Report

Project 101101584: 'DELIVERING FAIR TRANSPORT FOR ALL' (DFT4A)
Work package 3: 'WOMEN TRANSPORT WORKERS – Making the transport sector fit for women to work in – how to use the twin transition for the benefit of women in transport through gender mainstreaming?'

Women in Transport and the Twin Transition

Fondazione Giacomo Brodolini

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EUROPEAN TRANSPORT WORKERS' FEDERATION

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ABBREVIATIONS AND ACRONYMS

Acronym	Fullname
AI	Artificial Intelligence
CAVs	Connected and Automated Vehicles
DESI	Digital Economy and Society Index
DFT4A	Delivering Fair Transport for All
DTLF	Digital Transport and Logistic Forum
EC	European Commission
EEA	European Environmental Agency
EGD	European Green Deal
EIGE	European Institute for Gender Equality
EP	European Parliament
ERTMF	European Transport and Mobility Forum
EU	European Union
ETF	European Transport Workers' Federation
ETS	Emissions Trading System
FGB	Fondazione Giacomo Brodolini
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
ITS	Intelligent Transport Systems
IoT	Internet of Things
LFS	Labour Force Survey
NACE	Statistical Classification of Economic Activities in the European Community
NECPs	National Energy and Climate Plans
SSMS	Sustainable and Smart Mobility Strategy
STEM	Science, technology, engineering and mathematics
STRIA	Strategic Transport Research and Innovation Agenda
TEN-T	Trans-European Transport Network
TRIMIS	Transport Research and Innovation Monitoring and Information System
UNFCCC	UN Framework Convention on Climate Change
WiD	Women in Digital Scoreboard

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COUNTRY ABBREVIATIONS

Acronym	Fullname
AT	Austria
BE	Belgium
BG	Bulgaria
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
EL	Greece
ES	Spain
FI	Finland
FR	France
HR	Croatia
HU	Hungary
IE	Ireland
IT	Italy
LV	Latvia
LT	Lithuania
LU	Luxembourg
MT	Malta
NL	Netherlands
PL	Poland
PT	Portugal
RO	Romania
SK	Slovakia
SI	Slovenia
SE	Sweden

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INTRODUCTION

This report is a deliverable related to the 'Delivering Fair Transport for All' (DFT4A) project promoted by the European Transport Federation. The report focuses on gender mainstreaming in the transport sector, particularly on the role of women in the context of the twin digital and green transitions. The goal is to analyse how the transport sector can be made more inclusive for female workers, highlighting the opportunities offered by ongoing technological and environmental transformations, i.e. the structural changes brought about by digitalisation and the adoption of green policies to the sector and economy. The report presents analyses of employment data, both at the level of the European Union (EU) and for individual countries, and illustrates the effects that digital and green transformations may have on women in the sector.

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SECTION I: WOMEN IN THE TRANSPORT SECTOR IN THE EU – DATA OVERVIEW

1. Data

To discuss employment outcomes by gender in the Transport and Storage Sector, an in-depth analysis of 2022 data from the Labour Force Survey from EUROSTAT was carried out. Data used for the analysis are from the Transport and Storage Sector and were selected according to the Statistical Classification of Economic Activities in the European Community (NACE 2). In this classification, the Transport and Storage Sector is identified by the letter 'H'. Within the sector, the NACE 2 classification distinguishes five subsectors marked by alpha-numerical codes:

- H49: Land transport and transport via pipelines
- H50: Water transport
- H51: Air transport
- H52: Warehousing and support activities for transportation
- H53: Postal and courier activities.

The following activities relate to water transport are classified as H52:[1]

- Warehousing and storage of goods
- Port operation and other ancillary activities such as docking, pilotage, lighthouse operation and ship rescue
- Handling of goods

2. Main findings at the European Union level

Evidence from the data analysis for the total European Union (EU-27) is summarised below.

2.1 Women's employment in the Transport and Storage Sector vs in all sectors of the economy

Table 1 shows the share of employment in the Transport and Storage Sector and its subsectors compared to total employment in all sectors (the whole labour market) in the EU-27. The Transport and Storage Sector in 2022 had 5.4 % of the total employment of people aged 20 to 64 in the EU-27. In women and men are considered separately, the sector had 7.8 % of the total men's employment and 2.6 % of the total women's employment. In Table 1, the last line in red shows the share of women in every subsector in 2022. 'Land transport and transport via pipelines' and 'Warehousing and support activities for transportation' show the highest share of female employment respectively: 0.9 % and 0.8 % in the EU-27, followed by 'Postal and courier activities' with a share of 0.6 %. 'Air transport' accounts for 0.2 % followed by 'Water transport' with 0.1 %. These percentages have remained stable over the past decade (see again Table 1 and the line in green). This does not apply to the subsector 'Warehousing and support activities for transportation', which increased

[1] The rental of passenger and cargo ships without crew are classified as a distinct subgroup of the sector N 77 Administrative and support service activities. This distinct subgroup is coded N 77.34 – Rental of water transport equipment. Data at the level of subgroups cannot be analysed without losing reliability. See Annex A for a detailed list of the activities included in each subsector.

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about 0.2 percentage points (p.p.) for women. It should be noted that this also increased for men in the same time span, from 1.7 % in 2012 to 2.0 % in 2022.

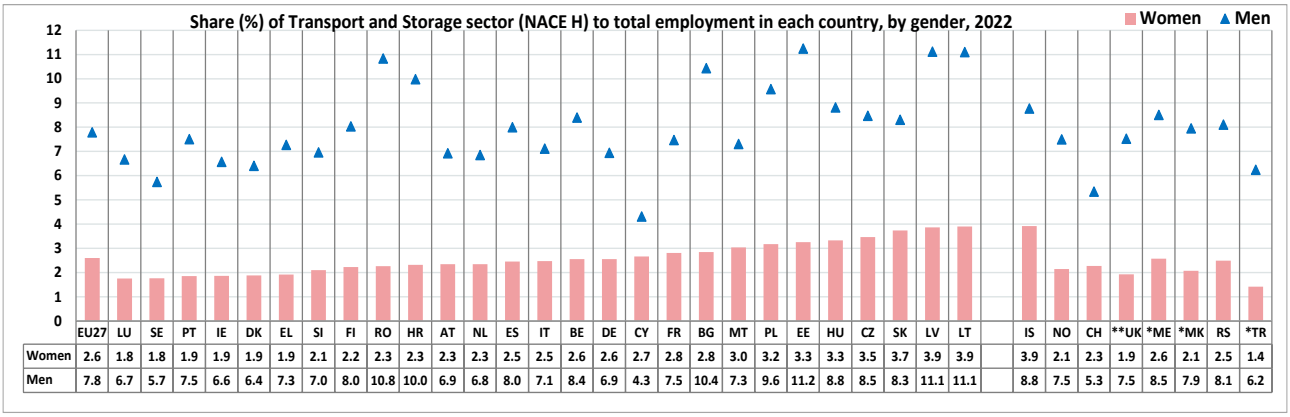
Table 1: Share of employees in the Transport and Storage Sector (NACE H) of total EU-27 employment (all NACE sectors), persons aged 20 to 64

EU-27	Share (%) of Transport and Storage Sector (NACE H) of total EU-27 employment						
Persons aged 20 to 64 years	**Land transport and transport via pipelines** (NACE H49)	**Water transport** (NACE H50)	**Air transport** (NACE H51)	**Warehousing and support activities for transportation** (NACE H52)	**Postal and courier activities** (NACE H53)	**Total** (NACE H)	**Total** (all NACE activities)
Total							
2012	2.8	0.1	0.2	1.2	0.8	**5.2**	100
2017	2.8	0.1	0.2	1.5	0.8	**5.4**	100
2022	2.8	0.1	0.2	1.5	0.7	**5.4**	100
Men							
2012	4.5	0.2	0.2	1.7	0.8	**7.4**	100
2017	4.5	0.2	0.2	2.0	0.8	**7.7**	100
2022	4.5	0.2	0.2	2.0	0.9	**7.8**	100
Women							
2012	***0.8***	***0.1***	***0.2***	***0.6***	***0.8***	***2.5***	***100***
2017	0.9	0.1	0.2	0.8	0.7	**2.6**	100
2022	**0.9**	**0.1**	**0.2**	**0.8**	**0.6**	**2.6**	**100**

Source: Eurostat, Labour Force Survey [lfsa_egan22d__custom_8982594].

Figure 1 details the situation at the country level for the share of employment in the Transport and Storage Sector compared to total employment in all sectors of the labour market in the EU-27 separately for women and men.

Figure 1: Share of employees in the Transport and Storage Sector (NACE H) of total employment in each country by gender, persons aged 20 to 64, 2022



	EU27	LU	SE	PT	IE	DK	EL	SI	FI	RO	HR	AT	NL	ES	IT	BE	DE	CY	FR	BG	MT	PL	EE	HU	CZ	SK	LV	LT	IS	NO	CH	**UK	*ME	*MK	RS	*TR
Women	2.6	1.8	1.8	1.9	1.9	1.9	1.9	2.1	2.2	2.3	2.3	2.3	2.3	2.5	2.5	2.6	2.6	2.7	2.8	2.8	3.0	3.2	3.3	3.3	3.5	3.7	3.9	3.9	3.9	2.1	2.3	1.9	2.6	2.1	2.5	1.4
Men	7.8	6.7	5.7	7.5	6.6	6.4	7.3	7.0	8.0	10.8	10.0	6.9	6.8	8.0	7.1	8.4	6.9	4.3	7.5	10.4	7.3	9.6	11.2	8.8	8.5	8.3	11.1	11.1	8.8	7.5	5.3	7.5	8.5	7.9	8.1	6.2

Source: Eurostat, Labour Force Survey [lfsa_egan2__custom_8984813].

For women, the share of employment in the whole Transport and Storage Sector fluctuates from 1.8 % in Luxembourg and Sweden to 3.9 % in Latvia and Lithuania. For men in all countries except for Cyprus (4.7 %), Switzerland (5.3 %) and Sweden (5.7 %), the Transport and Storage Sector has more than 6 % of total male

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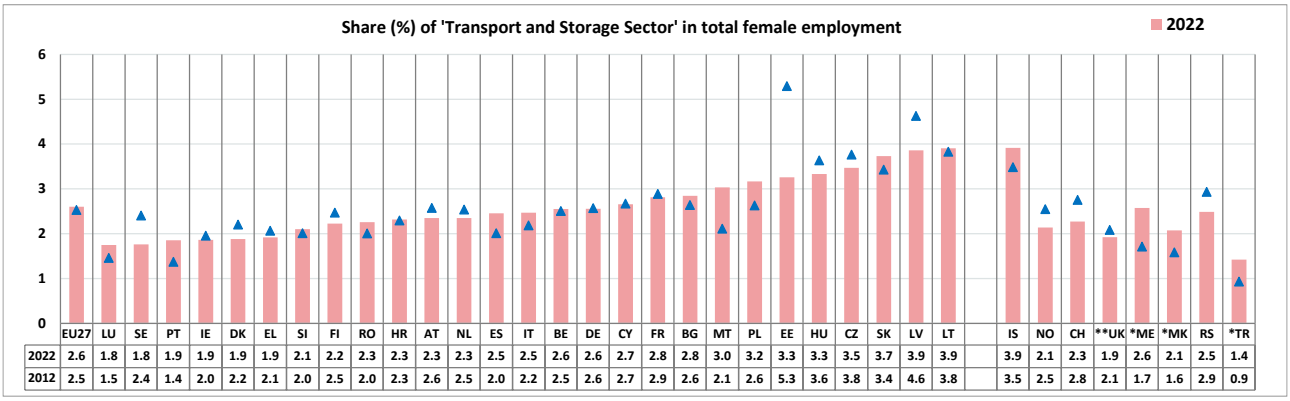
employment while in five countries (Romania, Croatia, Bulgaria, Latvia and Lithuania), the share is more than the 10 %.

Figure 2 focuses only on women's employment in the sector compared to total women's employment in all sectors and on its evolution over time. It shows that in six countries (Portugal, Malta, Poland, Montenegro, Macedonia and Turkey), the Transport and Storage Sector has recorded an increase in its relative share of total female employment of more than 0.5 percentage points between 2012 and 2022. In contrast, in Sweden, Estonia, Latvia and Switzerland, the relative share of female employment in the Transport and Storage Sector compared to overall female employment has decreased by more than 0.5 percentage points between 2012 and 2022.

Figure 2: Share of female employees in the Transport and Storage Sector compared to total female employment in each country in 2012 and 2022, persons aged 20 to 64



	EU27	LU	SE	PT	IE	DK	EL	SI	FI	RO	HR	AT	NL	ES	IT	BE	DE	CY	FR	BG	MT	PL	EE	HU	CZ	SK	LV	LT		IS	NO	CH	**UK	*ME	*MK	RS	*TR
2022	2.6	1.8	1.8	1.9	1.9	1.9	1.9	2.1	2.2	2.3	2.3	2.3	2.3	2.5	2.5	2.6	2.6	2.7	2.8	2.8	3.0	3.2	3.3	3.3	3.5	3.7	3.9	3.9		3.9	2.1	2.3	1.9	2.6	2.1	2.5	1.4
2012	2.5	1.5	2.4	1.4	2.0	2.2	2.1	2.0	2.5	2.0	2.3	2.6	2.5	2.0	2.2	2.5	2.6	2.7	2.9	2.6	2.1	2.6	5.3	3.6	3.8	3.4	4.6	3.8		3.5	2.5	2.8	2.1	1.7	1.6	2.9	0.9

Source: Eurostat, Labour Force Survey [lfsa_egan2__custom_8984813].

2.2 Women's employment in the Transport and Storage Sector

Table 2 presents the absolute number of women employed in the Transport and Storage Sector between 2012 and 2022. Women's employment in the sector in absolute numbers has increased steadily over the period 2012 to 2019 (from 2.07 million in 2012 to 2.33 million) in the EU-27. In 2020, women's employment declined to 2.21 million, followed by an increase over the next two years, reaching in 2022 its pre-pandemic level (2.34 million).

Table 2: Women's employment in the Transport and Storage Sector (NACE 'H'), EU-27, in thousands

EU-27	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
NACE-H	2,078.3	2,101.7	2,144.2	2,161.5	2,215.2	2,255.1	2,270.4	2,333.7	2,219.1	2,286.5	2,341.5

Source: Eurostat [lfsa_egan2__custom_8733065].

Using these absolute numbers of women employed in the Transport and Storage Sector as well as the corresponding numbers for men, the gender composition of employment in the sector can be calculated.[2] Table

[2] Staring from the absolute number of women, men and the total number (women plus men), the gender composition is calculated by the number of women (or men) divided by the total and multiplied by 100. The resulting share when summed up is equal to 100. This is the share of women (and men) out of the total employment in the sector.

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3 shows the gender composition of the whole sector. It shows that the share of women in the last decade fluctuated between 22 % and 23 % while the number of men between 77 % and 78 %.

Table 3: Share of total employment by gender in the Transport and Storage Sector (NACE H), EU-27

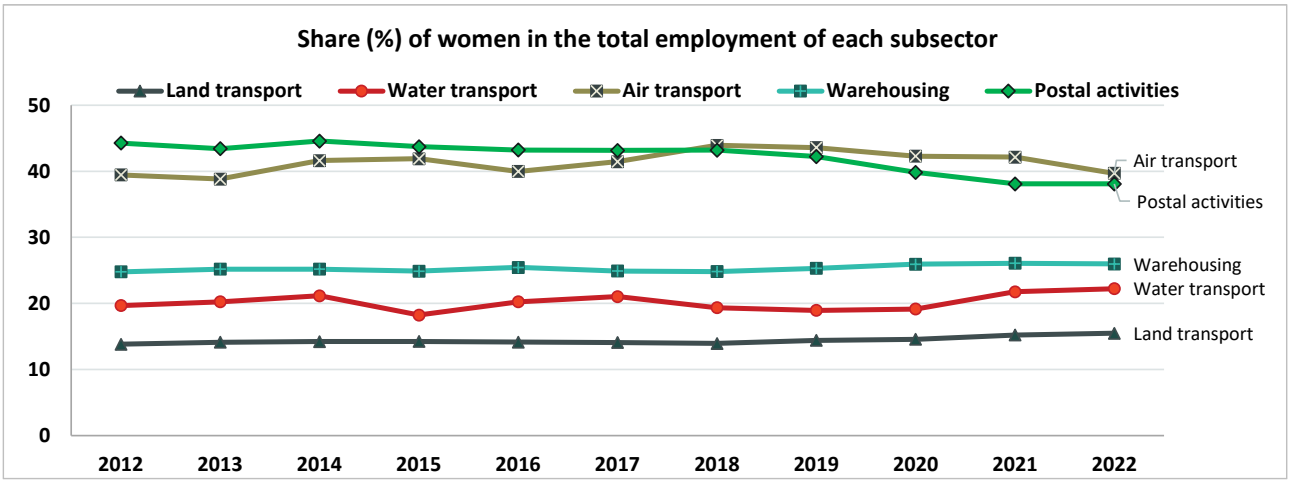
Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Women's share	22.3	22.4	22.7	22.5	22.5	22.3	22.2	22.5	22.2	22.5	22.5
Men's share	77.7	77.6	77.3	77.5	77.5	77.7	77.8	77.5	77.8	77.5	77.5

Source: Eurostat [lfsa_egan2__custom_8733065].

Women employed in the Transport and Storage Sector accounted for less than one in four workers (22.5 %) in this sector in 2022. This share was remarkably stable over the period 2012 to 2022, despite the increase of women in absolute numbers. The reason for this is that there was an almost equal increase in the number of employed men in the sector recorded over the period.

Focusing on the share of women in every subsector in 2022 (see Figure 3), a significantly lower share of women is found in all of them: women do not exceed 40 % of all employed persons. The same figure also shows the trend over time. It is observed that women's employment records a weak upwards trend during the period 2012 to 2022 in three subsectors: Land Transport, Water Transport and Warehousing, particularly visible in Warehousing. In contrast, in Air Transport and Postal and Courier Activities, the share of women declined.

Figure 3: Women's share of total employment by subsector of Transport and Storage Sector (NACE 'H'), EU-27



Source: Eurostat [lfsa_egan22d__custom_8734093].

By considering the situation in each country by each subsector, it is possible to investigate where the changes happened. Unfortunately, comparable data from the Eurostat Labour Force Survey are not available for all countries, and therefore there are several missing values in the figures.[3]

Figure 4 shows the situation for the Land Transport subsector. Except for Germany, where women's share reached 21 % in 2022, in all other European countries, women are less than 20 % in this subsector with Greece

[3] It is not possible to use national data for the cross-country comparison as they would not be homogeneous in terms of data collection conditions.

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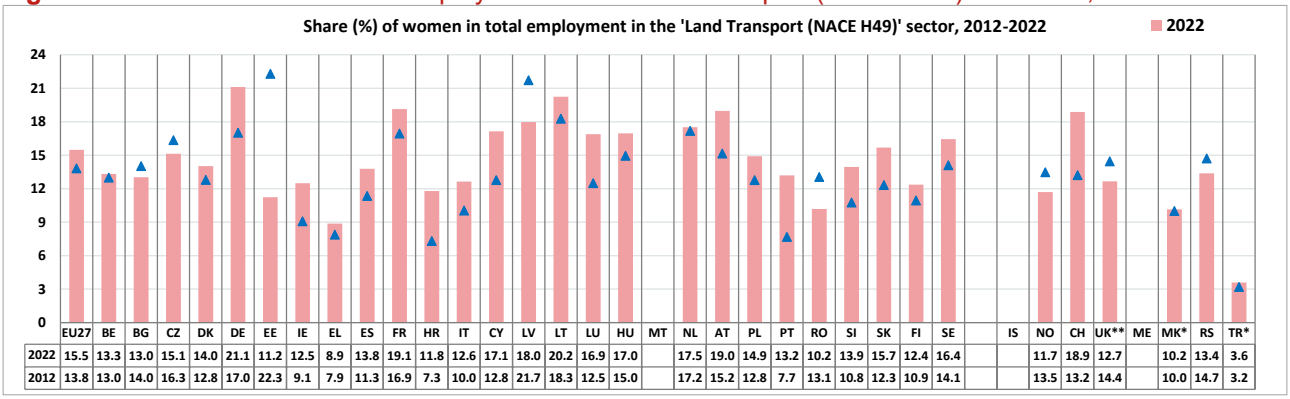
and Turkey showing the lowest presence (8.9 % and 3.6 % respectively). As regards the trends over the period 2012–2022, in the majority of countries (24), women's employment displayed an increase over the period 2012–2012 with Germany, France, Luxembourg, Portugal, Slovenia, Slovakia and the United Kingdom being the prominent examples.

Figure 4: Women's share of total employment in the Land Transport (NACE H49) subsector, 2012 and 2022



	EU27	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE		IS	NO	CH	UK**	ME	MK*	RS	TR*
2022	15.5	13.3	13.0	15.1	14.0	21.1	11.2	12.5	8.9	13.8	19.1	11.8	12.6	17.1	18.0	20.2	16.9	17.0		17.5	19.0	14.9	13.2	10.2	13.9	15.7	12.4	16.4			11.7	18.9	12.7		10.2	13.4	3.6
2012	13.8	13.0	14.0	16.3	12.8	17.0	22.3	9.1	7.9	11.3	16.9	7.3	10.0	12.8	21.7	18.3	12.5	15.0		17.2	15.2	12.8	7.7	13.1	10.8	12.3	10.9	14.1			13.5	13.2	14.4		10.0	14.7	3.2

Notes: No data available for Malta and Iceland; * and ** denote that the latest available data refer to 2020 and 2019 respectively.
Source: Eurostat [lfsa_egan22d__custom_9444718].

In **Figure 5,** the situation for the Water Transport subsector is shown. Data are available only for 18 countries. For five countries (Germany, Cyprus, Sweden, Norway and the United Kingdom), only 2012 data are available while for four countries (Czechia, Denmark, France and Switzerland) only 2022 data are found. In 2022, Switzerland was the country with the highest share (about 58 %) and was the only country where women were the majority (since the number of employees is small and they are mostly employed as white collar workers), followed by Finland (41.2 %) and then Estonia, Spain and Denmark (around 36 %). Among the countries for which data covering both reference years are available, Turkey showed the highest change from about 10 % to 23 %, followed by Finland (from 34 % to 41.2 %) and the Netherlands (from 18 % to 22 %). The smallest share of women in 2022 was recorded in Czechia (14 %).

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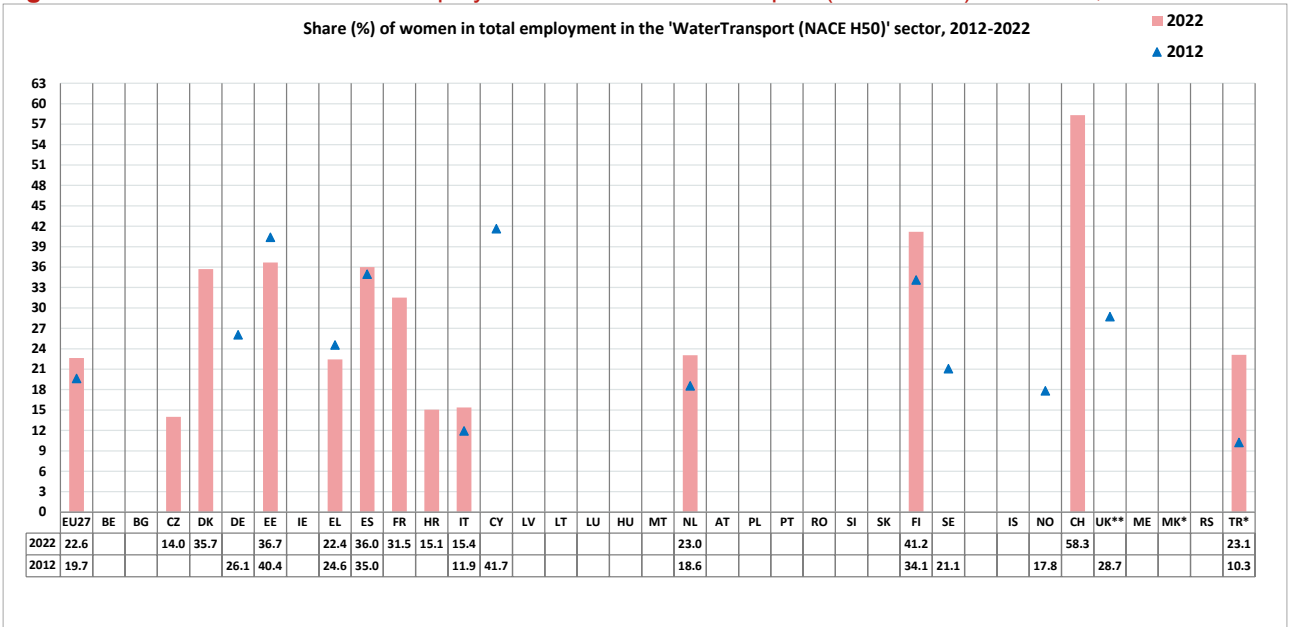
Figure 5: Women's share of total employment in the Water Transport (NACE H50) subsector, 2012 and 2022



	EU27	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE		IS	NO	CH	UK**	ME	MK*	RS	TR*
2022	22.6			14.0	35.7		36.7		22.4	36.0	31.5	15.1	15.4							23.0							41.2					58.3					23.1
2012	19.7					26.1	40.4		24.6	35.0			11.9	41.7						18.6							34.1	21.1			17.8		28.7					10.3

Notes: No data available for Belgium, Bulgaria, Ireland, Latvia, Lithuania, Hungary, Malta, Austria, Poland, Romania, Slovenia, Slovakia, Iceland, Montenegro, North Macedonia and Serbia.
Source: Eurostat [lfsa_egan22d__custom_9444718].

In **Figure 6,** the women's share of total employment in the Air Transport subsector is reported for the years 2012 and 2022. 2022 data are available for 19 countries. The highest share of women is found in Finland (73.8 %with an increase since 2012 of about 14 percentage points), followed by Switzerland (50.6 % where an increase of 5.8 percentage points was recorded) and Austria (48.4 % where in contrast a decrease of 2.7 percentage points occurred). Luxembourg is the country with the lowest share of women (19.5 % with a decrease in the last decade of 7.8 percentage points). Turkey shows the second highest increase after Finland (about 11 percentage points between 2012 and 2022) moving from 26.6 % to 37.5 %. For most of the countries, the share in 2022 varies between 35 % and 40 %. For Hungary, Malta, Portugal and Serbia, data cover only 2022 while for Ireland, Sweden, Norway and the United Kingdom, they are available for 2012 only.

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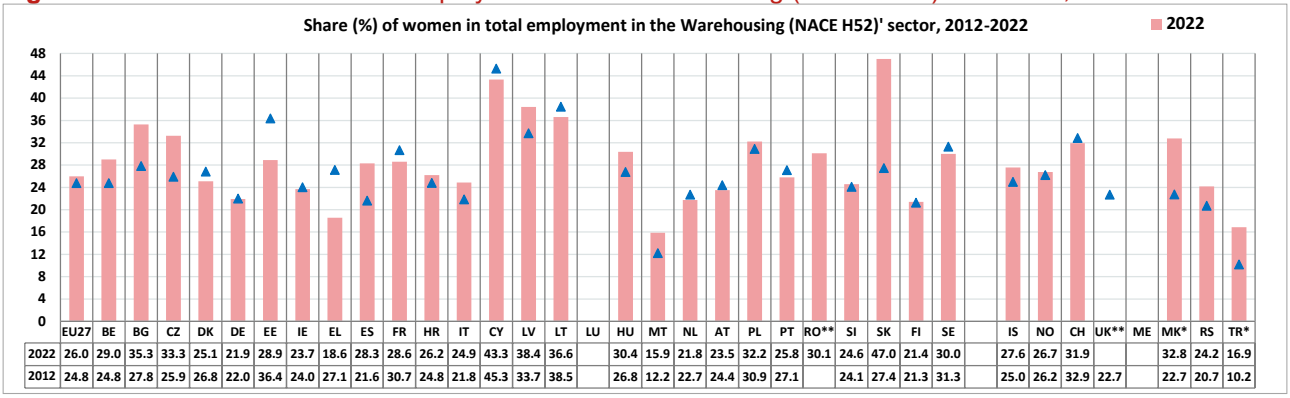
Figure 6: Women's share of total employment in the Air Transport (NACE H51) subsector, 2012 and 2022

	EU27	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE		IS	NO	CH	UK**	ME	MK*	RS	TR*
2022	39.8	29.0		31.1		45.6			34.1	40.6	35.9		33.1				19.5	44.4	45.8	39.6	48.4		47.2				73.8			36.6		50.6				32.9	37.5
2012	39.5	32.3		32.3	34.7	46.8		46.5	37.6	42.9	35.4		32.9				27.3			33.9	51.1						59.6	37.7		46.7	40.2	44.8	40.1				26.6

Notes: No data available for Bulgaria, Estonia, Croatia, Cyprus, Latvia, Lithuania, Poland, Romania, Slovenia, Slovakia, Montenegro and North Macedonia.
Source: Eurostat [lfsa_egan22d__custom_9444718].

In **Figure 7,** the situation in the Warehousing subsector is reported. In 2022, women's employment ranged from 15.9 % in Malta and 16.9 % in Turkey to 43.3 % in Cyprus and 47 % in Slovakia. Apart from Estonia and Greece, which have documented a significant decrease in women's share of employment, in all the other countries the corresponding figure for women in 2022 either fluctuates around the level of 2012, or increased by over 3 percentage points between 2012 and 2022: the case in 12 countries, with Slovakia, Macedonia, the Czech Republic and Denmark having more significant increases.

Figure 7: Women's share of total employment in the Warehousing (NACE H52) subsector, 2012 and 2022



	EU27	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO**	SI	SK	FI	SE		IS	NO	CH	UK**	ME	MK*	RS	TR*
2022	26.0	29.0	35.3	33.3	25.1	21.9	28.9	23.7	18.6	28.3	28.6	26.2	24.9	43.3	38.4	36.6		30.4	15.9	21.8	23.5	32.2	25.8	30.1	24.6	47.0	21.4	30.0		27.6	26.7	31.9			32.8	24.2	16.9
2012	24.8	24.8	27.8	25.9	26.8	22.0	36.4	24.0	27.1	21.6	30.7	24.8	21.8	45.3	33.7	38.5		26.8	12.2	22.7	24.4	30.9	27.1		24.1	27.4	21.3	31.3		25.0	26.2	32.9	22.7		22.7	20.7	10.2

Notes: No data available for Luxembourg, and Montenegro; * In Macedonia and Turkey, the latest data refer to 2019; ** No available data for 2012 in Romania and for 2022 in the United Kingdom.
Source: Eurostat [lfsa_egan22d__custom_9444718].

Women's representation in the Postal and Courier Activities subsector (see Figure 8) reaches or even exceeds the threshold of 50 % in four countries: Slovakia (68.7 %), Hungary (50.8 %), Bulgaria (49.8 %) and France

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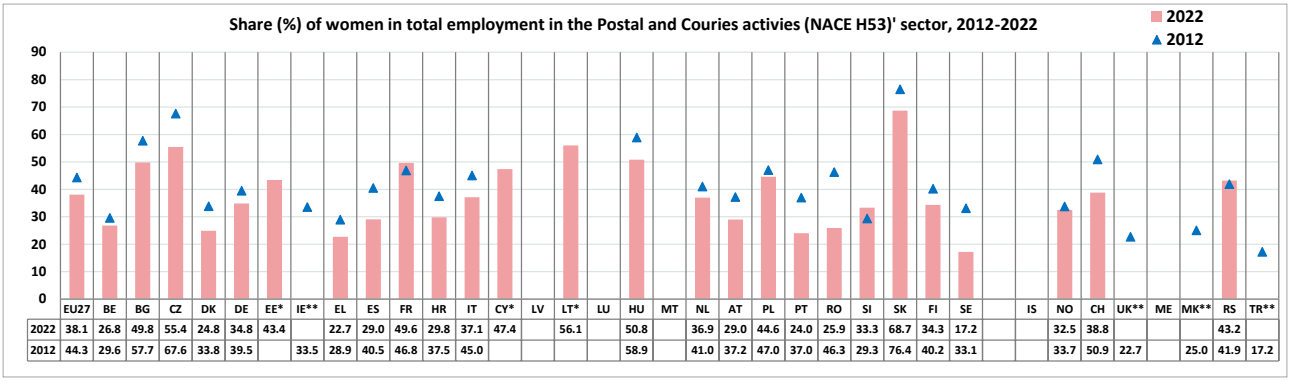
(49.6 %). At the same time, however, there is a decreasing share of women between 2012 and 2022 in 19 out of the total 25 countries for which there are available data. It is worth mentioning that in 17 out of the 19 countries in which women's relative share in this subsector decreased between 2012 and 2022, it did so by over 3 percentage points.

Figure 8: Women's share of total employment in the Postal and Courier Activities (NACE H53) subsector, 2012 and 2022



	EU27	BE	BG	CZ	DK	DE	EE*	IE**	EL	ES	FR	HR	IT	CY*	LV	LT*	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE		IS	NO	CH	UK**	ME	MK**	RS	TR**
2022	38.1	26.8	49.8	55.4	24.8	34.8	43.4		22.7	29.0	49.6	29.8	37.1	47.4		56.1		50.8		36.9	29.0	44.6	24.0	25.9	33.3	68.7	34.3	17.2			32.5	38.8				43.2	
2012	44.3	29.6	57.7	67.6	33.8	39.5		33.5	28.9	40.5	46.8	37.5	45.0					58.9		41.0	37.2	47.0	37.0	46.3	29.3	76.4	40.2	33.1			33.7	50.9	22.7		25.0	41.9	17.2

Notes: No data available for Latvia, Luxembourg, Malta, Iceland and Montenegro; * In Estonia and Cyprus no available data for 2012; ** In Ireland, the United Kingdom, Macedonia and Turkey, there were no available data for 2022.
Source: Eurostat [lfsa_egan22d__custom_9444718].

2.3 Gender differences in pay in the Transport and Storage Sector

Following this discussion of trends in employment, the next task is an investigation of gender differences in pay. **Figure 7** compares the gender pay gap in the Transport and Storage Sector with the one of the overall economy (all sectors) in 2021. The emerging picture reveals that in seven countries (Slovenia, Portugal, Lithuania, Poland, Hungary, Spain and Sweden), the gender pay gap in the sector is negative, suggesting that women receive, on average, higher wages compared to men in this sector. This contrasts with the corresponding picture of the gender pay gap in the whole economy (all sectors), in which in no country does the gender pay gap display negative values. Moreover, in 26 of the 33 countries for which data are available, the gender pay gap in the Transport and Storage Sector is lower than the overall (all sectors) gender pay gap. The reverse, i.e. a higher gender pay gap in the Transport and Storage Sector, seems to be the case in Greece and Cyprus, and to a lesser extent in Iceland, Italy and Luxembourg.

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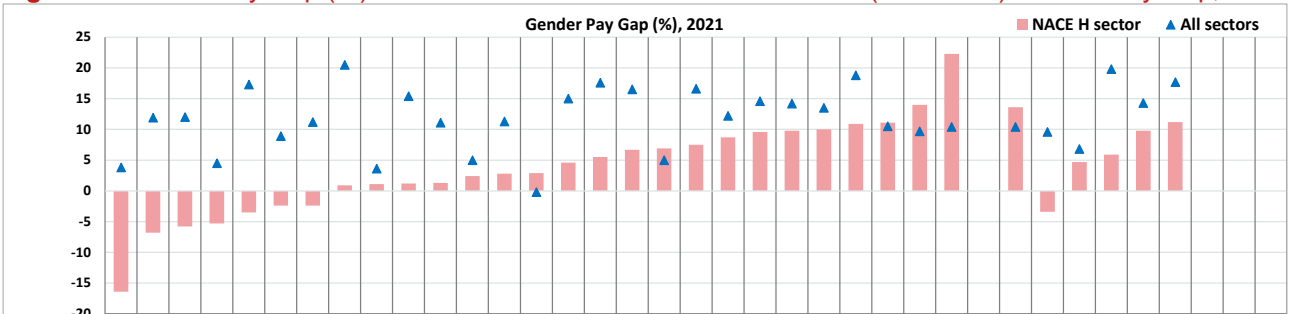
Figure 7: Gender Pay Gap (%) in the NACE H sector vis-à-vis the overall (all sectors) Gender Pay Gap, 2021



	SI	PT	LT	PL	HU	ES	SE	EE	RO	FR	HR	BE	IE*	LU	CZ	DE	FI	IT	SK	BG	LV	DK	NL	AT	MT	CY	EL*	IS	RS*	AL*	UK*	NO	CH	ME	MK	TR
NACE H sector	-16.4	-6.8	-5.8	-5.3	-3.5	-2.4	-2.4	0.9	1.1	1.2	1.3	2.4	2.8	2.9	4.6	5.5	6.7	6.9	7.5	8.7	9.6	9.8	10.0	10.9	11.1	14.0	22.3	13.6	-3.4	4.7	5.9	9.8	11.2			
All sectors	3.8	11.9	12.0	4.5	17.3	8.9	11.2	20.5	3.6	15.4	11.1	5.0	11.3	-0.2	15.0	17.6	16.5	5.0	16.6	12.2	14.6	14.2	13.5	18.8	10.5	9.7	10.4	10.4	9.6	6.8	19.8	14.3	17.7			

Notes: The Gender Pay Gap is calculated as the difference between men's and women's mean pay, expressed as a proportion of men's pay. It shows how much lower (or higher) in relative terms (%) is women's average pay compared to men's; no data were available for Montenegro, Macedonia and Turkey; * In Ireland, Greece, Russia and Albania, the figures for 2021 refer to 2019 data.
Sources: Eurostat [earn_gr_gpgr2__custom_8736177] & [earn_gr_gpgr2__custom_8735780].

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SECTION II: DIGITAL TRANSFORMATION

1. The overall picture

1.1 EU steps in digitalisation

In business and everyday life, digitalisation is a major trend. Digitalisation indicates the transition to a digital business,[4] and refers to the adoption of or the increased usage of digital or computer technology in a corporation, industry, sector or country. It differs from 'digitisation', which is the process of converting a physical or analogue object to a digital one. It is also different from 'automation', i.e. the substitution of people's activities with machines. However, digitalisation has pushed forward the progress of automation as an increase in computer technology allows further developments in automation and the digitisation of materials is necessary for digitalisation to be comprehensive.

Digitalisation is a new element of competitiveness for companies in all sectors and an essential condition for economies to perform well. However, digitalisation also causes concern for various reasons, for example, the easy creation of vertical and/or horizontal monopolies, the misuse of public data, and closed ecosystems that threaten employment as technology potentially replaces or lessens the need for both manual and intellectual occupations. As in other domains, the challenge for regulators is to balance the need for technological progress and its many benefits with safeguarding fundamental rights and the aspiration to full employment and social progress that are enshrined in the Treaty of the European Union (Articles 2 and 3).

The transformative dynamics of technology in the transport sector can be categorised into four primary domains, showing the trajectory of the industry's evolution:

1. Core automation functionalities encompassing both vehicular and infrastructural aspects, heralding a paradigm shift towards automated processes and operational frameworks.
2. User interfaces catering to the diverse needs of customers and equipment operators, facilitating enhanced interaction and usability across the transportation spectrum.
3. Vehicle and infrastructure maintenance, leveraging technological innovations to streamline upkeep processes and ensure optimal operational efficiency.
4. The development of novel services, exemplifying the integration of cutting-edge technologies to unlock new avenues of value creation and service delivery within the transport ecosystem.

The European Commission is monitoring digitalisation from several perspectives. The Digital Economy and Society Index (DESI) monitors overall digital transformation in the EU-27.[5] The index is numerical, ranges between 0 and 100, and is structured around four cardinal points of the Digital Compass: human capital, connectivity, integration of digital technology, and digital public services. Between 2017 and 2022, the EU-27 average of the DESI increased from 33.7 to 52.3. In parallel, the European Commission also calculates the Women in Digital (WiD) Scoreboard. With the scoreboard, it assesses Member States' female performance in the areas of Internet use, Internet user skills as well as specialist skills and employment. It aims at assessing women's inclusion in digital jobs, careers and entrepreneurship.[6] The score ranges between 0 and 100. The average EU-27 score in 2022 was 54.9 with high variation across countries: Finland was the highest with 80.4 and Romania the lowest with 35.8.

The European Union has been very active in trying to regulate digitalisation. In 2010, the EU provided one of the first measures of digitalisation applied to transport by adopting the legislative framework known as

[4] https://www.etf-europe.org/wp-content/uploads/2020/10/Final-report-Digital-transformation-and-social-dialogue-in-urban-public-transport-EN.pdf.
[5] https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi-2022/charts.
[6] https://digital-strategy.ec.europa.eu/en/news/women-digital-scoreboard-2021.

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Intelligent Transport Systems (ITS).[7] The Single European Transport Area as envisioned by the 2011 White Paper is the cornerstone of European transport policy.[8] In 2015, the European Commission set up an expert group, the Digital Transport and Logistic Forum (DTLF), to foster collaboration and exchange expertise to drive innovation in transport and logistics.[9] In a September 2016 communication titled, 'Connectivity for a competitive digital single market – Towards a European gigabit society' referring to transport, the strategy set a gigabit connectivity objective for 2025 for all main transport hubs.[10]

In May 2017, the Strategic Transport Research and Innovation Agenda (STRIA) was introduced. The Transport Research and Innovation Monitoring and Information System (TRIMIS) is the analytical support tool for the establishment and implementation of STRIA.[11] In 2017, the Council of the European Union adopted its conclusions on the digitalisation of transport. In the same year, within the activities of the project Mobility4EU, the European Transport and Mobility Forum (ERTMF) was established to foster a collaborative approach and knowledge-sharing among stakeholders to advance digitalisation and mobility solutions across Europe.[12]

In January 2020, the European Parliament adopted its resolution on the European Green Deal, looking towards a green Europe and opening up discussions about the move to a more digital world and the digital transition, thereby following up on the Commission communication and putting forward guidelines for transport under the heading 'Accelerating the shift to sustainable and smart mobility'.[13] In December 2020, the Commission presented its Sustainable and Smart Mobility Strategy to promote cleaner, greener and more intelligent transportation systems, emphasising the integration of digital solutions and smart technologies to drive progress towards a more sustainable future.[14] In December 2021, the Commission put forward a second package of proposals to support a transition to cleaner, greener and smarter transport in line with the objectives of the European Green Deal. Central to these efforts is the revision of the Trans-European Transport Network (TEN-T) Regulation, which represents a pivotal step towards modernising the European mobility network. By addressing key challenges and enhancing connectivity, the revised regulation seeks to enable more efficient, resilient and environmentally friendly transportation infrastructure, laying the groundwork for a sustainable and digitally enabled transport ecosystem in the European Union.[15]

Together, these initiatives underscore the EU's unwavering dedication to promoting digitalisation as a catalyst for innovation, efficiency and sustainability within the transport sector, laying the groundwork for a more connected and resilient transportation network in the digital age. The last act of the European Union in this area is the Artificial Intelligence directive that is expected to have specific impacts from a gender equality perspective. It will impact all sectors including transport.

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[7] https://transport.ec.europa.eu/transport-themes/intelligent-transport-systems/road/its-directive-and-action-plan_en.
[8] COM/2011/144 final. WHITE PAPER: Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system. The Commission has also evaluated this White Paper in *SWD (2020) 410 and SWD (2020) 411.*
[9] Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on electronic freight transport information. COM/2018/279 final – 2018/0140 (COD)
[10] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. Connectivity for a Competitive Digital Single Market – Towards a European Gigabit Society COM/2016/0587 final. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016DC0587.
[11] https://trimis.ec.europa.eu/stria, https://trimis.ec.europa.eu/about-trimis.
[12] https://www.etmforum.eu/wp-content/uploads/D4.5_action_plan_booklet_ed2_mar19_final.pdf
[13] COM/2019/640 final. The European Green Deal. EUR-Lex – 52019DC0640 – EN – EUR-Lex (europa.eu).
[14] COM/2020/789 final. Sustainable and Smart Mobility Strategy – putting European transport on track for the future. EUR-Lex – 52020DC0789 – EN – EUR-Lex (europa.eu).

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

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1.2 Gendered impacts of the AI Act on the Transport Sector

The EU AI Act constitutes a robust regulatory framework designed to tackle a number of issues concerning the utilisation of artificial intelligence (AI) across the European Union. Encompassing a wide array of considerations, this legislation sets out to govern the deployment, development and application of AI technologies within the EU.

While the primary focus of the AI Act may not be on the labour market or gender equality, its provisions carry significant implications for these domains, albeit indirectly. Within the Transport Sector, where AI-driven innovations are increasingly prevalent, the AI Act's regulatory measures will have various impacts, including gendered impacts, on employment.

For instance, the integration of AI technologies in transportation operations may lead to shifts in labour demand and job roles, impacting workforce composition and employment patterns. Moreover, the AI Act's emphasis on accountability, transparency and ethical AI deployment resonates with broader efforts to foster inclusive and equitable workplaces, potentially influencing gender equality initiatives within the transport sector.

The introduction of AI technologies in transportation operations may trigger changes in job roles, potentially leading to task automation and the emergence of new positions requiring different skill sets. Assessing the gender-specific impact of these changes is crucial to ensure equitable access to new opportunities and mitigate any disproportionate effects on women. Strategies must be devised to address potential gender disparities in job roles, fostering inclusivity and equal participation in the evolving transport workforce.

To effectively integrate AI technologies, transportation companies may need to invest in reskilling and upskilling programmes for their workforce. This presents an opportunity to address existing gender disparities in skills development, ensuring that women have equal access to training initiatives and opportunities for career advancement. By actively including women in reskilling programmes, companies can promote gender equality and cultivate a more diverse and empowered workforce.

The EU AI Act underscores the importance of ethical AI use, particularly in preventing discrimination and bias. Ensuring fairness in AI systems is paramount for promoting gender equality in the labour market. By scrutinising AI algorithms for gender biases and taking corrective measures, organisations can uphold equal opportunities for career progression and employment for women and men within the transport sector.

Mandating transparency and explainability in AI systems is critical for fostering fairness in hiring processes and promotions. This transparency is instrumental in identifying and rectifying potential biases that may affect the gender composition of the workplace. By disclosing the decision-making processes of AI systems, organisations can strive towards establishing a transparent and equitable work environment, thereby promoting gender equality in various roles throughout the transport labour market.

Data privacy and security have become increasingly critical considerations, particularly within the transport sector, where vast quantities of data are routinely collected. Protecting personal information is fundamental to ensuring the privacy and security of all employees, including women, who may be particularly vulnerable to privacy breaches or data misuse. Robust measures must be implemented to safeguard the confidentiality and integrity of personal data, thereby fostering a secure and trustworthy working environment for female workers.

Moreover, the integration of AI technologies necessitates the adoption of gender-sensitive policies to prevent the exacerbation of existing gender disparities. By employing fair and unbiased algorithms, especially in crucial areas like recruitment and performance evaluation, organisations can mitigate the risk of perpetuating gender-specific biases. These policies are instrumental in promoting equity and inclusivity in the workplace, thereby creating a more supportive environment for women in the transport labour market.

Effective monitoring and enforcement mechanisms are also vital for ensuring compliance with regulations related to gender equality. Authorities must actively address gender-related aspects in their monitoring efforts, fostering an environment where women are treated fairly and afforded equal opportunities for employment and

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career progression. By prioritising gender equality in monitoring practices, organisations can demonstrate their commitment to fostering diversity and inclusivity within the workforce.

Furthermore, integrating accessibility considerations into AI design offers significant benefits for all employees, including women. By prioritising inclusivity in the development of AI systems, organisations can ensure that these technologies are accessible and usable for everyone in the workplace. Gender-inclusive design principles play a crucial role in creating a more accommodating and equitable work environment, helping to remove barriers to participation and advancement for women in the transport sector.

2. Impact on the transport labour market

2.1 Overall impact

The digital transformation process in transport is already in full swing, with the adoption of new digital technologies and processes in all subsectors, from infrastructure and vehicles to customer relations and to the development of new digital-based services and business areas. The digital transformation in the sector is introducing higher levels of automation boosted by AI and the development of the Internet of Things (IoT). This is accompanied by an increasing level of interconnectedness in global transport processes.[16] Digitalisation is affecting all transport modes on many different levels of operations, from planning to execution. For example, by 2050, Connected and Automated Vehicles (CAVs) with improved sensing and wireless communication capabilities could become the norm.

The evolving trends in technology can be grouped into four main clusters: core automation functionalities of vehicles and infrastructure; user interfaces for customers and equipment operators, maintenance of vehicles and infrastructure, and new services.[17] These trends are already impacting the sector by enhancing operations, cutting costs and increasing productivity. As a consequence, new business models are emerging that are starting to generate new value and revenue and are remodelling the labour market of the sector.

2.2 Impact on women and transport

The overall impact of digitalisation on employment in transport will be profound.[18] A number of jobs are at risk of being lost and many others are likely to change. Three types of changes are expected on all sectors including the transport sector.

Job polarisation along with rising wages and income inequalities: Job polarisation refers to a decrease in the availability of jobs that require a moderate level of skills and an increase in the number of jobs at the bottom of the skill levels and of those at the top, requiring greater skill levels. This change would impact wages and increase inequalities in income.

More variety in working arrangements: A wider variety in work arrangements includes more opportunities for remote and smart working for professions that do not require the presence of in-person workers; these types of jobs are already increasingly available, particularly in response to the Covid-19 pandemic.

An impact on workers' wellbeing and work–life balance: Working arrangements might impact on workers' wellbeing and the opportunities to balance work and other responsibilities. The impact might be positive, where

[16] European Commission, Joint Research Centre, Baldini, G., Barboni, M., Bono, F. et al., *Digital transformation in transport, construction, energy, government and public administration*, Desruelle, P. (editor). Publications Office of the European Union. 2019. https://data.europa.eu/doi/10.2760/689200

[17] Among new services is Mobility-as-a-Service (MaaS). MaaS builds on the concept of multi-modal travel planners with booking and payment functionalities but takes it a step further by providing a subscription-based model for transport

[18] https://www.etui.org/sites/default/files/2024-01/Job%20quality%20and%20digitalisation_2024.pdf.

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the work–life balance would be improved, or negative, where workers would have to advocate for the right to disconnect if they are expected to work at all times.

3. Conclusion: The digital transition in transport

New technologies and increasing levels of automation have often been introduced in transport for safety or efficiency reasons and, most recently, for the benefit of the environment. However, every new invention changes the nature of work. It requires new skill sets or changes working routines. It reduces demand for workers of a specific profile and creates new demands for workers with different qualifications. The workforce is rapidly ageing, and significant shortages of labour force are already very visible in certain occupations. This is an area where digitalisation and automation has the potential to reduce the need for some new workers, and help relieve these shortages.

In transportation, the highest potential for automation is in remote operators, worldwide operating maintenance crews, and mobility-as-a-service providers. Automation and digitalisation are actually improving working conditions in the transport sector and removing many monotonous and physically tricky tasks, providing higher safety levels. Automation can also lead increased time flexibility with more availability of part-time jobs that might make the sector more attractive for employees with care responsibilities, particularly women. Automation can help under-represented groups of workers, such as workers with disabilities, access these new jobs because the new jobs thanks to automation can be performed by a more diverse workforce. But they may face barriers and stereotypes that would hinder their entrance and retainment in the sector.

While these advances hold promise for promoting diversity and inclusion within the transport sector, addressing entrenched stereotypes and biases remains essential. Organisations must actively work to challenge and dismantle discriminatory practices, foster inclusive workplace cultures, and provide equitable opportunities for all individuals, regardless of gender, ethnicity, ability, or other intersecting identities. By embracing diversity and leveraging the benefits of automation and digitalisation, the transport industry can move towards a more inclusive and sustainable future.

The European research project SKILLFUL[19] has identified the jobs and positions that are expected to be most affected by the present and future changes and developments in Europe's transportation systems. They are drivers, manual operators, ticket issuers and controllers, logistic centre staff, security controllers, and booking clerks and travel agents. Among those that are expected to become more relevant are logistics managers, logistics operators at terminals and delivery dispatchers, legal services personnel and privacy protection specialists, automated vehicle and drone operators, and experts on artificial intelligence, digital transformation, big data, security and cybersecurity.

In terms of gender, evidence from interviews with stakeholders has described the potential influence of automation and digitalisation on women as mixed. At the same time, it was not perceived that these trends will negatively affect female workforce members. For example, in the case of shipping where crews on board boats are mostly men, a new workforce structure, spurred by digitalisation could mean jobs in different locations, with more autonomy and with different terms of employment, which could be favourable to women.[20] Recent research on the introduction of robotics in procurement and supply chain management showed job opportunities through freeing up employees' time, as well as increased operational efficiency and quality.[21]

[19] Skills and competences development of future transportation professionals at all levels (https://www.skillfulproject.eu/) – Deliverable D1.1 (2017). Future scenarios on skills and competences required by the transport sector in the short mid and long-term.
[20] https://link.springer.com/article/10.1007/s13437-019-00176-w.
[21] https://www.sciencedirect.com/science/article/pii/S1478409221000522.

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The European Skills Agenda[22] supports the acquisition of skills for the green and digital transitions. One of its flagship actions is the Pact for Skills,[23] which aims to strengthen collective action on competencies development through partnerships. Underpinning these efforts is the Digital Education Action Plan 2021–2027, which prioritizes the enhancement of e-skills to drive digital transformation. Emphasising the importance of inclusive computing education, particularly from an early age, the plan aims to broaden participation in STEM fields, with a specific focus on encouraging women's engagement. By cultivating a diverse talent pool with robust digital proficiencies, the plan aims to alleviate the challenges faced by employers in recruiting highly skilled workers, including for the transport sector.

The twin transition should leave no one behind. In the transport sector, it should offer good social conditions, reskilling opportunities and attractive jobs to all, including women, people with disabilities and others who may be disadvantaged in the labour market.

[22] https://ec.europa.eu/social/main.jsp?catId=1223&langId=en.
[23] https://pact-for-skills.ec.europa.eu/index_en.

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SECTION III: GREEN TRANSFORMATION

1. The overall picture

1.1 EU steps towards green transition

Climate change is one of the greatest environmental and development challenges facing the world today. These include increased mortality and morbidity of people, ecosystems disruptions due to heat; loss in agricultural production due to heat and drought; increased water scarcity; and increased impacts of floods.[24] These climate challenges pose social and economic threats, as they directly impact people's health and wellbeing.[25]

Climate change mitigation contributes to avoiding the collapse of ecosystems and increases the likelihood of people continuing to live healthy lives in the future. However, transitions of such scope can magnify existing social challenges and create new ones, including for women and other disadvantaged groups. The deep structural shift needed to save the planet requires trade-offs and changes in established investment, current patterns of resource use, behaviours and values.

The EU and its Member States have ratified the UN Framework Convention on Climate Change (UNFCCC)[26] and later the Kyoto Protocol, providing an international framework for tackling climate change. In 2016, the EU ratified the legally binding global climate framework, the Paris Agreement,[27] which aims to limit global warming to well below 2°C and pursue efforts to keep it to 1.5°C.

The European Green Deal aims to establish a transport sector that is both competitive and sustainable, with a reduced impact on the environment and climate.[28] It should be considered jointly with the European Commission's 2011 White Paper, the 'Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system'.[29] This paper is the main document on EU transport policy. It outlines the goal of establishing a competitive transport system by 2050 that encompasses all modes of EU transport, including road, rail, aviation and waterborne transport and should therefore also have a strong impact on increasing the supply of jobs for women within the transport sector.

The Sustainable and Smart Mobility Strategy (SSMS), which was approved in December 2020 as part of the European Green Deal (EGD), offers recommendations for decreasing greenhouse gas (GHG) emissions produced by the transport sector in accordance with the EGD. The transport sector plays a crucial role in achieving the climate and energy goals set by the European Union, as stated in the National Energy and Climate Plans (NECPs) of its Member States. The NECPs largely prioritise targets and initiatives that aim to enhance the sustainability of the transport sector. In addition, the target actions of Member States are enhancing research, innovation and competitiveness in the sector.[30]

[24] IPCC (2022). Climate Change 2022: Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.
[25] European Commission (2022). Consequences of climate change.
[26] UNFCCC Secretariat (2022). Gender composition and progress on implementation. Report by the secretariat.
[27] https://unfccc.int/sites/default/files/resource/parisagreement_publication.pdf.
[28] European Commission (2019). The European Green Deal.
[29] European Commission (2011). WHITE PAPER: Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system.
[30] Sansonetti, S., and Davern, E. (2021). Women and transport. EPRS: European Parliamentary Research Service.

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The EU Emissions Trading System (ETS) is the cornerstone of achieving the EU's climate ambition and is its key tool for reducing GHG emissions. The EU ETS functions as a 'cap and trade' system, with caps set for the total amount of certain GHGs that can be emitted by operators covered by the system. This cap will be reduced over time to reduce emissions. The Fit for 55 package[31] strengthens the ETS, including on aviation, and extends it to new sectors, including maritime transport as of 2024. It also allows for setting up a second ETS for buildings, road transport and fuel combustion in industries not covered by the existing ETS (ETS II).[32]

The European Commission presented the European Green Deal in 2019 as a strategy for growth, setting the EU on the path to a green transition and tackle the current climate challenges. Together with the EU's 8th Environment Action Programme,[33] it emphasises the need for an integrated, transformative response across all policy areas to enable fundamental structural transformation towards a climate-neutral, resource-efficient and regenerative economy.

The European Green Deal sets out three key objectives. Firstly, it focuses on reducing net GHG emissions to zero by 2050 across all sectors and by 55 % by 2030. The second objective is to decouple economic growth from resource use while acting to protect, conserve and enhance the EU's natural capital. The third objective is to ensure that the green transition is fair and inclusive and built on the principle of leaving no person and no place behind. The European Green Deal is a comprehensive initiative that covers eight policy areas: climate action, clean and affordable energy, sustainable and smart mobility, energy and resource-efficient building and renovation, food systems, pollution, ecosystems, and biodiversity. It also emphasises the necessity of taking action on research and innovation, providing financial support for the transition, and ensuring that the transition is fair and equitable.[34]

The sectors expected to see the largest employment gains are utilities (through increased recycling activities), electricity supply (through increased demand for renewable energy) and manufacturing of appliances and electrical equipment.[35] While employment changes linked to the European Green Deal will be most pronounced in these sectors, changes are also expected in all sectors covered by the transition including building renovation, transport and food.

In fact, jobs benefiting from the green transition are often associated with challenges in gender-biased recruitment, namely in engineering and other scientific and technology-based studies. These perspectives must be considered when discussing a fair or socially sustainable green transition so that such a transition does not increase inequalities between women and men.[36]

1.2 Does the European Green Deal aim at a just and socially fair transition?

The IPCC Sixth Assessment Report underlines how gender can compound vulnerability to climate change. It points to the need to examine structures, processes and relationships of power between groups of women and

[31] European Commission (2021). 'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality. COM/2021/550 final.
[32] Council of the European Union (2023). "Council and Parliament reach provisional deal on renewable energy directive" Press release. 30 March.
[33] European Commission. Environment action programme to 2030.
[34] European Commission (2019). The European Green Deal.
[35] CEDEFOP (2021). The green employment and skills transformation: insights from a European Green Deal skills forecast scenario. LU: Publications Office.
[36] EIGE (2023). Gender Equality Index 2023 – Towards a green transition in transport and energy. Publications Office of the European Union.

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men, as well as potential intersectionalities with other social categories (for example, a woman with disability or a poor migrant man.[37]

The degree to which the European Green Deal advances a transition that is both equitable and socially just has been subject to scrutiny, as experts and civil society organisations contend that the concepts of 'climate justice' and 'gender justice' are constrained. It has been observed by others that the social aspect of the European Green Deal is not well-developed, as many issues related to employment and distribution are addressed in a fragmented or improvised manner.[38]

Addressing gender and intersecting inequalities is crucial for achieving a fair and socially equitable transition including in labour market participation. Disparities in social categories like gender, race, class, ethnicity, sexuality, indigenous identity, age, disability, income and migration status exacerbate susceptibility to environmental and climate hazards,[39] thereby reinforcing pre-existing power imbalances.[40] The EIGE asserts that despite progress in climate change policy, several elements of EU environmental policy still fail to incorporate a gender perspective.[41]

2. Impact on the transport labour market

2.1 Overall impact

The transport industry is responsible for some 25 % of the EU's greenhouse gas emissions. From 2013 onwards, the domestic transport sector in the EU experienced a rise in emissions, except for a small decline in 2020 due to the Covid-19 epidemic.[42, 43] Transportation not only contributes to carbon emissions but also generates air, noise and water pollution, congestion, and biodiversity loss, all of which have adverse effects on the environment and human health and wellbeing.[44]

The shift towards sustainable transportation will have significant ramifications for the labour market, specifically in relation to employment in the transportation sector. Gaining a comprehensive understanding of the evolving skills requirements and career opportunities, as well as the emerging transport technology and new options for mobility, will be essential in facilitating the necessary adaptations for transport workers. There is a high possibility of job redundancies in some areas of the transport industry; however, the exact figures are currently unknown. For example, electric vehicles have a lower number of parts and components compared to internal combustion engines, which implies a reduction in demand for automotive service professionals.

The green transition, while offering potential for innovation and structural transformation towards a more ecologically sustainable economy and society, also poses the danger of intensifying gender disparities. The European Commission suggests that the benefits and drawbacks of adaptation are likely to be spread unevenly

[37] IPCC (2022). Climate Change 2022: Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.
[38] EIGE (2023). Gender Equality Index 2023 – Towards a green transition in transport and energy. Publications Office of the European Union.
[39] Kaijser, A., and Kronsell, A. (2014). Climate change through the lens of intersectionality. *Environmental Politics*, 23(3), 417–433. doi:10.1080/09644016.2013.835203.
[40] Heffernan, R., Heidegger, P., Köhler, G., Stock, A., and Wiese, K. (2021). A Feminist European Green Deal Towards an Ecological and Gender Just Transition.
[41] EIGE (2023). Gender Equality Index 2023 – Towards a green transition in transport and energy. Publications Office of the European Union.
[42] EEA (2022). Trends and projections in Europe 2022.
[43] Eurostat (2022). "Greenhouse gas emissions falling in most source sectors". 23 August.
[44] EEA (2020). Healthy environment, healthy lives: how the environment influences health and well-being in Europe.

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according to gender and income.[45] Men are likely to benefit more from job growth in sectors moving to green practices, which might potentially exacerbate the gender gap.

Transport is a sector which has a significant and persistent gender imbalance despite some progress achieved globally and in Europe. The green transition is expected to impact on the sector by introducing technical and digital innovations (for instance, some technological changes like electrification are motivated by the need to reduce CO2 emissions and electric vehicles often include new digital devices), simultaneously transforming work with repercussions on the sector employment including on women's work in particular. This is likely to accelerate in the near future and with women already largely under-represented in all job functions, including STEM roles, these trends have, and will continue to have, decidedly gendered impacts.

Failure to act risks locking in transport's existing gender imbalance for decades to come. Consequently, the shift towards sustainability risks not offering women sufficient employment opportunities in the sector. Furthermore, women who are already in the sector might even see their current jobs at risk given the innovations and changes that the green transition is introducing, unless their positions are suitable for continuous reskilling and upskilling. For instance, if there is a growing demand for eco-bikes in the future, it could result in an increased need for workers in the industry. These people will likely be professionals such as engineers, IT developers, urban planners and providers of services like shared mobility services rather than drivers. To capitalise on the employment opportunities opened up by electric bikes, a comprehensive set of policies should be implemented at the same time and these policies should consider the potential role of women.

More generally, this can be applied to any possible future scenario implied by the Green Deal and should include skills development policies, social protection policies, active labour market policies, and policies to promote both social dialogue (especially if green transport is to be financed through 'green taxes') and fundamental rights at work. Industrial policy designed to foster the industries that would grow under a green transport scenario also need support. Promoting sustainability through the expansion of public transport and the electrification of private passenger and freight transport are just two areas in which future developments will affect employment throughout the economy. Other important areas whose impact on job creation deserves further study are automation, shared mobility, various modes of transports, hyperloop transport systems, delivery drones, and 'buy local' or 'short circuit' economies.

2.2 Impact on women and transport: Can green jobs be 'pink' jobs in the transport sector?

The European Green Deal is founded on the concept of 'green jobs', which refer to activities that aim to decrease carbon emissions by employing more efficient methods of energy and resource utilisation. However, the term 'green jobs' can be understood more broadly and encompass not just employment with low or zero emissions, but also jobs that offer wider environmental advantages and guarantee sufficient, secure and healthy working conditions for individuals.[46] Between 2022 and 2023, the share of green talent in the workforce grew by a median of 12 %, while the share of job postings requiring green skills grew by 22.7 %.[47]

Crossovers between green and 'non-green' sectors are fluid, particularly given the broad understanding of environmental technologies, which speak of different 'shades of green'. Accordingly, there are no generally recognised statistics that would allow for comparisons to be drawn between sectors, countries or over time. In order to distinguish between green jobs and other jobs, a distinction can be made between an output and a process perspective. From an output perspective, green jobs refer to the jobs in companies and sectors which produce goods and services that are either environmental goods in the strictest sense or relatively environmentally friendly goods. From a process perspective, the definition goes beyond this and covers

[45] European Commission (2022). Towards a green, digital and resilient economy: our European Growth Model.

[46] The Greens/EFA in the European Parliament. (2021). Green Jobs: Successes and Opportunities for Europe.

[47] LinkedIn Economic Graph (2023). Global Green Skills Report 2023.

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employment that seeks to improve the environmental impact of companies which do not produce environmental goods in one sense or another. Both are difficult to operationalise and measure.[48]

Aligned with the under-representation of women in all transport subsectors, women are predominantly found in administrative roles, particularly in service and sales positions (46 %), secretarial support positions (46 %), and professional roles (37 %). Some researchers believe that the advancement of digital technology and automation in the transportation industry is likely to eliminate many administrative jobs, particularly those related to clerical support and service and sales.

There are slightly more women employees in the EU (19 %) than men employees (17 %) in supervisory roles in the transport sector. These shares conceal significant disparities based on educational attainment, as the probability of women assuming supervisory roles rises in tandem with their degree of education. Furthermore, there is a significant disparity in the distribution of genders in leadership roles, particularly among individuals with advanced levels of education.

The 'More Women in Transport – EU Platform for change', founded in 2017 and coordinated by the European Commission, brings together organisations dedicated to enhancing women's employment and promoting equal opportunities for both women and men in the transport sector. The aim of the platform is to increase female employment and equal opportunities in the transport sector by giving stakeholders a platform to connect and share best practices and advice.[49] The European Transport Workers' Federation (ETF) is an active partner of the platform, which involves social partners at the European level, and shares and widely disseminates relevant recommendations, and also supports social dialogue projects on the topic.[50] The Platform is also committed to raise awareness on equality issues with the active support to a network of Diversity Ambassadors created for this purpose.

Several member organisations have already implemented various measures to address gender disparity in the transportation industry, such as green educational programmes, training initiatives, professional networking and mentorship opportunities, and projects aimed at increasing green transition awareness.[51]

To increase the number of women in such jobs, contractors can include specific clauses on a required percentage of women employees, both for road maintenance and for jobs in public transport systems. Employers, trade unions and public authorities could also support gender equality in the workplace through adaptation of working conditions, measures to support work–life balance and gender equality in recruitment policies, professional mobility and career development, and access to training.[52]

When analysing the potential of green jobs, it is evident that men tend to get more advantages from the expansion of 'green jobs', whereas industries that have traditionally been low in carbon emissions and have a significant proportion of women are often disregarded. Studies suggest that gender disparities and preconceived notions result in women facing more disadvantages than males in terms of adjusting their abilities and capitalising on the developing career prospects arising from the green transition (EIGE, Dhir 2017,)[53].

Sustainable transport also has the capacity to make a significant contribution to a diverse range of employment opportunities across sectors and subsectors. This can be accomplished by directly engaging in the building

[48] Klaus Jacob, Rainer Quitzow and Holger Bär – Environmental Policy Research Centre, Freie Universität Berlin (2015). Green Jobs: Impacts of a Green Economy on Employment.
[49] https://transport.ec.europa.eu/transport-themes/social-issues-equality-and-attractiveness-transport-sector/equality/women-transport-eu-platform-change_en.
[50] Projects such as the Joint Recommendations on Digital Transformation and Social Dialogue in Urban Public Transport in Europe, the results from the Union co- funded project on Employability in the Rail Sector in Light of Digitalisation and Automation, and the recommendations from the Union co-funded WESS project: Contributing to an Attractive, Smart and Sustainable Working Environment in the Shipping Sector.
[51] EIGE (2023). Gender Equality Index 2023 – Towards a green transition in transport and energy. Publications Office of the European Union.
[52] European Parliament (2012). The role of women in the green economy – The issue of mobility.
[53] EIGE (2023). Gender Equality Index 2023 – Towards a green transition in transport and energy. Publications Office of the European Union.

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and upkeep of infrastructure, such as pavements, cycling lanes and bus stops. It can also involve the production of rolling stock, buses and bicycles, as well as the operation and maintenance of the infrastructure and accompanying vehicles.

Furthermore, there are significant indirect employment opportunities that arise from the value chain, particularly in the construction, manufacturing and maintenance sectors. For example, this includes the production of spare bicycle parts or materials for bicycle lane construction. Additionally, there are employment opportunities in professional and administrative services for the management of green and healthy transport systems. Additional employment opportunities can arise when an increased number of households, who obtain income either directly or indirectly from environmentally friendly transport, allocate a larger portion of their earnings towards economic activities. The aggregate expenditure in the economy leads to the generation of additional employment opportunities.

3. Conclusions: skills and the green transition in transport

Owing to the current gender disparities in the labour market, encompassing both sectoral and occupational divisions, women are less able than men to seize the opportunities presented by a job market that is expanding from the green transition. CEDEFOP predicts a rise in female employment in the service industry.[54] However, further actions are necessary to enable women to fully benefit from the increasing opportunities in the sectors specifically focused on by the European Green Deal.

According to the European Training Foundation, digitalisation has a widespread impact on several areas of life and technological advancement.[55] Therefore, possessing digital literacy and skills, particularly STEM (science, technology, engineering and mathematics) skills, is essential. The European Training Foundation acknowledges that the move to a more environmentally friendly economy necessitates advanced technical knowledge and abilities. However, it also acknowledges that this presents a significant obstacle for women, who are not adequately represented in STEM fields. The European Training Foundation has published a policy brief titled 'Skills for the green transition'.[56] Such a framework should address several skill components including basic skills, hard skills and soft skills. It is important to remember that green competencies are a reflective, multidimensional spectrum comprising dimensions such as green knowledge, green skills, green abilities, green attitudes, green behaviour and green awareness.

The European Green Deal has created a strong need for a workforce that is well-educated in STEM fields, particularly in industries like energy and transport. According to the European Commission, it is essential to enhance and update the digital capabilities of the European Union workforce in order to successfully implement the European Green Deal and the twin transition.

Recognising the significance of STEM skills in the green transition and the persistent problem of women's under-representation in STEM-related education and training is of utmost importance.[57] However, it is crucial to take a more holistic approach to green skills, moving beyond a narrow viewpoint that suggests persons lacking technical expertise in STEM areas should be immediately disqualified from being considered for 'skills for green professions'. It is crucial to prioritise sectors that are typically not dominated by STEM fields, which are frequently characterised by a male majority, such as the transportation industry.

To facilitate this transformation, it is necessary to alter the view of 'green' or sustainable jobs. In an ecofeminist wellbeing economy, sustainable jobs cover any occupations that actively contribute to the preservation and enhancement of the welfare of both individuals and the environment. It is important to acknowledge that both

[54] CEDEFOP (2021). The green employment and skills transformation: insights from a European Green Deal skills forecast scenario. LU: Publications Office
[55] ETF (2023). Skills for the green transition: Evidence from the EU neighbourhood.
[56] Ibid.
[57] Janta, B., Kritikos, E., and Clack, T. (2023). The green transition in the labour market: how to ensure equal access to green skills across education and training systems. EENEE Analytical report. doi 10, 563345.

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the care and education sectors, which are mostly staffed by women, are crucial parts of the transition. This is because climate change and environmental degradation, especially widespread pollution, will increase the demand for health and care services. Moreover, the ageing population in Europe will also create additional needs in these sectors. It is important to ensure that jobs in these industries are evenly allocated across women and men and that the industries receive equivalent economic and social advantages as traditional 'green' occupations. The benefits encompassed in this category consist of satisfactory labour conditions, equitable remuneration, employment stability, occupational safety, entitlement to social security, and provision of childcare facilities. First and foremost, care and health jobs can be considered low-carbon because they require a significant amount of labour rather than relying heavily on energy or raw materials. They have a vital function in advancing the wellbeing of different age cohorts and bolstering society's general capacity to adapt and thrive.[58]

[58] A. Novello and G. Carlock. (2019). Redefining Green Jobs for a Sustainable Economy. USA: The Century Foundation.

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SECTION IV: CONCLUSIONS

1. Women in transport: an underexplored area of study

Women's issues in transport is a relatively new topic. European regulations considered women and transport issues about 20 years ago, while relevant European-funded research projects started slightly later, around 15 years ago. Over the last decade, policy-related research in transport employment has slowly shifted its attention toward issues surrounding gender balance in the workplace and women's employment experiences. The growing body of literature at the European Union level on this topic testifies to the increasing attention toward this issue.[59]

However, there is still little attention to women in transport. TRIMIS,[60] the EC analytical support tool for the establishment and implementation of the Strategic Transport Research and Innovation Agenda (STRIA),[61] contains an open-access, searchable database of projects and programmes of some 9,000 projects on transport. Less than 1 % of the projects within the TRIMIS database analyse women's issues in transport. Only eight projects specifically address the problem of lack of qualified personnel and women, and all of these projects were completed some time ago (six belong to the FP7 programme and two to H2020). The share of women in the sector has not increased, even after the finalisation of projects addressing the lack of qualified personnel and women.

The area of women's participation in the transport sector is therefore an area that needs to be further developed with data and information collection and analysis. Sectoral analysis with a gender perspective is pivotal to design a strategy to enhance women's participation in the sector, particularly now that the twin transition is changing the profiles of occupations and jobs. Women can seize this opportunity to become actors of the change.

2. Impacts of the twin transition on women in transport

Women in the transport sector continue to face multiple impediments to enter, remain and advance their careers. Gendered stereotyping, discriminatory and unsafe workplace cultures, lack of work–life balance solutions to support workers with a care role and childcare provision, and glass ceilings constrain progress towards a more gender-balanced workforce, with detrimental impacts on those women already working there.

If the transport sector is to progress, key fundamental changes need to be implemented that actively improve women's ability to access the sector, their workplace experiences, and decision-making roles. Such advancement is not simply an opportunity; it is a necessity. Failure to address recruitment, training, workplace culture and safety, maternity provisions, work–life balance and barriers to career progression mean many women will be locked out of the new opportunities, which are emerging across all subsectors of transport, and other opportunities directly and indirectly related to transport. At the same time, an inability to address gender diversity will stifle the industry's capacity for sustainable growth.

[59] Collaborative efforts by the European Commission and international representative bodies such as the International Transport Workers' Federation (ITF) and European Transport Workers' Federation (ETF) and networks including the Women's International Shipping and Trading Association, Women in Transport and Women in Trucking have exposed discriminatory practices and cultures, highlighting challenges, and campaigning for action.
[60] https://trimis.ec.europa.eu.
[61] STRIA outlines future transport research and innovation priorities to decarbonise the European transport sector outlined in seven roadmaps: cooperative, connected, and automated transport (CAT), transport electrification (EV), vehicle design and manufacturing (VDM), low emission alternative energy for transport (ALT), network and traffic management systems (NTM), smart mobility and services (SMO), and infrastructure (INF).

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3. Impacts on transport employment of the twin transition

The impacts on employment of the twin transition vary by subsectors where different forces and trends are at work. What follows is an analysis of the expected impacts.

3.1 Gendered impacts on the aviation sector of the twin transition

Aviation companies indicate an increasing trend in traffic for the coming years. However, the limitations due to decarbonisation might lead to slow down the current growth unless greening policies are designed by combining carbon budget/blending obligations and limitations in the number of seats for kilometre. This strategy can reduce transition risks and increase airline profitability.62

The current jobs will offer less opportunities, but new skilled jobs are expected to be created. A rearrangement in the skills profiles of workers in this area is expected. Women need to align with this demand.

New systems assisting pilots are expected to reduce the number of pilots needed on long-haul flights though the minimum of two pilots will not be reduced on short flights as this would require changes in international standard procedures. Women pilots are about 5.8 % of all pilots worldwide and are increasing.[63] There is no reason for this positive trend to reverse as there are many initiatives worldwide aimed at promoting women's access to the profession.

There will be deeper changes in the operations of control centres. Each of them is expected to manage several control towers simultaneously with fewer operators in every tower but more personnel will be needed in control centres to coordinate them. This is a typical male occupation, and women need support in terms of skilling.

A strong reduction in the number of jobs in the area of ground handling and maintenance occupations, which are typical male occupations, has already taken place after the reduction in volumes of checked baggage following the introduction of online check-in and the application by carriers of additional costs to extra-cabin baggage. The trend is expected to be confirmed. Assistance to clients at the airport is also changing: a typical female occupation now requires more digital skills.

3.2 Gendered impacts on the maritime sector of the twin transition

The volume of global shipping is expected to continue growing due to the increase in international trade. This growth is positively correlated with economic growth, and with increased environmental impacts.[64] The impact of the European Union green policy in the sector in the short-term has implied economic losses.[65] It is suggested to support the sector by investing in port infrastructure and ecological ships to support the sector in accordance with the current European trends and concerns.[66] Renovation in infrastructure will imply more automation and digitalisation.

From the workers' point of view, these changes may contribute to shorten working times and long hours and improve safety but autonomous shipping will lead to a net loss of jobs for onboard work. Demand for officers and clerical workers for remote ship controlling is expected to increase. Retraining existing employees will be harder than hiring new ones as the skills are totally different. The European Transport Workers' Federation is

[62] Gössling, S. and Humpe, A. (2024). Net-zero aviation: Transition barriers and radical climate policy design implications, Science of The Total Environment, Volume 912.
[63] https://centreforaviation.com/analysis/reports/women-airline-pilots-numbers-are-growing-but-still-a-pitiful-percentage-655755.
[64] Fratila, A.; Gavril, I.A.; Nita, S.C. and Hrebenciuc, A. (2021). The Importance of Maritime Transport for Economic Growth in the European Union: A Panel Data Analysis. *Sustainability* 13: 7961. https://doi.org/10.3390/su13147961
[65] Goyal, S. and Llop, M. (2024) The shipping industry under the EU Green Deal: An Input-Output impact analysis, Transportation Research Part A: Policy and Practice, Volume 182. https://doi.org/10.1016/j.tra.2024.104035.
[66] Alamoush, A.S., Ölçer, A.I. and Ballini, F. (2022). Port greenhouse gas emission reduction: Port and public authorities' implementation schemes. *Research in Transportation Business & Management*, Volume 43. https://doi.org/10.1016/j.rtbm.2021.100708.

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working with the employers on a strategy for future education and training for maritime professionals. These changes can make the sector more attractive to women. The situation in inland waters transportation is similar.

In the area of docks employment, the impact is substantial. For example, a fully automated marine terminal can reduce the number of workers by 45 %. There will be a consistent improvement in safety conditions due to automation and a radical change in the skills needed, with physical work potentially being replaced by screen-based work. This could be positive from a gender perspective as far as employers will show a positive attitude towards the entrance of women in the sector. However, the tasks might become very repetitive, bringing a worsening in working conditions that might make the sector poorly attractive to women.

3.3 Gendered impacts on the railway sector of the twin transition

Promoting railway transport is an important part of the European Green Deal. High-speed railways[67] as well as local railways[68] will positively contribute to the reduction of carbon emissions and to the wider economy by improving accessibility. Electrification and new power technologies (fuel cells and hydrogen) will lower emissions in the sector.[69] The introduction of new technologies will promote automation and digitalisation.

The whole process is already impacting strongly on the subsector and will continue to do so in the future. Automation and digitalisation might lead to deskilling of drivers. In the meantime, greater surveillance at work is being introduced with the possible adoption of inward-facing video cameras. Digitalisation is changing the roles of guards on trains. Staff numbers in ticket offices have also been reduced as tickets are bought online and from automated machines. Station masters are substituted by automated systems making workers in smaller stations redundant. New type of occupations, however, are emerging with an increase in customer care and selling, requiring completely different skills. From a gender perspective, this change may favour women's employment.

The sector is unattractive for women due to shift work and continuous services. Companies have developed measures to increase their attractiveness to women. Automation and digitalisation improve working conditions and offer opportunities to women The European Social Partner Agreement on Women in Rail, signed in 2021 by the Community of European Railway and Infrastructure Companies (CER), representing railway sector employers, and the European Transport Workers' Federation (ETF), representing railway workers, includes measures to attract more women to work in the rail sector by improving work–life balance, promoting career development for women, improving health and safety at work, and preventing sexual harassment and sexism.

3.4 Gendered impacts on the road transport sector of the twin transition

In 2019, road transport accounted for 71.7 % of EU-27 transport sector emissions. Among the road transport modes, cars accounted for 60.6 % of emissions, followed by heavy-duty trucks and buses, which together represented 27.1 % of emissions.[70] Reducing emissions in this area is also requiring innovation and automation.[71] Automation in road transport will have profound implications for gender equality within the workforce. As automation technologies gain traction, the roles and responsibilities of drivers undergo a fundamental transformation, necessitating the acquisition of new skills and competencies. The impending shift towards highly automated vehicles presents implications for employment structures and occupational roles.

[67] Holvad, T. (2024). High Speed Railways: A Review of Available Evidence on Socio-economic Impacts. In: Pagliara, F. (eds). *Socioeconomic Impacts of High-Speed Rail Systems.* IW-HSR 2023. Springer Proceedings in Business and Economics. Springer, Cham. https://doi.org/10.1007/978-3-031-53684-7_8.
[68] Lunardon A., Vladimirova, D. and Boucsein, B. (2023). How railway stations can transform urban mobility and the public realm: The stakeholders' perspective, *Journal of Urban Mobility*, Volume 3. https://doi.org/10.1016/j.urbmob.2023.100047.
[69] https://www.era.europa.eu/content/2024-rail-environmental-report.

[70] https://www.eea.europa.eu/publications/transport-and-environment-report-2021.
[71] Ibid.

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As automation becomes increasingly prevalent in trucks, long-distance buses and coaches, drivers are confronted with the pressing need to acquire new skills.

Moreover, the potential introduction of more sophisticated personal monitoring systems, leveraging advanced sensors to ensure driver vigilance and prompt intervention capabilities, underscores the technological advancements reshaping the industry's operational norms. However, the nuanced impact on women's employment prospects remains multifaceted. On one hand, the integration of automation may mitigate traditional barriers to entry for women by minimising physical labour and fostering a more inclusive work environment. On the other hand, the potential displacement of traditional driving roles and the emergence of new digitalised tasks could exacerbate existing gender disparities, particularly if proactive measures are not implemented to address gender imbalances in skill acquisition and career advancement opportunities. Changes already underway show poor improvement in terms of female employment. Therefore, fostering gender equality requires a comprehensive approach that prioritises skills development, promotes inclusive workplace policies, and empowers women to thrive in the rapidly evolving landscape of road transport.

3.5 Gendered impacts on urban public transport of the twin transition

Smart cities are the application of the Internet of Things to urban life. Smart cities allow the more effective and timely management of key urban issues including and traffic, taxi sharing, parking space, waste collection, street lighting, energy and pollution.[72] They are pivotal for the implementation of the green transition at the local level. By introducing the Internet of Things, however, public transport is changing dramatically. The ticketing services available online or from automatic machines are reducing the number of ticket office staff. The introduction of driverless metros and trams is threatening driving jobs. On the other hand, the increased use of digital technology (remote camera control) is requiring staff with new digital skills and ensures higher security and safety levels.

From a gender equality perspective, initiatives to encourage women in driving and in remote patrolling in urban transports are already in place and proved to be effective, particularly for publicly owned companies. Additionally, staff formerly in ticketing offices are now being used to provide more passenger information. Other new occupational profiles are emerging in planning and remotely controlling the overall system. Dedicated mobility services for people with disabilities or with other special mobility needs seem to be expanding.

Initiatives at the company level to increase the number of female employees should address poor working conditions (including work–life-balance), safety (experiences of harassment and violence), training, recruitment and wage equality, gender stereotyping and gender discrimination. Moreover, efforts to enhance training, recruitment practices and wage equality are essential for creating an inclusive and equitable workplace environment. Addressing gender stereotyping and discrimination also remains imperative, necessitating concerted efforts from industry stakeholders and policymakers. The International Association of Public Transport (UITP) and European Transport Workers' Federation have two projects dealing with women's employment and gender equality in the European public transport sector and have agreed on joint recommendations to increase the share of women in employment in urban public transport.

3.6 Gendered impacts on the logistics sector of the twin transition

In the past, logistics and freight transport were viewed as low-value services and thus outsourced by manufacturing companies to specialised third-party providers. This led to a fragmented sector characterised by extensive subcontracting and lean production models. However, the role of logistics has evolved significantly, particularly within the e-commerce sector, where it now holds strategic importance. Large logistics firms now handle complex services, such as warehouse management, integrated supply chain management,

[72] https://www.frontier-economics.com/uk/en/news-and-insights/articles/article-i4604-how-smart-cities-can-help-tackle-climate-change/.

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data analysis and strategy development. These functions are increasingly merging with digital freight forwarding, which combines marketplace and software company roles to integrate supply chain information.

The emergence of platform work has profoundly reshaped the landscape of the logistics sector, catalysing a robust wave of digitalisation that is still expanding. The exponential growth of e-commerce, accelerated by the global pandemic, has spurred employment opportunities within the logistics industry but entailed an increase in energy, raw materials and soil consumption as well as in pollution, greenhouse gases emissions, waste and noise.[73]

At the same time, the increase in labour demand has led to a rise in the use of subcontracting chains, particularly for last-mile delivery services. This reliance on subcontractors often results in precarious working conditions, including a lack of direct employment, frequent use of (often misleading) self-employment, and the associated risks of job insecurity and poor labour standards. Workers face excessive pressure, long hours and physically demanding tasks, which adversely impact their health and safety. The prevalence of temporary, on-call or seasonal contracts contributes to high rates of accidents and musculoskeletal disorders.

Furthermore, this surge in employment has been juxtaposed with technological advancements, including digitalisation and automation that are reshaping the sector. These changes demand new skills and training for workers but also lead to increased physical and mental stress due to the relentless pace of work. The introduction of automation and digital surveillance raises concerns about worker privacy and data protection, as well as the potential for algorithmic management to affect wages and working conditions, despite the fact that digitalisation holds the potential for enhancing health and safety monitoring protocols. The current deployment of technology often fails to prioritise workers' wellbeing.

Trade union activity is fragmented due to the high turnover and subcontracting practices. In many countries, unions face difficulties even in establishing representation at the company level or negotiating effectively due to hostile environments and lack of recognition.

From a gender perspective, the impact of digitalisation in the logistics subsector, particularly in the realm of delivery services, has been decidedly negative. Persistent gender disparities in opportunities and treatment persist, perpetuating systemic inequalities and hindering the advancement of gender equality within the industry. If male workers' conditions are hard, female workers' conditions are even harder as work organisation is gender blind. As such, concerted efforts are required to address these disparities and foster a more equitable and inclusive working environment for all logistics workers both women and men meeting their gender-specific needs

Proper implementation at the national level of the EU Directive on Corporate Sustainability Due Diligence, which obliges companies to manage adverse impacts on human and social rights, and environmental conditions, across their operations and those of their partners will help enforcing these standards throughout the entire supply chain. In this context, national trade unions can adopt strategic litigation to hold companies accountable for non-compliance with due diligence obligations. Strategic litigation has proven effective in some countries and can serve as a powerful tool of enforcement.[74]

[73] Silva, V.; Amaral, A. and Fontes, T. Sustainable Urban Last-Mile Logistics: A Systematic Literature Review. *Sustainability* 2023, *15*, 2285. https://doi.org/10.3390/su15032285.

[74] See the project TeamHub implemented by FILT-CGIL in partnership with Fondazione Giacomo Brodolini (FGB), Belgische Transportbond (BTB), Elliniko Idryma Evropaikis Kai Exoterikis Politikis (ELIAMEP), University of Jyvaskyla, University of Taru, NOTUS, Fundacja Instytut Spraw Publicznych, Institut de Recherche Economique et Sociale (IRES), Vereinte Dienstleistungs-gewerkschaft Ver.di, the European Transport Workers' Federation (ETF), Organizacja zakładowa and Federación de Servicios a la Ciudadanía de CCOO. For more info: https://team-hub-project.eu/

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SECTION V: Exploring existing initiatives

1. The Italian experience

The interviewed experts provided evidence about the Italian situation and the impact of the twin transition on female employment in the transport sector in Italy.[75] Automation has already been introduced across all transport subsectors: Logistics, Maritime, Urban Public Transport, Road Transport, Railways and Aviation. This technological shift is reshaping how operations are managed, with automated systems increasingly performing tasks once carried out manually. Despite the rapid adoption of automation, particularly in areas such as freight handling, traffic management and customer service, it remains challenging to pinpoint its precise impact on employment, especially with regard to female workers.

Contrary to initial concerns that automation would drastically reduce the need for human labour, the introduction of these technologies has not led to a significant reduction in workforce numbers. In fact, in many instances, automation has instead triggered the need for new skills and qualifications among workers, leading to processes of upskilling and reskilling. It has also alleviated the physical demands of certain tasks, reducing the need for physical strength and enabling women to access roles that were previously reserved for men with specific physical characteristics.

For female workers, this transition has often resulted in the acquisition of more advanced technological competencies, enabling them to adapt to emerging roles in increasingly automated environments. Furthermore, rather than eliminating jobs, automation has prompted internal redeployment, with workers being reassigned to different roles within companies, thus maintaining employment levels while embracing new technologies.

Currently, the cost of personnel in many cases remains significantly lower than the acquisition of replacement machinery, thereby maintaining the competitiveness of the workforce. This dynamic presents opportunities for growth, particularly if upskilling and reskilling efforts are strategically aligned to enhance women's participation in technical roles that are often under-represented by female employees. However, it also highlights the need for policies and training programmes that specifically address the gender disparities in access to these new opportunities. Finance and tools for upskilling and reskilling should be supported by EU funding.

Trade unions are actively engaging in this matter by conducting studies, organising discussions with experts, and holding training days to assess the potential impact of the twin transition on employment in the transport sector and its subsectors.

Cultural barriers, however, still hinder women's access to certain positions within the transport sector, underscoring the urgency of implementing measures to mitigate gender bias and facilitate greater access for women to roles traditionally held by men.

In this context, the following section analyses the experience of Il Porto delle Donne (the Port of Women) in Livorno, a project that focused on deconstructing gender stereotypes to make women's work more visible and relevant in the maritime sector. This model could be replicated in other transport subsectors as well.

1.1 Il Porto delle Donne (The Port of Women)

The Port Department of the Municipality of Livorno implemented the project, Il Porto delle Donne (The Port of Women) with the aim of ensuring female representation in port work for women.[76] The project aimed to promote

[75] The information for implementing this section was provided by Francesca Baiocchi, Unione Italiana del Lavoro (UIL) National Secretary for Transport, Delegate for Equal Opportunities and International Policies.
[76] The information for this best practice was provided during an interview conducted with Barbara Bonciani, who currently serves as the Councillor for the Port of Livorno in Tuscany, Italy, focusing on integration between the port and the city. She works at the Research Office of the Port Authority and is the Vice President of the Association Network for Collaboration between Ports and Cities for the Italy section.

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a greater understanding of the work that women perform in the maritime port sector and, at the same time, stimulate a debate among stakeholders not only at the local level but also at the national and European levels to understand how to improve the presence of women in the port and maritime sector. For this purpose, interviews were conducted with female workers in the sector, starting from focus groups with port and maritime workers, which were then edited into video interviews and made available on social networks and the Municipality of Livorno's website.

This project sparked interest from national and local TV networks, creating further opportunities for the visibility of women employed in this sector. Additionally, a photo shoot by photographer Elena Cappanera was conducted within the port and on ships to depict female labour. The photos were exhibited in a display at the City Museum of Livorno and then moved to the Port Workers' Palace, where they remained. On 19 February 2024, the photos were hosted at the Chamber of Deputies. Furthermore, a mural depicting female labour was created within the port of Livorno, and Paolo Ruffini, a director and actor, was commissioned to produce commercials to address gender stereotypes.

To promote debate among stakeholders, a conference was held in May 2023, attended by key actors in the port and maritime sectors, to raise awareness on the issue of women working in these sectors and discuss how to improve the presence of women in these fields. The first day of the conference was focused on local actors, followed by a national conference on the second day.

2. The Norwegian experience

Nordic countries are highly supportive of the introduction of automation, driven by the belief that machines can alleviate the physical demands of certain tasks, allowing individuals with diverse physical abilities to perform roles that previously required specific physical attributes.[77] There are several positive examples of this approach. For instance, a warehouse in Oslo has been fully automated, and the workforce has undergone comprehensive reskilling to retain their jobs. Notably, women have been the primary beneficiaries of this reskilling process.

This trend is also observed in port operations, where tasks now managed by machines, along with the demand for new skill sets, have enabled women to occupy positions that were previously held predominantly by men. Gender equality in the maritime sector, however, is influenced by numerous complex factors. Women are strongly under-represented in the maritime sector, and the majority are employed in non-technical roles (such as hotel catering). Fisheries is also a male-dominated sector.

In the maritime sector, it is difficult to achieve a balance between work and private life and to adapt work to personal needs. Furthermore, cultural biases build barriers to accessing these jobs.

Sexual harassment and bullying are still strongly in place in these sectors, with evidence reported. There is a cooperation operation agreement between the Norwegian Maritime Authority (NMA), the Equality and Discrimination Ombudsman and selected organisations on how to prevent and prevent sexual harassment and harassment in the fishing industry.

Challenges such as a lack of industry knowledge, working environment issues, attitudes and harassment are hindering female participation, especially at sea. However, the industry can promote gender equality through role models, inclusive recruitment, awareness campaigns and supportive personnel policies. Ultimately, it is up to company management to prioritise and implement measures to foster gender equality, with approaches varying widely among companies.

[77] The information for this best practice was provided during interviews conducted with Anu Hietala, General Secretary of the Nordic Transport Federation, an umbrella organisation of 40 transport unions from 5 Nordic countries (Finland, Sweden, Norway, Denmark and Iceland); Lena Dyring, the women's representative on the ITF Seafarers' Section; and Line Heimstad, Member of the Norwegian Seafarers' Union and the ETF Women's Steering Group.

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The difference in pay between women and men is greatest in shipping and transport, where the female median income is 64 % of the male median income (70 % average). The difference is significantly less in the shipyard segment, where women earn 95 % of what men earn (93 % average). In the maritime industry as a whole, the female median income is 83 % of the male median income (82 % average). The wage gap between women and men in all segments, except for shipping and transport, is greater among those with a university and college education than among those with a lower level of education.

The proportion of women in maritime study programmes at upper secondary schools is particularly low. In second-year upper secondary school maritime courses, 11 % of the students are women. The share of women who are apprentice deckhands is 8.5 % and marine engine mechanics is 7 %.[78]

2.1 Norwegian Seafarers' Union Survey

Before the Norwegian Seafarers' Union congress in 2022, there had been several disturbing cases of sexual harassment of female seafarers in the fishery sector. These incidents made headlines in major newspapers, prompting the congress to take decisive action to address the broader issues of harassment, bullying and discrimination.

In response, the Norwegian Seafarers' Union commissioned a survey through a professional research agency in February and March 2023 on bullying, harassment and sexual harassment. [79] All working members were given the opportunity to share their opinions and experiences. Similarly, the Norwegian Maritime Directorate conducted its own survey, yielding comparable results.

The findings revealed that about 25 % of respondents had experienced some form of bullying or harassment in the past 3 to 4 years. Alarmingly, among young women, this figure rose to 30 %, with many reporting incidents of sexual harassment on board ships. Furthermore, around 30 % of those who reported these incidents faced negative consequences as a result.

In light of these troubling statistics, the entire Norwegian maritime sector, including the government, has come together to tackle this challenge. All industry stakeholders have shown strong support for creating a safer workplace environment. There is a widespread belief that to attract the most skilled men and women to the industry, it is essential to ensure a safe working environment. Achieving this goal requires a collaborative effort involving all parties in the industry.

2.2 Gender Equality Strategy for the Maritime Sector

The Norwegian Government led efforts to draft a cooperative declaration with the maritime industry aimed at advancing gender equality within the sector and documenting its progress.[80] This declaration outlined specific objectives and a timeline, developed collaboratively with stakeholders and the Norwegian Ministry of Culture and Equality.

In terms of **recruitment and role models**, the Gender Equality Strategy for the Maritime Sector initiated a dialogue with maritime educational institutions regarding increasing recruitment of women and men and launched information campaigns targeting girls of lower secondary school age to promote career opportunities in the maritime sector.

It also provided measures to improve the **working environment** from a gender and inclusive perspective, by actively engaging in international forums like the International Maritime Organization (IMO) and International

[78] Norwegian Directorate for Education and Training. Elevtall i videregående skole – utdanningsprogram og trinn (udir.no)
[79] The information for this best practice was provided by Line Heimstad, Member of the Norwegian Seafarers Union and of the ETF Women's Steering Group.
[80] The information for this best practice has been provided during the interview conducted with Lena Dyring, the women's representative on the ITF Seafarers' Section. Through this role, she promotes the rights of women seafarers worldwide. Dyring is also working as Director of Cruise Operations for the Norwegian Seafarers' Union where she takes part in negotiations and maintains Collective Bargaining AreementsAgreements for many seafarers in the cruise industry. Lena is based at the NSU head office in Oslo, Norway.

Labour Organization (ILO) to advocate for gender equality and diversity within the maritime sector. The strategy also integrates diversity and gender equality principles into the government mandate for revising the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) at the IMO. Moreover, it revises course descriptions developed by the Norwegian Maritime Authority in collaboration with the maritime industry to ensure the incorporation of gender-neutral language. It also updates Norwegian maritime legislation to promote the use of gender-neutral terminology. Finally, it enhances the Norwegian Maritime Authority's communication efforts to promote gender equality among industry stakeholders and employees.

The Norwegian Government is committed to taking concrete actions to address and **prevent sexual harassment** in the maritime sector. This includes ratifying ILO Convention No. 190 and presenting a report to the Norwegian Parliament on sexual harassment in 2024. Moreover, the government will explore potential amendments to Norwegian maritime legislation aimed at highlighting and enhancing measures to combat harassment. Efforts will also be made to bolster the supervisory role of the Norwegian Maritime Authority in addressing instances of harassment within the industry.

2.3 Cooperation agreement between the NMA, the Equality and Discrimination Ombudsman and selected organisations on how to prevent and prevent sexual harassment and harassment in the fishing industry

In the autumn of 2021, female fishermen brought to light instances of severe harassment and sexual harassment within the fishing industry through media channels. In response, the Minister of Fisheries reached out to the Equality and Anti-Discrimination Ombud (LDO), who recommended convening industry organisations to discuss preventive measures against harassment.[81] Subsequently, a joint agreement was reached among all parties involved to collectively combat sexual harassment and harassment.

The LDO is tasked with promoting equality and preventing discrimination across various domains, including gender, ethnicity, religion, disability, sexual orientation, gender identity, gender expression and age. The ombud also has an expanded responsibility to offer guidance on harassment and sexual harassment.

Building on this, the Norwegian Maritime Directorate, LDO and key organisations within the fishing industry decided to formalise collaboration aimed at preventing sexual harassment and harassment in the sector. Participating organisations include Norway's Fishermen's Association, Norway's Coastal Fishermen's Association, the Norwegian Seafarers' Union, the Pelagic Association, She Fishes and Seafood Norway.

The collaboration's primary objective is to enhance awareness and understanding of sexual harassment, particularly concerning factors such as ethnicity, gender, sexual orientation, gender identity and gender expression. Key measures include raising awareness among supervisory authorities, leaders, safety representatives and elected representatives.

For successful implementation, endorsement from the leadership of the Norwegian Maritime Directorate and participating organisations is crucial. Responsibilities, roles and resources have been delineated, with commitments from LDO to develop training materials and offer guidance services, and from the Norwegian Maritime Directorate to provide information and conduct training sessions. The organisations have pledged to

[81] Samarbeidsavtale mellom Sjøfartsdirektoratet, Likestillings- og diskrimineringsombudet og utvalgte organisasjoner om hvordan forebygge og hindre seksuell trakassering og trakassering i fiskerinæringen https://www.ldo.no/globalassets/_ldo_2019/_bilder-til-nye-nettsider/seksuell-trakassering/operativ-samarbeidsavtale-om-hvordan-forebygge-og-hindre-seksuell-trakassering-og-trakassering-i-fiskerinaringen.pdf
The information for this best practice has been provided during the interview conducted with Lena Dyring, the women's representative on the ITF Seafarers' Section. Through this role, she promotes the rights of women seafarers worldwide. Dyring is also working as Director of Cruise Operations for the Norwegian Seafarers' Union where she takes part in negotiations and maintains Collective Bargaining Areements for many seafarers in the cruise industry. Lena is based at the NSU head office in Oslo, Norway.

incorporate training modules, conduct risk assessments, provide information on their websites, designate contact persons, and collaborate on preventive measures.

3. The Austrian experience

Austria ranks among the countries with the lowest number of women employed in the railway sector.[82] Data on this matter are regularly monitored and incorporated into the EU Women in Rail Report.[83] The barriers are primarily cultural, with multiple consequences. Events dedicated to increasing awareness and promoting women's employment in the railway transport sector have been organised, such as one held in Vienna in 2019.

Within the Austrian Federal Railways, a central measure of performance management has been implemented, known as target agreements or Management by Objectives (MbO). This measure requires managers to refer to gender quotas established within the MbO when hiring new personnel within the organisation. For example, this measure has positively contributed to the increased hiring of women in the railway sector.

The collective agreement in Austria and in the railway sector allows for equal pay between men and women, but the distribution of men and women in various job positions is heavily influenced by gender stereotypes and general culture. While it is possible to find women in leadership positions, for example, there are very few women employed as train drivers. This is also due to working conditions that often do not align well with family needs for reconciliation and caregiving. The work shifts are organized very conservatively, and this does not adapt easily to family needs. Freight trains, for example, are not designed to meet the physical needs of women. Some of them do not even have toilets, which is not ideal for anyone and even less feasible for women.

3.1 Financial compensation during pregnancy and maternity leave for train drivers

Within the collective bargaining agreement negotiated by the unions, several gender equality issues have been raised and brought to the discussion table. It is essential to investigate the characteristics of each context in order to implement actions that are truly effective and can have a significant impact on gender equality.

The Maternity Act Law in Austria contains measures for the prevention and protection of women during pregnancy and maternity leave. One such measure is the protection of women from night shifts, which are often very demanding due to disrupted sleep patterns. The recognition of the more taxing nature of night shifts over time led to the establishment of a night shift allowance, which adds to the base salary and increases the net pay at the end of the month.

The issue was the exclusion of women from night shifts during pregnancy and maternity leave without any financial compensation or support. The unions managed to negotiate with employers that women who exercise their right to abstain from night shifts during pregnancy and maternity leave would receive financial compensation to offset the loss of earnings resulting from the suspension of night shifts. The proposal encountered no particular resistance; it was only necessary to ensure that the measure was correctly formulated from a legal perspective.

Women who are pregnant or on maternity leave receive an increase in net pay ranging from EUR 100 to EUR 250 per month. Since this is a collective bargaining agreement, all organisations are obligated to provide this pay to pregnant women or those on maternity leave in compensation for abstaining from night shifts (as guaranteed by the Maternity Act).

[82] The information for this best practice was provided during the interview with Olivia Janisch, who since 2023 is the Deputy Chairwoman of the ÖBB Group Works Council and since 2022 Member of the Women's Steering Committee and the Executive Committee of the European Transport Workers' Federation. Since 2021 she has been the Federal Women's Chairwoman of Vida, the union that supports a wide range of professional groups in the transport and service sectors. She is also Deputy Chairwoman of Vida and
Member of the ÖGB Executive Board.
[83] The is available at: https://cer.be/cer-eu-projects-initiatives/wir.

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Immediately after the negotiation, it was necessary for the Work Council to monitor the implementation of this good practice by employers to ensure that they applied this new right acquired by female workers to receive an average monetary compensation as a substitute for the compensation for uncovered night shifts due to pregnancy or maternity leave.

Another measure that is entering the negotiation phase concerns female train drivers. To operate a train, workers must possess a licence. To maintain this licence, they must demonstrate regular train operation. When a woman is pregnant or on maternity leave, she temporarily suspends her work activity, and since she cannot demonstrate regular train operation during this period, she automatically loses her licence. The unions are drafting a negotiation to ensure that women who are pregnant or on maternity leave are not subject to this loss of a licence.

4. The Belgian experience

Interviews with Belgian representatives described that the road transport sector encompasses logistics, where the presence of women is significant. However, in roles such as tram, bus or truck drivers, the percentage of women is generally very low, reaching only 2 % in Belgium. In some regions of Belgium, there are no women in these roles. Conversely, in logistics roles, numerous auxiliary automations have been integrated, allowing women as well as individuals with smaller physical stature to be employed in this sector. However, in the road transport sector, particularly in track transportation, loading and unloading tasks remain physically demanding, and adequate machinery and automation have not yet been implemented to make them accessible to all.

In Belgium, there exists a national contract that ensures equal working conditions for both men and women. Consequently, efforts to address the gender pay gap, common in other countries, are no longer necessary in Belgium. However, the main challenge remains the participation of women in the transportation sector. Furthermore, working arrangements often lack compatibility with work–life balance, with work shifts reaching up to 60 hours per week, particularly concerning caregiving responsibilities, which are predominantly shouldered by women.

4.1 Part-time solutions for women in the aviation sector

In Belgium, women working in the aviation sector, especially in civil aviation, face challenges in balancing their professional and family lives, particularly when they need to travel frequently between various cities served by the airline. This difficulty is amplified when they have dependants, such as children or elderly family members.

To meet the needs of a work–life balance, in Belgium and at the flight operator, the TUI Group, various part-time work arrangements can be requested.[84] The Belgian welfare state provides an integration subsidy for those who request part-time work due to family care or study reasons. Available part-time employment options include weekend part-time work, allowing employees to work only on Saturdays and Sundays, thus enabling them to care for dependent family members during the week.

The weekend part-time mode is set at a working time ranging from 50 % to 60 % – all concentrated in the weekend – of a normal full-time working time. However, since there were far fewer people willing to work on weekends in the past, this allowed for collective bargaining that recognised a salary equal to 75 % to 90 % of the normal full-time rate.

The weekend part-time arrangement was set at a working time ranging from 50% to 60% - all concentrated in the weekend - of a normal full-time working time. However, since in the past, there were far fewer people

[84] The information for this best practice was provided during the interview with Jessica Milazzo. She has been working at TUI for 17 years and since 2020 is a Member of the Women's Steering Committee and the Executive Committee of the European Transport Workers' Federation (ETF).

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willing to work on weekends, this allowed for collective bargaining that recognised a salary equal to 90% of the normal full-time rate.

Recently, the upper management of TUI has had to address some internal discontent, as employees who were employed on a full-time basis began to protest that those who were on the weekend part-time schedule were receiving almost the same salary, yet had the additional organisational convenience of being able to predict their days off (as their contract stipulated working only on Saturdays and Sundays). These protests from full-time staff led the upper management to consider the possibility of eliminating the weekend part-time option.

Many mothers work using weekend part-time schedules to better balance their professional and family responsibilities. Therefore, unions intervened during the period immediately before the Covid-19 pandemic, to maintain this option, and after lengthy negotiations, they succeeded in retaining weekend part-time work but with a salary reduction to 75 % of the full-time salary.

4.2 Union negotiations to improve safety for Belgian flight staff

In Belgium, the TUI Group is a flight operator, which owns aircraft and employs its staff.[85] For staff shift management, Tui utilises a system where work shifts during the work week alternate with standby periods. Standby is not an actual work shift, but workers must ensure their availability in case of the need to replace one or more colleagues. This availability condition requires that the worker be capable of reaching the airport and commencing duty within 45 minutes upon being called.

This meant that workers would wait in their cars in parking areas near the airport or parked along the road near the airport, often in dimly lit and sparsely populated areas, which were unsafe, as is common around airports.

ACV Transcom (General Christian Trade Union) is the largest union in Belgium. They negotiated with the TUI Group, on behalf of their members, reaching an agreement that stipulates that workers have the right to wait in nearby hotel rooms when on standby. This agreement applies to all staff and is funded by the TUI Group. The majority of flight staff (except for pilots, who are mostly male) are women.

5. The German experience

The German transport sector is heavily dominated by male workers.[86] However, in recent years, there has been a slight shift, with a growing trend of more women workers, especially in leadership positions. Nevertheless, the percentage of women employed in the transportation sector remains relatively low, standing at around 30 %.

One of the main issues faced within the transportation sector is that of sexual harassment and gender-based violence. This is a concern that affects not only customers but also employees within the sector, especially women. This is not a new issue, but there is a lack of interventions from institutions, which should be expected to invest economic resources to address and reduce the problem of sexual harassment and gender-based violence. The working arrangements also pose a problem for balancing professional and personal life, and this issue particularly affects women who are primarily in charge of unpaid care work.

Some sectors of the transportation industry are heavily male-dominated and cater to male needs. As a result, young women who start working in these sectors often leave early because they do not find working conditions

[85] The information for this best practice was provided during the interview with Liesbet Verboven, ACV Transcom Regional Officer with responsibilities in Road Transport and the union's representative for the Road Transport sector in ETF and the ETF Women's Committee.
[86] The information for this best practice was provided during the interview with Marium Beckmann, responsible for Women, Family and Gender Equality at EVG, the biggest Railway and Transport Union in Germany.

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suitable for their needs. For instance, work–life balance is a challenge, as well as a lack of adequate restroom facilities for women.

5.1 Part-time solutions and work–life balance actions in the transport sector

Measures to support gender equality as well as employee wellbeing have been made available to workers, such as support for those experiencing burnout, who can also request part-time work, as can all workers who need to balance work–life responsibilities with caring for dependents.

With the aim of overcoming gender stereotypes and promoting gender equality, the Federal Women's Leadership – established in 2007 with the latest update in 2022 – has strongly supported the establishment of using inclusive language, which involves using feminine job titles that were previously only in the masculine form.

Recently, the 'part-time bridge' has also been introduced. It refers to a specific form of part-time work arrangement aimed at facilitating the transition from full-time work to retirement. It allows older workers to reduce their working hours gradually before retiring completely. Part-time bridge arrangements typically involve a reduction in working hours and corresponding adjustments in salary, while still allowing employees to remain in their positions and contribute to the workforce. An explanatory video has been produced for workers that compiles the options for accessing a part-time work regime in combination with private life responsibilities, including the part-time bridge.

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SECTION VI: Developing a future scenario: opportunities, roles, needs and skills for women in transport in the twin transition

The transport sector is undergoing significant transformations driven by climate change, digitalisation, and the green transition. These changes present both challenges and opportunities for transport workers, particularly women. To navigate these changes effectively, trade unions must engage in proactive negotiations with employers to ensure that women are adequately represented and supported in the workforce. Assuming a gender-specific perspective in negotiation will help improve the quality of the work environment, not only for women but for all workers. For example, the adoption of family-friendly support measures would support all carers, not just women carers.

The information in this section has been provided through qualitative interviews with selected stakeholders.

1 Opportunities

The digital and green transitions offer a plethora of opportunities for women in the transport sector. As automation and digitalisation reduce the physical demands of many jobs, more roles become accessible to a diverse workforce. Women can now take on positions that were previously dominated by men, such as operating advanced machinery, managing automated systems and performing high-tech tasks.

For example, in the maritime sector, automation has enabled women to work with cranes and transtainers, roles that were traditionally off limits due to their physical demands. Similarly, in the road transport sector, automated systems for opening and closing truck tarpaulins are making these jobs more accessible to women. In the railway sector, the introduction of Digital Automatic Coupling is expanding job opportunities by reducing the physical requirements of the work.

The rise in digital and remote occupations also presents new career paths for women. High-tech and digital skills are increasingly in demand, and roles in these areas can often be performed remotely, offering more opportunities for workers to balance work and private life.

2 Roles

With the evolving landscape of the transport sector, women can occupy a variety of roles that leverage new technologies. These include:

- **Automation Operators:** Managing and operating automated systems in ports, railways and road transport.
- **Digital Technicians:** Handling digital tools and systems that streamline operations in the maritime and fisheries sectors.
- **Sustainability Coordinators:** Overseeing green practices and ensuring compliance with environmental regulations.
- **Remote Operators:** Working in remote or digital control centres to manage logistics and transport operations.

3 Needs

To fully capitalise on these opportunities, it is essential to address the specific needs of women in the transport sector:

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- **Training and reskilling:** Continuous access to training programmes that focus on digital and high-tech skills. Women must be equipped with the knowledge to operate new technologies and handle automated systems.
- **Work–life balance arrangements:** Policies that support solutions to help women balance work and caregiving responsibilities, mostly in terms of the time spent at work or in the office, for example, hour banks, remote working and job sharing.
- **Maternity and caregiving support:** Adequate maternity leave, childcare support and family-friendly policies are crucial to retain women in the workforce.
- **Health and safety:** Enhanced safety protocols (including health, hygiene and anti-violence measures) to ensure that the work environment is safe for all employees, particularly when dealing with new technologies and automation.

4 Skills

The transition to a digital and green transport sector requires a new set of skills. Women in transport need to develop:

- **Technical proficiency:** Skills in operating and maintaining advanced machinery and automated systems.
- **Digital literacy:** Understanding digital tools, software and remote operation technologies.
- **Green competencies:** Knowledge of sustainable practices and environmental regulations relevant to the transport sector.
- **Leadership and management:** Skills to lead teams, manage projects and drive innovation in a technology-driven environment.

5 Tools

There are two tools available to unions that can support better integration of gender equality in the transport sector.

First, there should be an increase in women's participation and leadership within transport unions to ensure their active role in negotiations. A global minimum target of 30 % female representation in leadership positions and negotiation delegations within workers' organisations is considered by international organisations, experts and academics as a baseline to achieve gender-sensitive objectives throughout negotiations. Moreover, advancing to leadership roles within these organisations remains challenging for women. Training and mentoring activities are strongly recommended to support women's advancement in unions.

Second, the EU Directive on Corporate Sustainability Due Diligence requires companies to address negative effects on human and social rights as well as environmental conditions within their own operations and those of their partners. For this Directive to be effective, it must be implemented properly by Member States, and it has the potential to ensure fair practices within companies and their supply chains. In this framework, national trade unions can use strategic litigation to hold major companies accountable for failing to meet due diligence standards. By working with sector-specific NGOs, unions can strengthen the effectiveness of these legal actions. Strategic litigation has shown to be a potent enforcement tool.[87]

[87] See the project TeamHub implemented by FILT-CGIL in partnership with: Fondazione Giacomo Brodolini (FGB), Belgische Transportbond (BTB), Elliniko Idryma Evropaikis Kai Exoterikis Politikis (ELIAMEP), University of Jyvaskyla, University of Taru, NOTUS, Fundacja Instytut Spraw Publicznych, Institut de Recherche Economique et Sociale (IRES), Vereinte Dienstleistungs-gewerkschaft Ver.di, Federation Europeenne des Travaulleurs des Transports (ETF), Organizacja zakładowa, Federación de Servicios a la Ciudadanía de CCOO. For more info: https://team-hub-project.eu/.

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6 Conclusion

By addressing these opportunities, roles, needs and skills, and by using the suggested tools, the transport sector can create an inclusive environment where women thrive. Employers and trade unions must work together to implement policies that support women‘s participation and advancement in this rapidly evolving industry. The future scenario for women in transport can be promising, with the potential for significant contributions to innovation, sustainability and overall industry resilience. As women take on these new roles, they will help shape a more diverse, equitable and forward-looking transport sector.

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Annex A

Within Sector H TRANSPORTATION AND STORAGE, the following groups are considered:

- 49 Land transport and transport via pipelines
- 50 Water transport
- 51 Air transport
- 52 Warehousing and support activities for transportation
- 53 Postal and courier activities.

The five tables below include a detailed description of the subsector included in each group.

Table A1: NACE 49 Land transport and transport via pipeline

Code	Subsector
49.1	Passenger rail transport, interurban
49.10	Passenger rail transport, interurban
49.2	Freight rail transport
49.20	Freight rail transport
49.3	Other passenger land transport
49.31	Urban and suburban passenger land transport
49.32	Taxi operation
49.39	Other passenger land transport n.e.c.
49.4	Freight transport by road and removal services
49.41	Freight transport by road
49.42	Removal services
49.5	Transport via pipeline
49.50	Transport via pipeline

Table A2: NACE 50 Water transport

Code	Subsector
50.1	Sea and coastal passenger water transport
50.10	Sea and coastal passenger water transport
50.2	Sea and coastal freight water transport
50.20	Sea and coastal freight water transport
50.3	Inland passenger water transport
50.30	Inland passenger water transport
50.4	Inland freight water transport
50.40	Inland freight water transport

Code 50 excludes

- Warehousing, storage of goods, which are in 52.10 – Warehousing, storage
- Port operation and other ancillary activities such as docking, pilotage, lighthouse operation and ship rescue, which are in 52.22 – Service activities incidental to water transportation
- Handling of goods, see 52.24 – Cargo handling
- Rental of passenger and cargo ships without crew, see 77.34 – Rental of water transport equipment (Code 77 is for Administrative and support service activities.

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Table A3: NACE 51 Air transport

Code	Subsector
51.1	Passenger air transport
51.10	Passenger air transport
51.2	Freight air transport and space transport
51.21	Freight air transport
51.22	Space transport

Table A4: NACE 52 Warehousing and support activities for transportation

Code	Subsector
52.1	Warehousing and storage
52.10	Warehousing and storage
52.2	Support activities for transportation
52.21	Service activities incidental to land transportation
52.22	Service activities incidental to water transportation
52.23	Service activities incidental to air transportation
52.24	Cargo handling
52.29	Other transportation support activities

Table A5: NACE 53 Postal and courier activities

Code	Subsector
53	Postal and courier activities
53.1	Postal activities under universal service obligation
53.10	Postal activities under universal service obligation
53.2	Other postal and courier activities
53.20	Other postal and courier activities

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