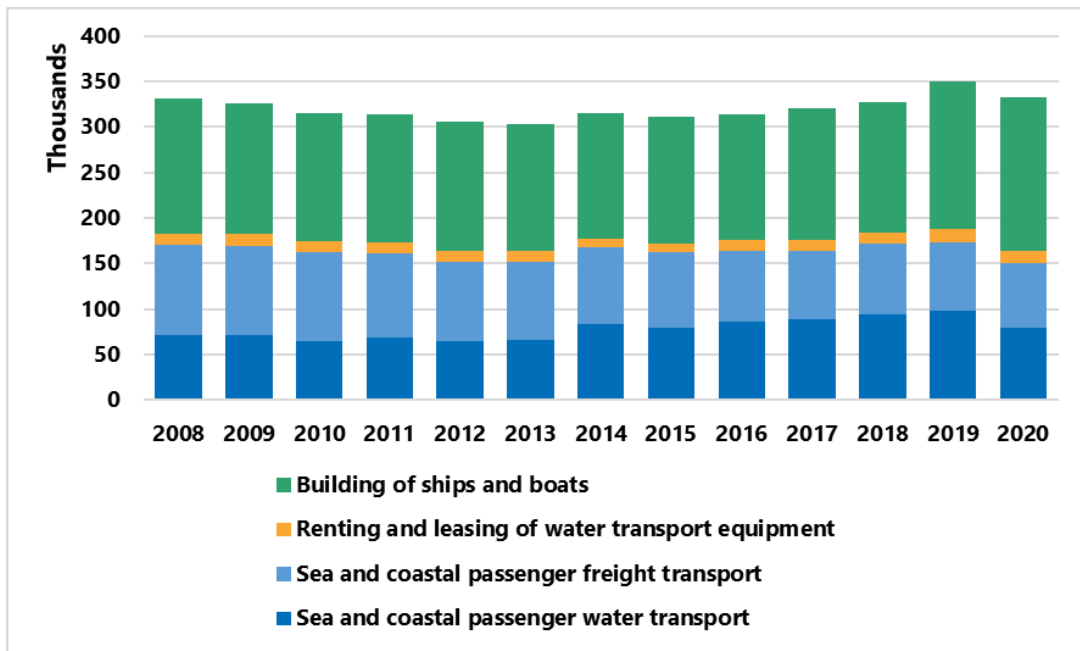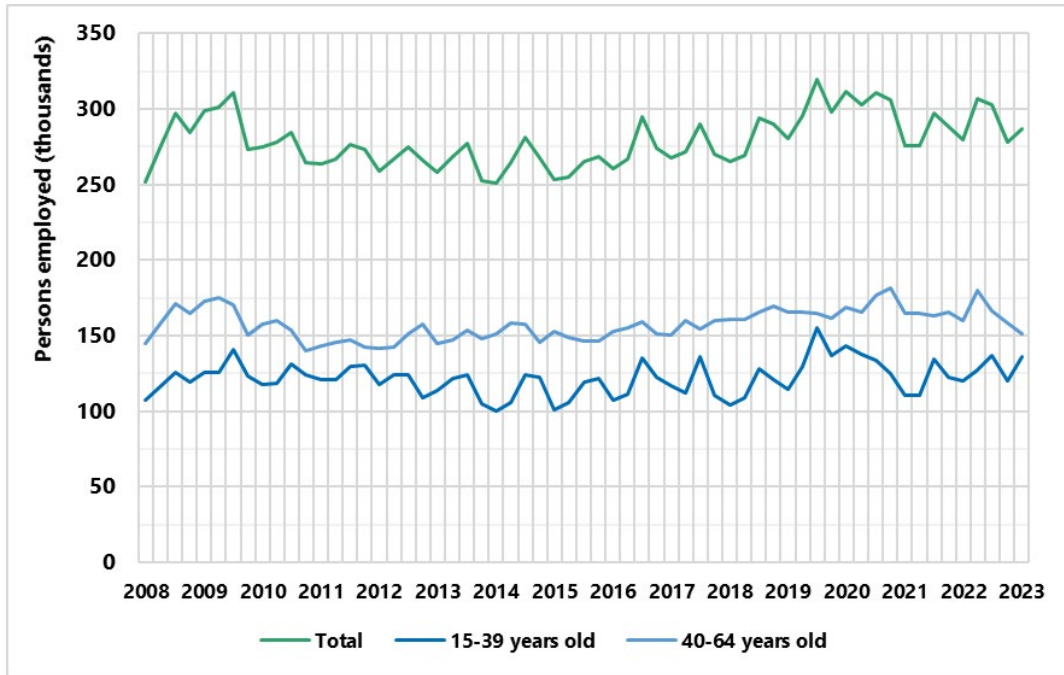

Source: elaboration of the authors based on Eurostat data

Figure A.11: Number of enterprises in the maritime transport sector (2008-2020)
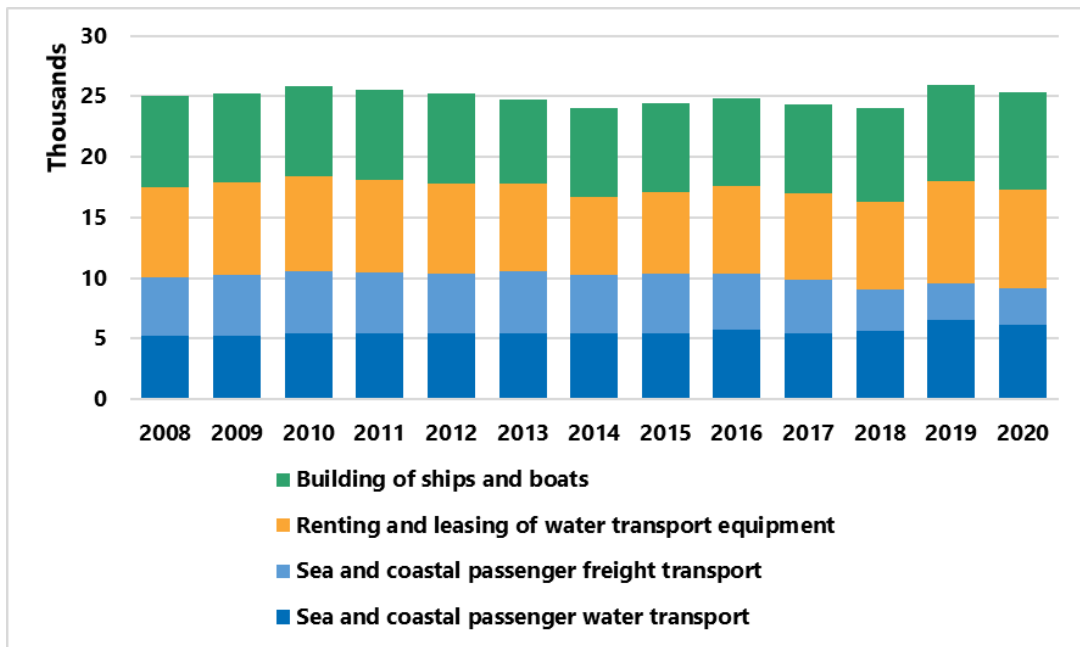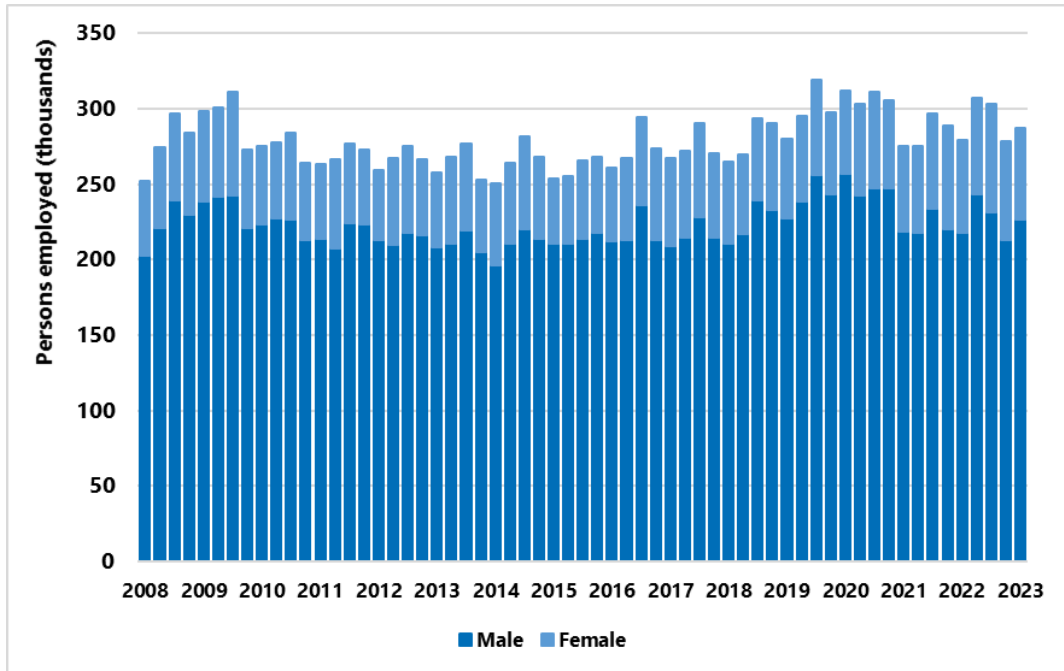

Source: elaboration of the authors based on Eurostat data

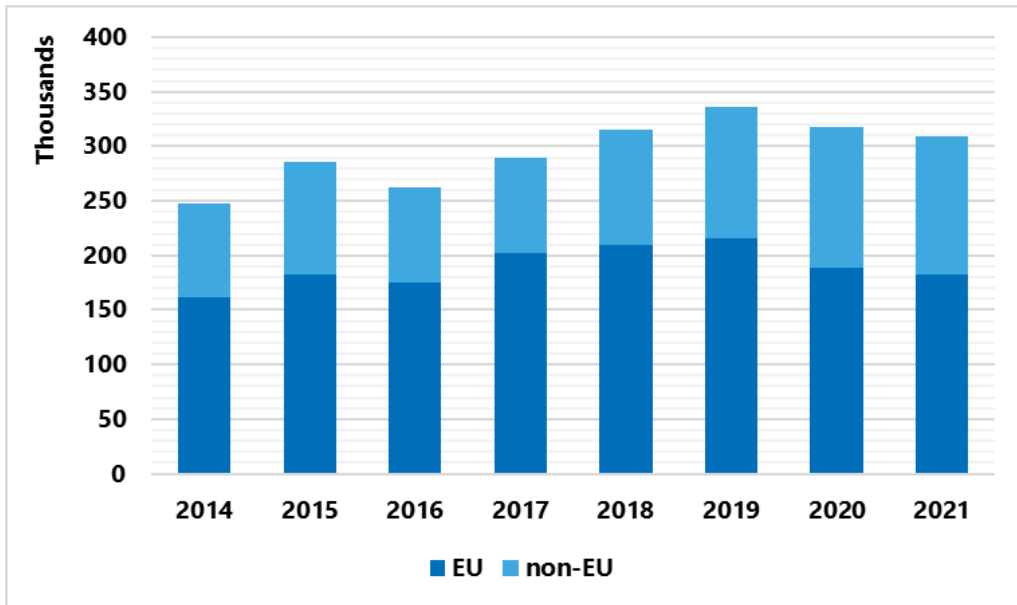**Figure A.12: Trend of the distribution of workers by age in the maritime transport sector**

Source: elaboration of the authors based on Eurostat data

Figure A.13: Trend of the distribution of the workers by gender in the maritime transport sector
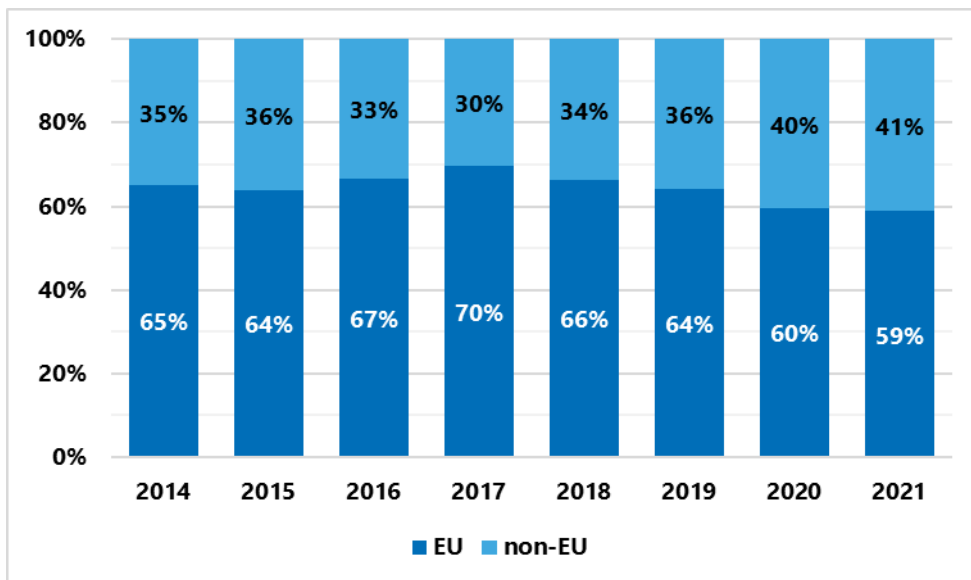

Source: elaboration of the authors based on Eurostat data

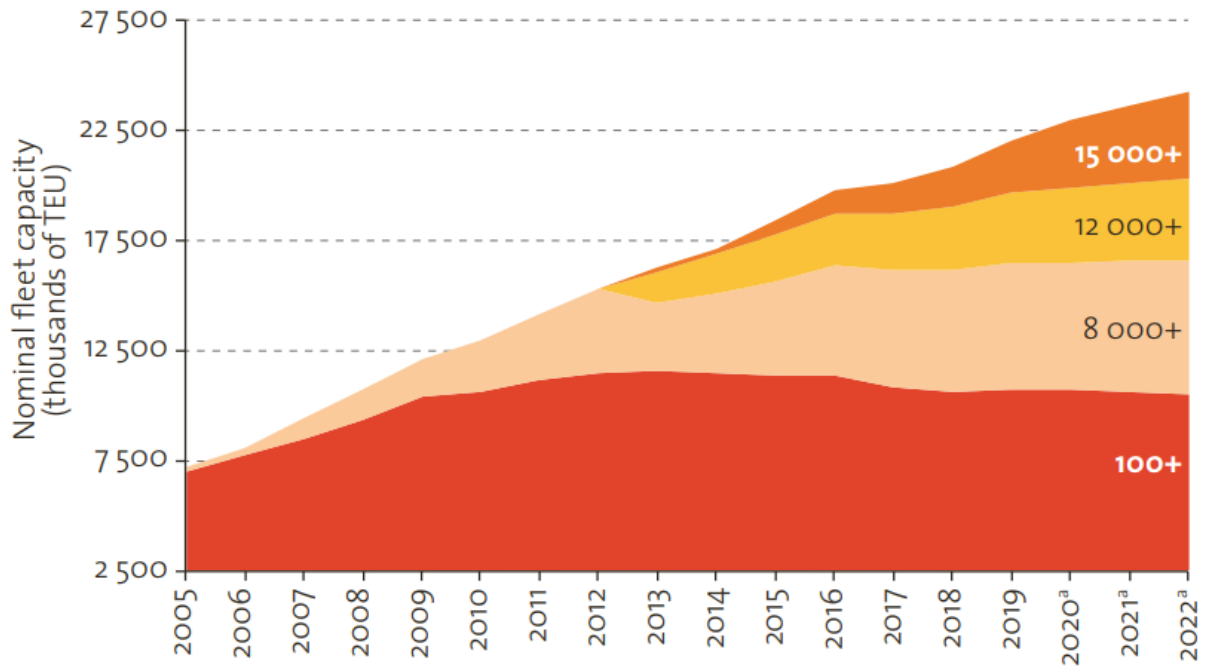**Figure A.14: EU and non-EU seafarers, absolute values (2014-2021)**

Source: elaboration of the authors based on EMSA data (EMSA, 2023)

Figure A.15: EU and non-EU seafarers, percentages (2014-2021)
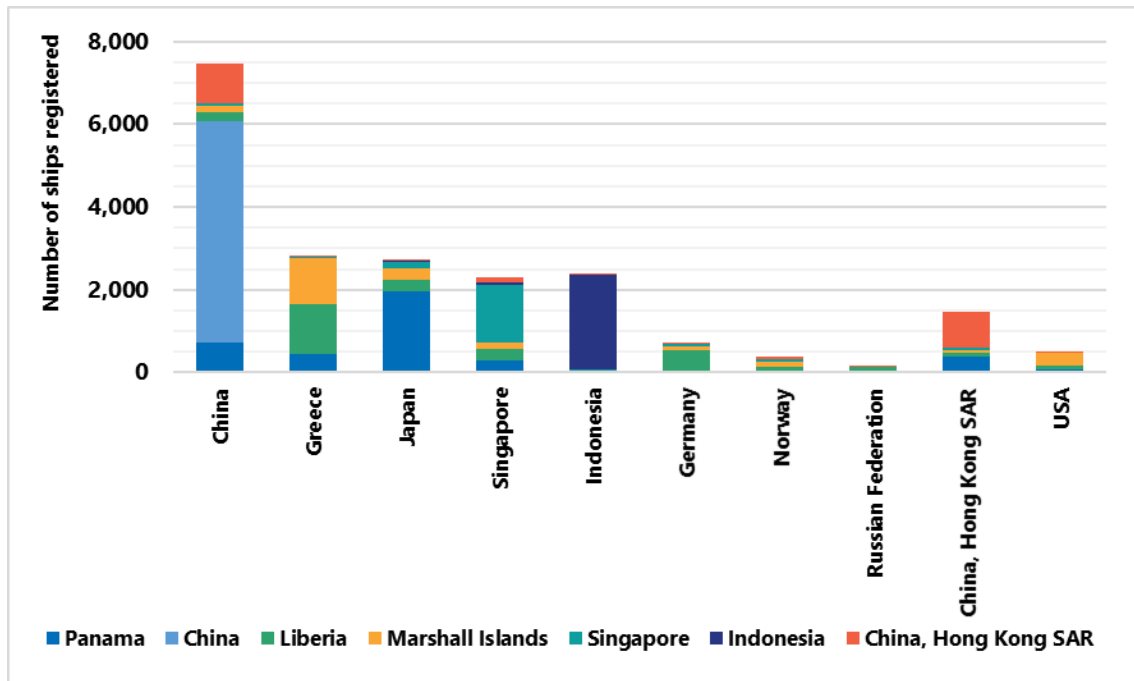

Source: elaboration of the authors based on EMSA data (EMSA, 2023)

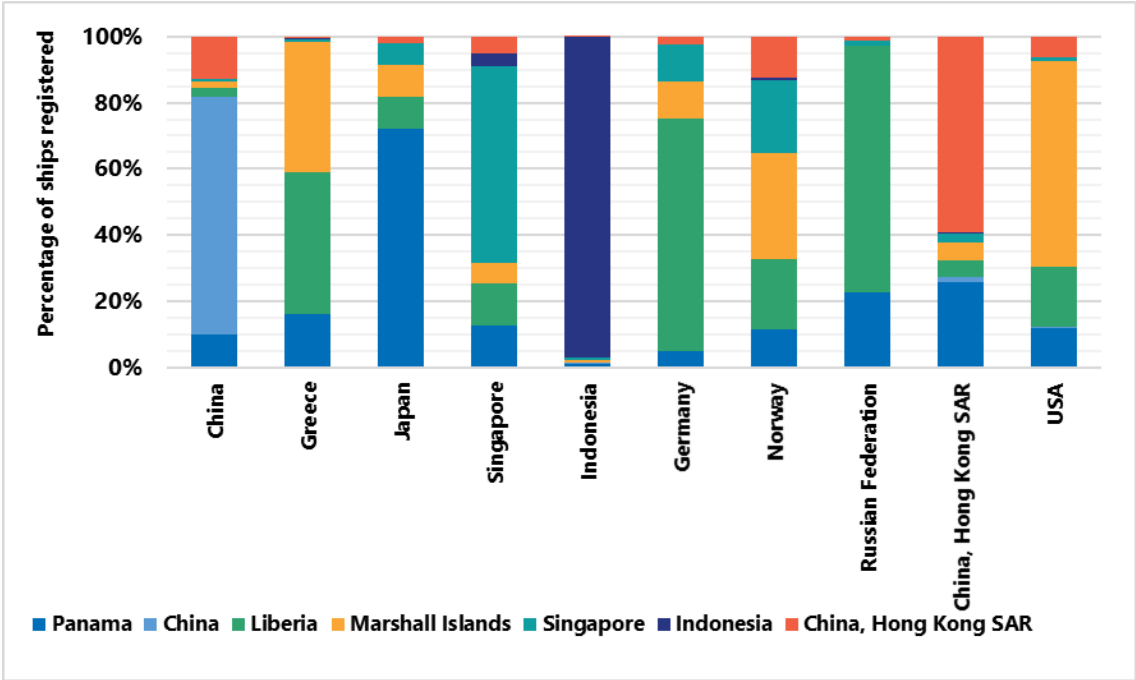**Figure A.16: Trend in gigantism of container ships (2005-2022)**

Source: (ECLAC, 2020)

Figure A.17: Fleet ownership and registration (number of ships registered)

Source: elaboration of the authors based on UNCTAD data

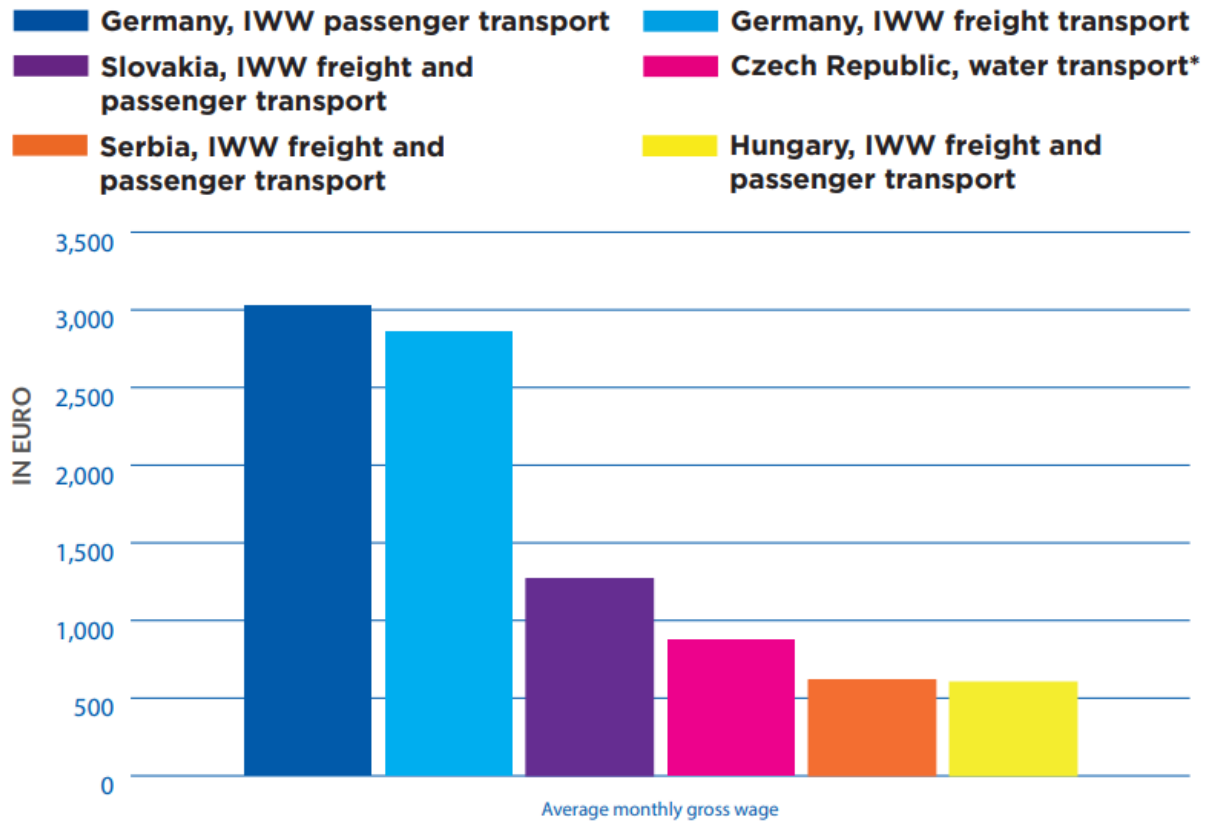**Figure A.18: Fleet ownership and registration (percentage of ships registered)**

Source: elaboration of the authors based on UNCTAD data

Inland waterways transport

Figure A.19: Average monthly gross wages per employee working in IWW freight and IWW passenger transport per country in Europe

Legend:
- Germany, IWW passenger transport
- Germany, IWW freight transport
- Slovakia, IWW freight and passenger transport
- Czech Republic, water transport*
- Serbia, IWW freight and passenger transport
- Hungary, IWW freight and passenger transport

Sources: German Federal Labour Agency, Statistical Office of the Slovak Republic, Czech Ministry of Transport, National Statistical Office of Serbia, Hungarian National Employment Service

*For the Czech Republic, employment and wage data concern NACE sector 50 (water transport) in general, but around 99% of the employed persons in Czech water transport are estimated to be employed in inland water transport.

Source: (CCNR, 2021)

Figure A.20: Commissioning years for the Rhine fleet over time (number of inland vessels)
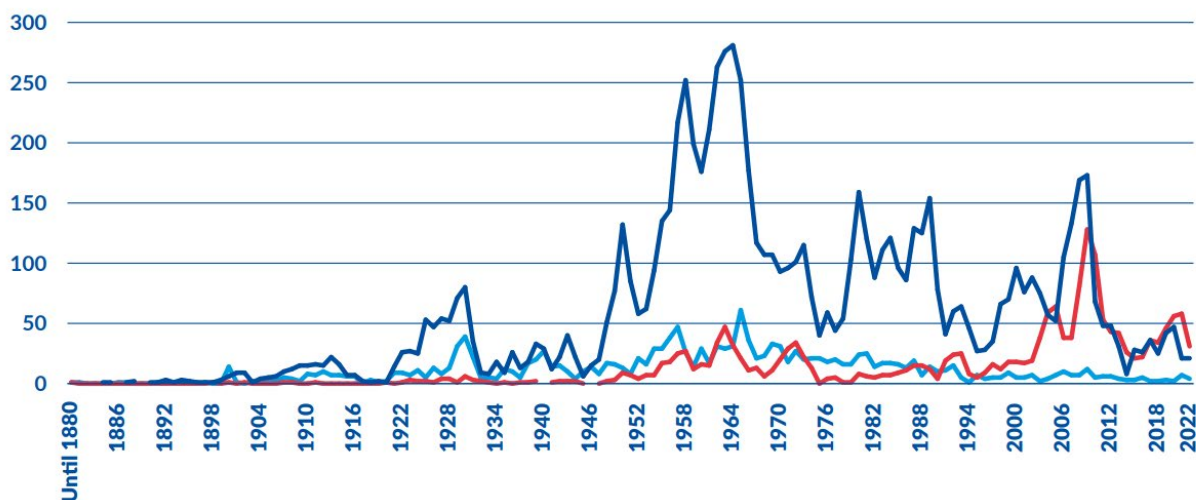
Sources: IVR, CCNR analysis
Note that 121 dry cargo vessels and 15 push and tug vessels have an unknown year of construction.
Furthermore, 235 additional tanker vessels, 1,750 dry cargo vessels and 500 push and tug vessels
are recorded in the IVR database as being registered in countries other than Rhine countries.
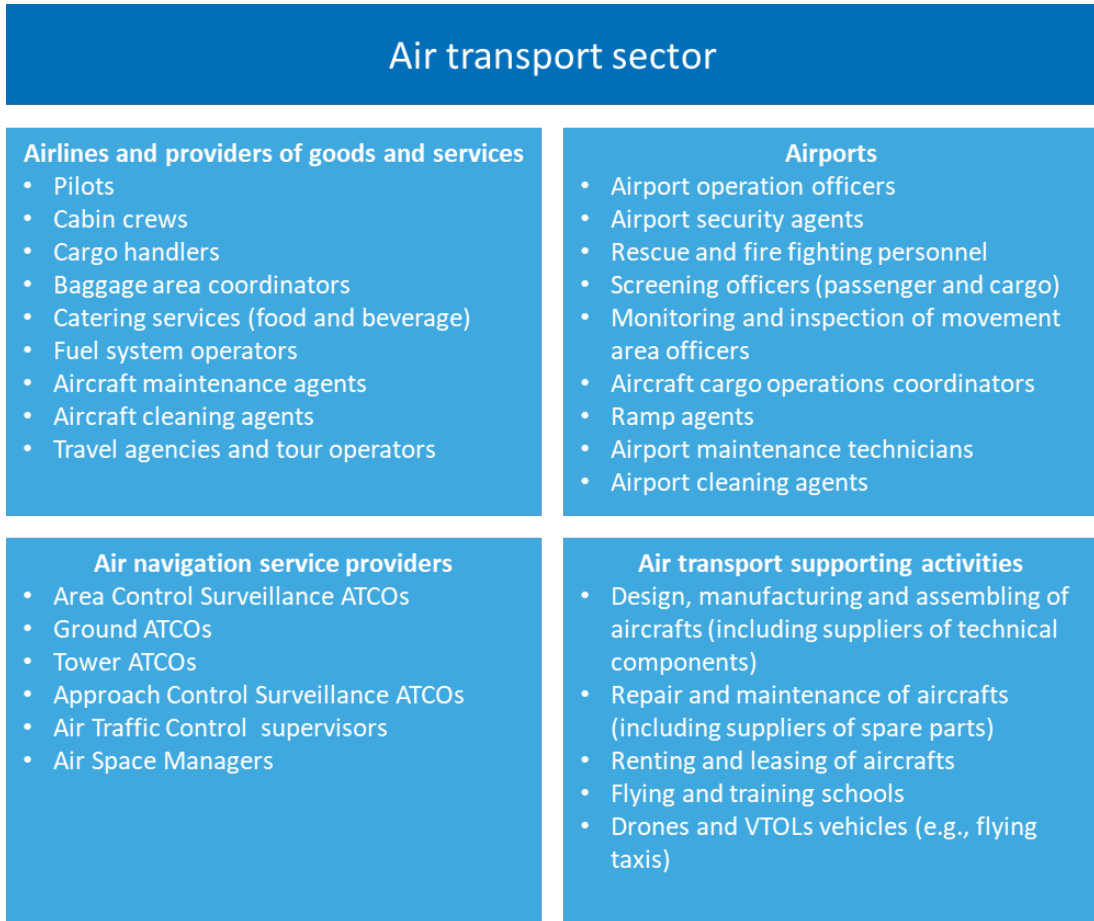
Source: (CCNR, 2023)

Figure A.21: International definition for levels of automated navigation (CCNR)

|	Level of automation[1]	Designation	Craft command (steering, propulsion, wheelhouse, etc.)	Monitoring of and responding to navigational environment	Fallback performance of dynamic navigation tasks
BOATMASTER PERFORMS PART OR ALL OF THE DYNAMIC NAVIGATION TASKS	0	**NO AUTOMATION** the full-time performance by the boatmaster of all aspects of the dynamic navigationtasks, even when supported by warning or intervention systems	👤	👤	👤
	1	**STEERING ASSISTANCE** the context-specific performance by a steering automation system using certain informationabout the navigational environment and with the expectation that the boatmaster performs all remaining aspects of the dynamic navigation tasks	👤🚢	👤	👤
	2	**PARTIAL AUTOMATION** the context-specific performance by a navigation automation system of both steering and propulsion using certain information about the navigational environment and with the expectation that the boatmaster performs all remaining aspects of the dynamic navigation tasks	👤🚢	👤🚢	👤
SYSTEM PERFORMS THE ENTIRE DYNAMIC NAVIGATION TASKS (WHEN ENGAGED)	3	**CONDITIONAL AUTOMATION** the sustained context-specific performance by a navigation automation system of all dynamic navigation tasks, including collision avoidance, with the expectation that the human boatmaster will be receptive to requests to intervene and to system failures andwill respond appropriately	🚢	👤🚢	👤🚢
	4	**HIGH AUTOMATION** the sustained context-specific performance and fallback performance, by a navigation automation system of all dynamic navigation tasks without expecting a boatmaster responding to a request to intervene[2]	🚢	🚢	🚢
	5	**AUTONOMOUS = FULL AUTOMATION** the sustained and unconditional performance and fallback performance, by a navigation automation system of all dynamic navigation tasks, without expecting a boatmaster responding to a request to intervene	🚢	🚢	🚢

Source: (CCNR, 2018)

Air transport

Figure A.22: The air transport sector and its sub-sectors

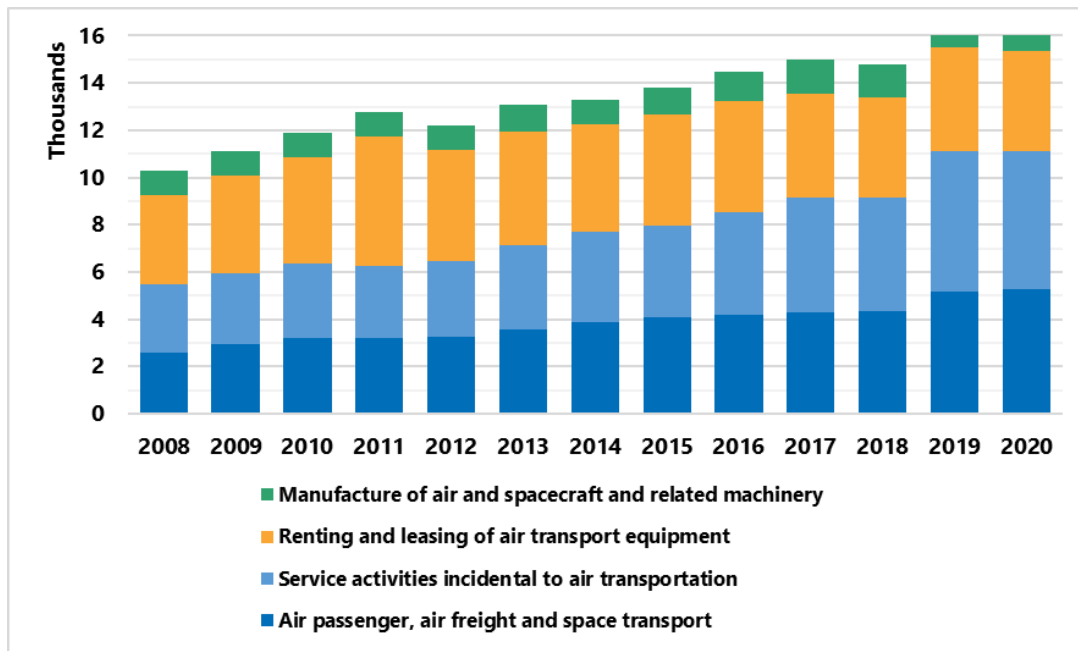| Air transport sector	
Airlines and providers of goods and services • Pilots • Cabin crews • Cargo handlers • Baggage area coordinators • Catering services (food and beverage) • Fuel system operators • Aircraft maintenance agents • Aircraft cleaning agents • Travel agencies and tour operators	**Airports** • Airport operation officers • Airport security agents • Rescue and fire fighting personnel • Screening officers (passenger and cargo) • Monitoring and inspection of movement area officers • Aircraft cargo operations coordinators • Ramp agents • Airport maintenance technicians • Airport cleaning agents
Air navigation service providers • Area Control Surveillance ATCOs • Ground ATCOs • Tower ATCOs • Approach Control Surveillance ATCOs • Air Traffic Control supervisors • Air Space Managers	**Air transport supporting activities** • Design, manufacturing and assembling of aircrafts (including suppliers of technical components) • Repair and maintenance of aircrafts (including suppliers of spare parts) • Renting and leasing of aircrafts • Flying and training schools • Drones and VTOLs vehicles (e.g., flying taxis)

Source: elaboration of the authors based on (Steer Davies Gleave, 2015), (SkillFull, 2020) and stakeholder consultation

Figure A.23: Number of workers in the air transport sector (2008-2020)
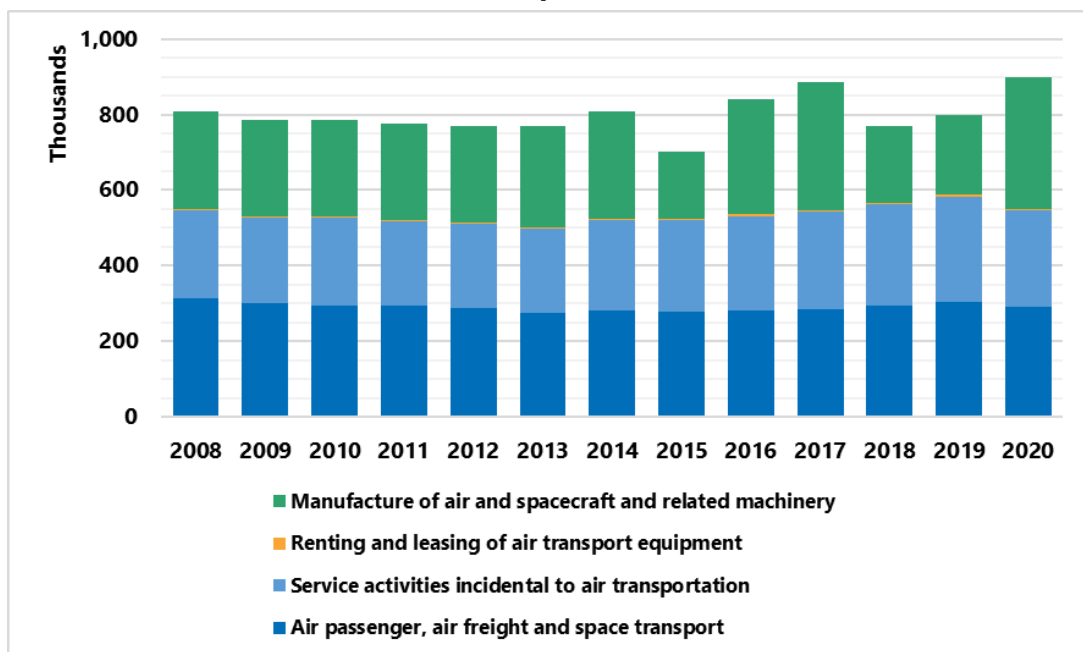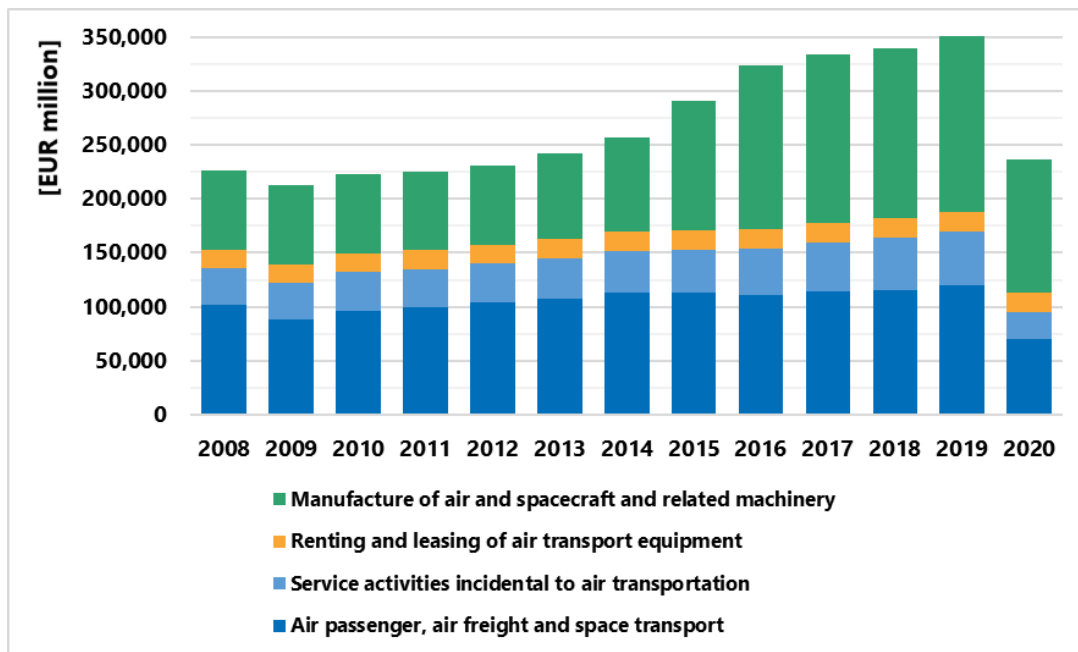

Source: elaboration of the authors based on Eurostat data

Figure A.24: Number of enterprises in the air transport sector (2008-2020)
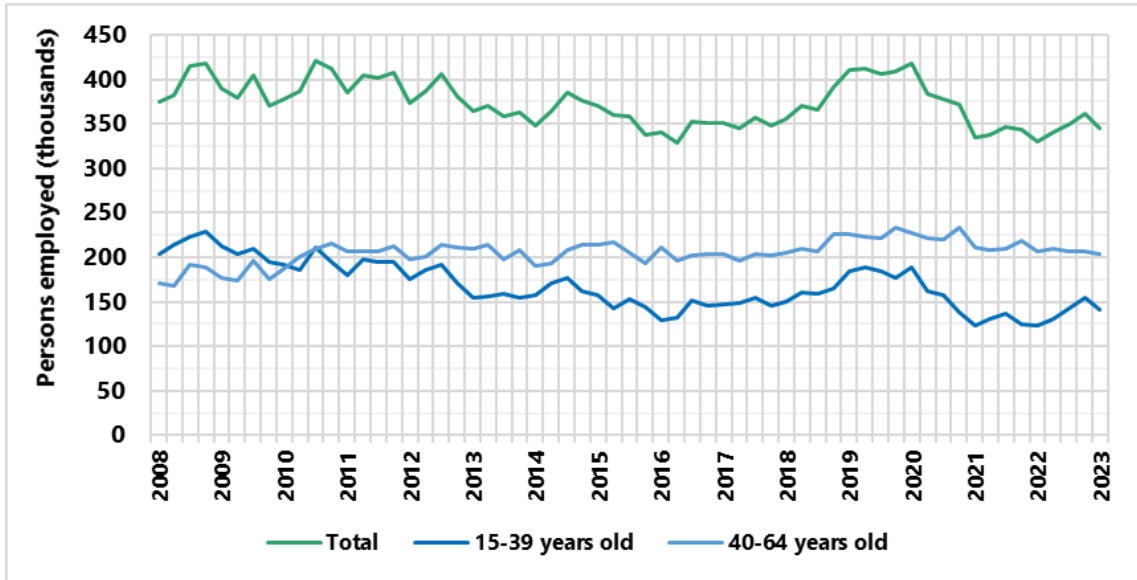

Source: elaboration of the authors based on Eurostat data

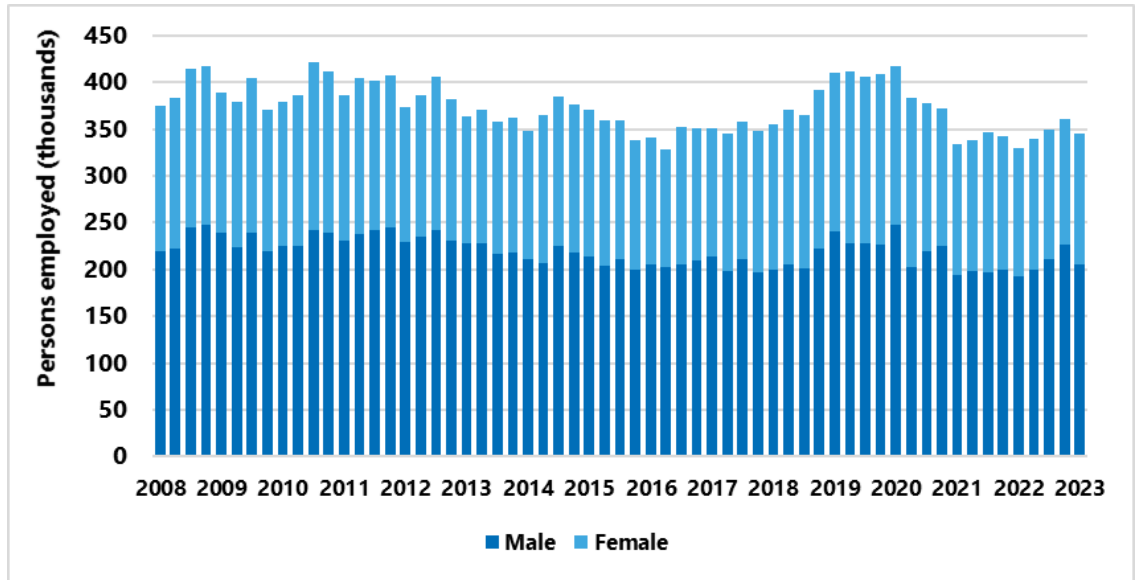**Figure A.25: Turnover of enterprises in the air transport sector (2008-2020)**

Source: elaboration of the authors based on Eurostat data

Figure A.26: Trend of the distribution of workers by age in the air transport sector

Source: elaboration of the authors based on Eurostat data

Figure A.27: Trend of the distribution of the workers by gender in the air transport sector

Source: elaboration of the authors based on Eurostat data

Figure A.28: Trends and technological solutions related to areas of the aviation sector

Trends and technological solutions related to specific areas of the aviation sector	ATM	COMMERCIAL AVIATION	AIRPORT OPERATIONS	RPAS OPERATIONS
	Increased automation support	Single Pilot Operation	Smart maintenance	Task reduction
	Virtualisation and remote towers	Cockpit connectivity	Enhancing passengers experience at airports	Autonomy of functions
	Unmanned Air traffic Management	Mixed traffic interoperability	Biometrics and seamless security checks	UTM and U-SPACE

Source: (SKILL-UP, 2021)

Figure A.29: The integration of air traffic management and UTM

Source: (Airbus and Boeing, undated)

The study provides a comprehensive review of the transport labour market trends in the EU, the challenges and the future prospects that transport workers and undertakings are confronted with, notably for digitalisation, automation and decarbonisation processes.

The study describes the impacts on the EU transport labour market in terms of number of jobs, job structure by age, workers' skills, working conditions, shortage of workers and attractiveness of the occupations. A stakeholder consultation complements the findings of the literature review.