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Women in European transport with a focus on Research and Innovation

An overview of women's issues in transport based on the Transport Research and Innovation Monitoring and Information System (TRIMIS)

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Contents

Abstract

Gender differences exist with regard to access to transport and mobility, transport safety, personal security, and participation in the transport sector. This report analyses gender differences in the transport sector across the European Union (EU). It identifies key issues based on a survey of relevant literature and summarises EU policy initiatives and regulations that address gender equality and transport. The study examines the status and evolution of European research in tackling women's issues in transport and analyses women's participation in transport research and innovation activities. It assesses the progress to date and identifies challenges and opportunities concerning women and mobility. It concludes by providing policy recommendations to overcome the main barriers to gender equality in transport.

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Executive summary

The Transport Research and Innovation Monitoring and Information System (TRIMIS) is the analytical support tool for the establishment and implementation of the Strategic Transport Research and Innovation Agenda (STRIA), and is the European Commission's (EC) instrument for mapping transport technology trends and research and innovation capacities.

A total of seven STRIA roadmaps have been developed covering various thematic areas, namely:

- Cooperative, connected and automated transport;
- Transport electrification;
- Vehicle design and manufacturing;
- Low-emission alternative energy for transport;
- Network and traffic management systems;
- Smart mobility and services; and
- Infrastructure.

Policy context

In May 2017, the EC adopted the STRIA as part of the '*Europe on the Move*' package, which highlights main transport research and innovation (R&I) areas and priorities for clean, connected and competitive mobility to complement the 2015 Strategic Energy Technology Plan.

In June 2015, the Commissioner for transport, Violeta Bulc, and the Commissioner for employment, Marianne Thyssen, organised a conference to discuss the most pressing social issues in transport. The conference was followed by two additional workshops that addressed ways to attract more women to the transport sector.

Using TRIMIS, the Joint Research Centre (JRC) has undertaken an overview of women's issues in European transport R&I as a contribution to the sixth International Conference on Women's Issues in Transportation (WIiT 2019) that will take place on 10-13 September 2019 in Irvine, California.

Key conclusions

The **main findings** are summarised in the following points:

- Women have specific travel characteristics about mode choice, time of travel, trip purpose, route, trip chain and travel distance. Transport safety and security are critical factors in women's mobility choices, and the introduction of new innovative technologies, and increased automation, are not necessarily gender neutral, with women less willing to use them.
- Although research on equality and women (e.g. in the UK and the US) has been undertaken since the early 1980s, women's issues in transport is a relatively new topic. European regulations considered women and transport issues at the beginning of this century, and relevant European research funded projects began less than 20 years ago.
- Few projects within the TRIMIS database analyse women's issues in transport (approximately 2% of the projects). In terms of the number of projects funded, no significant difference exists between Member States and the EU. However, there are more EU funded research projects loosely connected to the topic than strongly connected. Moreover, although some financial progress has been made (8.3% budget increase in strongly connected projects from FP7 to H2020) the gender dimension in R&I programmes is either not working or has not been fully considered. Therefore, further progress in addressing women issues in transport research is needed.
- Most of the strongly linked projects have the category of multimodal (40%) and road transport (41%), and for 83% of the projects, their geospatial scope is "*Other*" instead of "*Urban*" or "*Infrastructure nod*'. Moreover, 55% of the projects do not apply in particular to any one of the seven STRIA roadmaps. Travel behaviour/travel patterns dominate with 41% of the strongly connected projects followed by socio-economic issues and safety and security, which have 16 projects (30%) in each category.
- In the European transport sector, women are underrepresented compared to their male counterparts (22% of workers are female). An analysis of the 769 transport researchers working in 21 European projects

(selected from the TRIMIS database) and 223 organisations, found that approximately 22% of the researchers are females. Only seven projects specifically addressed the problem of lack of qualified personnel and women, and all of these projects had been completed some time ago (six belong to the FP7 programme and one to H2020). Member States funding do not seem to address these types of projects. Women are also underrepresented in jobs linked to transport science and engineering and it can therefore be assumed that this is the case regarding transport research.

Policy recommendations

From the scientific findings described above, the report provides the following **policy recommendations**:

- More data about women-specific travel characteristics and lack of interest in the transport sector is needed. Targeted R&I research should collect data in a comparable manner across the EU and internationally.
- *Policies that enhance welfare should also promote equality in society.* The wealthier the country the more aware of social issues. Countries with prosperous economies are more aware of women's issues in transport, have higher levels of national investment, and seem better prepared for European research programme calls.
- *Transport policies should support greener mobility if they are to be beneficial to women.* Future low carbon mobility options should recognise women's transport needs to avoid further gender gaps. Women are more willing to use environmentally friendly transport modes. Therefore, policies that enable greener travel will also benefit women.
- *Policies should increase the awareness of equality and respect among men and women as in doing so they address gender equality.* Several reasons explain the underrepresentation of women (e.g. difficulty to find a work-life balance in shift work, lack of appropriate working environment and equipment, etc.) and this requires a diverse policy response.
- Greater understanding of the reasons behind the lack of female transport researchers is needed to increase the share of women in transport. The share of women has not increased, even after the finalisation of projects addressing the lack of qualified personnel and women. The transport sector continues to be unappealing for women to develop their research careers. Additional data on seniority of women in research teams (i.e. number of women as principal investigators) could provide a better understanding of whether household dynamics (e.g. childcare responsibilities) acts as a barrier to career progression.
- *Gender-equitable research consortia should be actively incentivised in European transport research.* In addition to increasing women in the research workforce, research consortia for the next European funding programme (*Horizon Europe* 2021-2027) should have a greater gender balance. In this way, R&I programmes will actively consider gender dimensions while supporting the research careers of women.

Related and future JRC work

The JRC has launched TRIMIS in 2017 on behalf of DG MOVE and RTD and has published a number of Science for Policy and Technical reports[1] that directly support the STRIA process and the related roadmaps. This report is the first TRIMIS study that analyses mobility issues of vulnerable and special user groups of transport. It assesses the actions undertaken in Europe to tackle key barriers, including R&I actions based on the TRIMIS database.

Quick guide

The report is structured as follows: Chapter 1 provides a brief introduction to women and transport issues based on a literature review. Chapter 2 describes the main EU policy initiatives and regulations regarding gender equality and transport. Chapter 3 presents the results on R&I dimensions such as EU research framework programmes, national funding, geographical and organisational distribution of funds, projects per Member State and mode of transport. Chapter 4, analyses women's participation in transport R&I activities, including descriptive statistics, key features, and outlines relevant capacities. Finally, Chapter 5 concludes with policy recommendations to overcome barriers to gender equality in European transport.

(1) https://trimis.ec.europa.eu/archive/trimis/documents

1 Introduction

Gender equality in transport aims to reduce mobility inequalities between men and women. While gender issues have been considered in a number of policy areas, little progress has been made in the transport sector.

There is increasing evidence to suggest that transport is not gender neutral (Meyer, 2006). For example, women are currently underrepresented in the European transport sector ([2]) accounting for only 22% of transport workers (Giannelos et al., 2018). The underrepresentation of women in the transport sector can be explained by several reasons: difficulty to find a work-life balance in shift work, lack of appropriate working environment and equipment, lack of training and life-long learning opportunities or inadequate targeted recruitment (European Commission, 2019) persistence of stereotypes, harassment, and bullying (Pillinger, 2017).

Women also have specific travel characteristics with regard to mode choice, time of travel, trip purpose, route and travel distance. This is because the activities women undertake tend to be more complex than those of men due to women often being more responsible for domestic chores, children, elderly relatives and the sick (Duchene, 2011). Gender differences in travel patterns reflect the division of roles in the family and affect women's employment conditions, income levels and mobility needs (Civitas, n.d., Sola, 2016). Gender is therefore a key factor in mobility and travel behaviour differences and as a consequence, time lost in travelling has a more penalising effect on women than men (EIGE, 2016).

Understanding the factors that influence women's travel behaviour such as personal security and safety issues on public transport and attitudes to innovative transport technologies, can contribute to the design and implementation of sustainable transport policies that can reduce polluting air emissions and improve gender equity (Ng and Acker, 2018).

The aim of this report is to provide an overview of women's issues in the European transport sector. It outlines key factors that affect women, transport and mobility. This is followed by a summary of relevant EU policy initiatives and regulations regarding gender equality and transport. An analysis of the evolution of European research in tackling women issues in transport is undertaken based on the research and innovation (R&I) projects listed in the European Commission's (EC) Transport Research and Innovation Monitoring and Information System (TRIMIS)([3]). Women's participation in transport R&I activities is also analysed. The report concludes by identifying the main barriers for women's equality in transport and key recommendations to overcome these are outlined.

1.1 Women's mobility and travel behaviour

A survey of literature on women and transport issues suggests gender mobility patterns in Europe have been changing as gender differences in socio-economic and demographic conditions have evolved.

An overview of gender differences in mobility and travel behaviour can be gained from *ad hoc* research. In addition, European national mobility surveys provide gender disaggregated data that are useful for Member State gender and transport research. However, these data are not always comparable or standardised. Comparable data are available from the European Union (EU) harmonised time use surveys but these provide only travel time and mode by gender and lack spatial information, the availability of national gender-disaggregated mobility data needs to be addressed to gain a greater understanding of gender and transport issues across the EU.

Although women's participation in the EU labour market has been increasing, there is still fewer women employed than men (66.4% in 2017 compared to 77.9% for men). The average pay of women is approximately 16% lower than that of men. In addition, women in all EU Member States undertake unpaid care responsibilities each week. This varies between 6 to 8 hours in Nordic countries and can be over 15 hours in countries such as Italy, Croatia, Slovenia, Austria, Malta, Greece and Cyprus. Part-time work remains the predominant way women can engage in the labour market (European Commission, 2019a).

While there has been a change in the traditional gender roles and household responsibilities, women still retain more responsibility than men. There is still a transport disadvantage for women that is linked to their participation in the labour market and the division of household tasks. The unequal division of domestic tasks is a burden on women's time budget and can lead to an increased car use, shorter journeys, and more part-time working which limit employment opportunities (Best and Lanzendorf, 2005).

Access to private transport is therefore a key factor in determining women's mobility and economic inclusion. Limited access to private transport has the potential to lock women into a low wage, low skilled economy. The

(2) Transport sector: Transportation and storage sector (H) in NACE Rev. 2, considering age class 15-64
(3) https://trimis.ec.europa.eu/

extent to which these processes impact on women depends on geographic location, age, class, economic position, ethnic origin, physical and intellectual abilities (Dobbs, 2005).

In general, women undertake a high number of trips per day, travel shorter distances than men and spend less time per day on travel (Pasaoglu et al., 2012). Women also tend to have more non-work related trips, travel off-peak hours and use more flexible transport modes (Gossen and Purvis, 2004; Ng and Acker, 2018). As a consequence, shared mobility or mobility as a service could attract more female than male users when given better alternatives to private transport (Ng and Acker, 2018). Women's lower rate of motorisation forces them to use public transport, walk and cycle (Civitas, n.d.). Women have a higher prevalence than men of walking for leisure, for exercise, and for fun when all ages are considered together (Pollard and Wagnild, 2017). Women therefore tend to be greener not only because they have limited access to cars, but they have different attitudes to mobility (e.g. being more concerned about risk than men) (Civitas, n.d.).

Women are also more willing to limit their car use than men and show more support for environmental issues and are more positive towards car use reduction measures, such as improving and expanding public transport (Denton, 2002; Polk 2003; Kellstedt, 2008; Sovacool et al., 2018). However, women have been found to be unrepresentative in commuter cycling, consequently they miss out on the health benefits of active commuting over distances where walking is less practical. The gender gap in cycling is explained by a differentiated response to the attractiveness of cycling as in general women require a more conducive environment. This suggests improvements in the cycling environment may be needed to improve the attractiveness of cycling (Grudgings et al. 2018). The future development of low carbon mobility will need to recognise the complexity of women's transport needs as they could have serious gender implications (Dobbs, 2005).

Younger women (aged under 30) are travelling further compared to younger men. Young men are becoming less mobile as they approach early midlife, traditionally a life course peak in travel mobility. Possible reasons for the greater mobility of young women than young men include lifestyle shifts and social changes. For example, young women are increasingly socially and economically independent, have accessed education and professional employment and are therefore more equal to men (Tilley and Houston, 2016).

Given the gender differences in travel and transport, there is a strong justification to focus on women's transport issues and the need for continued research on the nature of travel differences between women and men to provide the evidence base for effective transport policies (Rosenbloom, 2004).

1.2 Women's personal security and transport

Transport safety and security are key factors in women's mobility choices, especially with regard to public transport use. Women tend to use public transport more than men and may feel exposed to physical aggression, sexual harassment or other unwelcomed behaviour (Bakran, 2018).

An international review revealed that emerging economies, where public space is regarded as a male domain, have higher rates of harassment and assault on public transport (Gekoski et al., 2017). In France, the National Observatory of Crime and Criminal Justice (ONDRP) survey of sexual harassment on public transport found that 267,000 people – 85 % of whom were women – were sexually harassed on public transport between 2014 and 2015, including kissing, groping, flashing and rape (Tabary, 2017).

Although sexual harassment on public transport appears to be a growing issue, there is a high level of under-reporting. Concern about personal security has implications for a number of issues including the design of transport interchanges, waiting areas and for staffing. For example, increased automation in public spaces such as train stations require less physical presence of service staff. As a consequence, passengers may feel less secure as there is no one there to assist, whatever the gender. Despite interventions such as lighting and security cameras these have limited impact on reducing women's fear, compared to formal surveillances by police or transport employees (Gardner et al., 2017).

The interaction between women's personal security and use of new mobility services (e.g. Uber and MaaS) and whether these are safe for women is still unclear. An analysis of women's motivations for using a car sharing service (e.g. car club, peer-to-peer car sharing) found trust, utility and safety as important issues for women in this new form of mobility (Alonso-Almeida, 2019).

1.3 Women and new transport technologies

The EC aims to ensure a smooth transition towards a mobility system which is safe, clean, connected and automated. This requires reducing transport emissions by low-emission mobility by 60% by 2050 (European Commission, 2011). However, the decarbonisation of the transport sector and the introduction of new innovative technologies are not necessarily gender neutral.

A number of changes are taking place in the transport sector such as innovative digital solutions, new business models (e.g. car sharing, collaborative models), new services and new jobs (e.g. remote operators of vehicles). These also bring new challenges such as cybersecurity, supervision of unregulated service providers and potential threats of shared vehicle users. It is therefore important that the specific needs of women are taken into account when developing new transport technologies and services (Bakran, 2018).

Men are early adopters of new vehicle technologies who, for example, are more likely to be interested in purchasing fully automated vehicles (AVs) than women (Berliner et al., 2019). Women tend to have a lower willingness to use AVs than men because they anticipate higher anxiety from riding in an AV (Hohenberger et al., 2016). Women are inclined to be more hostile to AV technology such as driverless cars and trucks (Hudson et al., 2019). They are also less willing to pay for adding partial and full automation to their next vehicle (Bansal et al., 2016). This lack of willingness for AV is not necessarily detrimental since it could mean that women are more risk-averse and tend to use new technologies once these are operational and consolidated.

Sovacool et al. (2018) found that women have less driving experience of electric vehicles (EV) and interest in owning an EV compared to men. Women attached more importance to ease of use, safety, cost and environmental impact and charging option than the range an EV can drive, which was important to men. In contrast, Berkeley et al. (2018) suggest that women are more sceptical about the readiness and reliability of EV technology and infrastructure than men. This may be linked to levels of interest in technology generally, and vehicle technology in particular, but could also reflect personal safety concerns linked to the perceived potential to be left 'stranded' by the lack of reliability or range of an EV.

Gender influences attitudes to new vehicle technologies and preferences with regard to their adoption. In general, women hold less positive attitudes toward emerging technologies and perceive higher risks from these technologies than men. This may be linked specifically to the characteristics of new technologies and how they impact different individuals, but also to a more general concern about robots, which impact attitudes to new vehicle technologies.

A gender gap continues to exist in European transport and mobility. Further mainstreaming of gender into policy is therefore needed to close this gap. This requires developing a robust evidence base on which to formulate policies that meet the travel and mobility needs of women.

2 Overview of European initiatives and regulations

2.1 Gender equality in the EU

During earlier years of the European Community, the concept of equal opportunities for men and women was limited to the principle of equal pay. However, the issue of equality of opportunity between men and women was later enshrined in the objectives of the Treaty of Amsterdam (1999) (European Commission, 1999).

In 1996, the EC set out its strategic approach to mainstreaming equal opportunities between men and women. It aimed to incorporate equal opportunities into all European policies and activities (European Commission, 1996) such as the 1998 new employment strategy (European Commission, 1997). This was followed by a number of policy initiatives related to gender equality. The following sections highlight those initiatives that are relevant for transport research and innovation.

2.2 Promoting gender equality within the European science and research

The EC included the concept of equal opportunities in its Fifth Framework Programme (FP5) for research and technological development (1998-2002), where it emphasised the participation of women in European research (European Commission, 1998). In a 1999 Communication (COM(1999)76) on women and science, the EC aimed to increase female participation in Community programmes and set up a women and science working group.

Within the FP5 key action on sustainable mobility and Intermodality, researchers were encouraged to:

"… take into account the needs of women, where they are specific, when carrying out research on the impact of transport policies and projects. In research relating to accessibility, fares policy and urban public transport, assessment will include the question of whether different social groups, including gender, are fairly treated and have fair access to these systems" (European Commission, 1999).

On 20 May 1999, a Council Resolution on women and science recognised the need for equal opportunities and increased female participation in research (Council of the European Union, 1999). In the same year, the Commission established the Helsinki Group on Gender in Research and Innovation as an advisory group to assist in tackling disadvantages women faced in the fields of research and science (ERA, 2019).

Gender equality was included as one of the strategy points of the Science and Society Action Plan presented in Communication COM(2001)714 final. Specific actions were proposed to: establish a European platform of women scientists; monitor progress towards gender equality in science; mobilise women scientists in the private sector; and promote gender equality in European science (European Commission, 2001). The same principles were also included in the 2002 EC Society Action Plan (European Commission, 2002).

The 2005 Commission staff working document "*Women and Science: Excellence and Innovation - Gender Equality in Science*" provides an overview of women and science actions implemented at the European level. It focuses on EC activities to promote gender equality through the research framework programmes and the progress made in increasing the participation of women in science (European Commission, 2005).

The EC Green Paper entitled "*The European Research Area: New Perspectives*" (COM(2007)0161) and the accompanying staff working document (SEC(2007)0412) sets as one of the European Research Area's (ERA) targets the creation of equal opportunities and attractive working conditions for both men and women in research careers (European Commission, 2007).

The EC report "*The Gender Challenge in Research Funding – Assessing the European National Scenes*" focuses on research funding across Europe, mainly from a gender perspective, and analyses the gender dynamics within the funding processes and the role of key funding organisations in promoting gender equality in research (European Commission, 2009a).

In 2009, the EC published a report on gender equality and education, entitled "*Gender, Education, and Employment – lessons from research for policy makers*" (European Commission, 2009b). A year later in May 2010, the Council of the European Union in its conclusions concerning various issues related to the development of the ERA recognised the negative effects of gender stereotyping in the work environment and acknowledged the work of the Helsinki Group (Council of the European Union, 2010).

In the EC report entitled "Realising the New Renaissance – Policy proposals for developing a world-class research and innovation in Europe 2030 – Second report of the European Research Area Board – 2010", the ERA Board recommends that half of all scientists and research policymakers, across all disciplines and at all levels of the science system to be women by 2030 (European Commission, 2010a).

In September 2010, the EC the adopted priorities set out in its strategy for equality between women and men (2010-2015) including equal economic independence, pay, labour market opportunities and access to decision-making positions. It also highlighted the gender imbalance in science and research as a major obstacle to the European objective of increasing competitiveness and maximising innovation potential (European Commission, 2010b).

The EC 2011 Green Paper "*From Challenges to Opportunities: Towards a Common Strategic Framework for EU Research and Innovation funding*" (COM(2011)48) intended to launch a public debate on key issues to be taken into account for future EU R&I funding programmes. It identified key questions on how to achieve its objectives, including the actions that should be taken at the EU level to further strengthen the role of women in science and innovation (European Commission, 2011b).

The 8 March 2011 European Parliament resolution on equality between men and women in the EU highlights sectoral segregation with reference to science, the remaining gap between genders and the need for action, including measures to inform and motivate employers to recruit and promote women (European Parliament, 2011).

The EC's "Proposal for a Regulation of the European Parliament and of the Council establishing Horizon 2020 – The Framework Programme for Research and Innovation (2014-2020)" COM(2011)809 includes an article on gender equality to ensure the effective promotion of gender in R&I content in Horizon 2020 (European Commission, 2011d).

The EC Communication "*A Reinforced European Research Area Partnership for Excellence and Growth*" COM(2012)392 highlights gender equality and gender mainstreaming in research as one of the main ERA's priorities and invites Member States and stakeholder organisations to take action (European Commission, 2012). The Council Conclusions on a reinforced ERA partnership for excellence and growth adopted on 11 December 2012, underline that both EU and Member State strategies should be strengthened towards the direction of gender equality and noted the EC's intentions to recommend common guidelines on relevant institutional changes for universities and research institutions (Council of the European Union, 2012).

In the Regulation (EU) no 1291/2013 of the European Parliament and of the Council of 11 December 2013 establishing Horizon 2020 – the Framework Programme for Research and Innovation (2014-2020) and repealing Decision No 1982/2006/EC (Text with EEA relevance) 20/12/2013, it is noted that within the H2020 context, gender would be addressed as a cross-cutting issue to rectify imbalances and to integrate a gender dimension in R&I programming and content (European Union, 2013).

European Parliament Resolution of 9 September 2015 on women's careers in science and universities, and glass ceilings encountered (2014/2251(INI)) examined various aspects of the current status of gender equality in the professional, academic and science environment. The Resolution calls for positive and corrective measures towards equal opportunities, balance and higher women involvement at various levels. It highlights the need for a balanced professional and personal life, institutional changes and projects and calls for action at European and Member State level (European Parliament, 2015).

The Council in its conclusions on advancing gender equality in the ERA, adopted on 1 December 2015, highlights the role of equality in science. The Council reaffirmed its commitment to enhance equality in the ERA, to change the gender equality status through the ERA roadmap implementation. It focuses on sustainable cultural and institutional changes, gender balance in decision making positions, and gender knowledge and monitoring (Council of the European Union, 2015).

In 2017, the Helsinki Group was transformed into the Standing Working Group on Gender in Research and Innovation of the ERA and Innovation Committee (ERAC) (ERA, 2019).

2.3 Promoting gender equality within the transport sector

In 2006, Regulation (EC) No 1922/2006 established the European Institute for Gender Equality (EIGE) to contribute and support the promotion of gender equality, including gender mainstreaming in all EU policies and the resulting national policies. The EIGE online platform provides access to the Gender Equality Index and the Gender Statistics Database with the latter also providing KPIs and insights on transport (European Union, 2006).

In the Communication COM(2009) 279 "*A sustainable future for transport: Towards an integrated, technology-led and user friendly system*" it is noted that gender considerations should also be taken into account, to facilitate women's access to transport jobs in order to support the protection and development of the human capital in relation to transport (European Commission, 2009c)

The 2011 Commission staff working document SEC(2011)391 "Accompanying the white paper Roadmap to a Single European Transport Area: Towards a competitive and resource-efficient transport system" refers to the promotion of gender equality through policies for transport workers (European Commission, 2011c).

The September 2012 European Parliament's Resolution on the role of women in the green economy (2012/2035(INI)) calls on the Commission and Member States to create sustainable transport systems which take equal account of women's and men's transport needs. Moreover, it calls on Member States to ensure that women are equally represented in political decision-making and government-appointed bodies and institutions dealing with defining, planning and implementing environmental, energy and green jobs policies (European Parliament, 2012). In its Resolution of 9 September 2015 on the implementation of the 2011 White Paper on "*Transport: taking stock and the way forward towards sustainable mobility"* (2015/2005(INI)), the European Parliament stresses measures to boost women's participation in the transport labour market, remove possible existing barriers and ensure equal treatment by addressing existing remuneration and advancement gaps (European Economic and Social Committee, 2015)

At its meeting on 1 July 2015, the European Economic and Social Committee adopted the opinion: "Women and Transport" acknowledging that the transport sector and transport policy is male oriented with gender considerations being absent from EU transport policy. It provides recommendations for the sector to be more inclusive and calls for gender-neutral policies to support competitiveness, innovation, growth and jobs (European Economic and Social Committee, 2015).

The Commission's "*Strategic Engagement for Gender Equality 2016-2019*" identifies key actions to be implemented in five priority areas towards gender equality, with timelines and indicators for monitoring, emphasising the need to integrate a gender equality perspective into all EU policies and funding programmes (European Commission, 2016)

In 2016, three public consultations regarding women in transport took place. These were addressed to EU Member States, key EU Transport Trade Unions and EU associations of transport operators and were focused on improving working conditions and changing culture using a variety of tools (e.g. legislation, disaggregated data, studies) at various levels (i.e. ranging from EU to family) (European Commission, 2019b).

EIGE published a dedicated report on gender in transport under the gender mainstreaming programme of the European Institute for Gender Equality. It aims to improve individual and institutional competences to include gender into the different sectorial areas and throughout the different stages of policy, programme and project development (European Institute for Gender Equality, 2016).

On 21 April 2016, EU Commissioners for Transport, Violeta Bulc, and Justice, Consumers and Gender Equality, Věra Jourová, organised a participatory event to reflect on how to attract more women to the transport sector (European Commission, 2019c).

The Women in Transport - EU Platform for change, was launched on 27 November 2017 aiming at strengthening women's employment and equal opportunities in the transport sector, while also serving as a forum for discussion and exchange of good practices (European Commission, 2017). Another conference entitled "*How to attract women to the transport sector?*" was organised on 27 November 2018 focusing on work-life balance and possible economically viable solutions to improve transport workers' choice of shifts and on gathering positive insights on what are the attractors of the transport sector for women, to be used against negative stereotypes (European Commission, 2018a). Another event planned for 26 September 2019 is the High-Level Conference "*Towards a more inclusive and diverse transport sector.*" This will be held in Brussels (Belgium) and aims to raise awareness and promote diversity in transport (European Commission, 2019e).

In summary, the European Commission has taken progressive action to mainstream gender issues into policy as part of its strategy to achieve greater gender equality. Mainstreaming has involved the integration of a gender perspective into the preparation, design, implementation, monitoring and evaluation of policies, regulatory measures and spending programmes. This approach has assisted in promoting greater equality between women and men (European Institute for Gender Equality, 2019).

3 Evolution of research projects regarding women's challenges in transport

This section presents an overview of the research projects related to women's issues in transport. It covers projects available in TRIMIS, which maps and analyses technology trends and R&I capacities in the European transport sector. TRIMIS supports the implementation and monitoring of STRIA that outlines future transport R&I 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).

TRIMIS contains an open-access, searchable database of projects and programmes that to date contains approximately 7,000 projects grouped according to the seven roadmaps that have been financed by EU research Framework Programmes, EU Member States and other countries. To select the projects applicable to this study, a search was undertaken using five keywords (*Women*, *Gender*, *Equality*, *Inequality* and *Equity*), which appeared in the majority of the papers examined in the literature review.

Each individual keyword was used to search the TRIMIS database. If a project contained the keyword in its description, it would appear in the search (i.e. a single keyword search). After carefully reading the background of the projects, the project would then be included in the research or classified as non-applicable and discarded. Some projects contained two or more keywords in their description. If this was the case, the keywords appeared twice, once per keyword.

All projects in the TRIMIS database have the following features and attributes:

- Title.
- Acronym.
- Start date and end date.
- Funding origin (e.g. European, EU Member States, international).
- Programmes linked to the project.
- Cost and EU contribution (feature only available for European funded projects)
- A description of the project which includes background and policy context, strategic objectives, methodology and critical results.
- Organisations and partner Organisations (feature only available for European funded projects).
- Technologies.
- Geospatial type (i.e. urban, infrastructure node or other location).
- Transport modes (i.e. road transport, rail transport, waterborne transport, aviation, multimodal).
- Transport policies (i.e. societal/economic issues, environmental/emission aspects, safety and security, digitalisation, deployment/planning/financing/market roll-out, other specified).
- Transport sectors (i.e. passenger, freight, both).
- STRIA Roadmaps (i.e. Cooperative, connected and automated transport – CAT –, transport electrification, vehicle design and manufacturing – VdM –, Low-emission alternative energy for transport – AFs –, Network and traffic management systems – NTM –, Smart mobility and services – SMO –, Infrastructure, and Other).
- Project status (i.e. completed or ongoing).

To classify the projects, the description, methodology and results of each project was reviewed. In addition, two new features were added to the characteristics of each project. The first of these features identifies whether the project is strongly connected or weakly connected to the topic of women and transport. For example, a project, which studies travel behaviour of women, is strongly linked whereas one addressing sustainable mobility as a whole will be weakly connected since gender issues will not be at the core of the research. For

instance, the projects TINNGO ([4]) ("*Transport Innovation Gender Observatory*") and DIAMOND ([5]) ("*Revealing fair and actionable knowledge from data to support women's inclusion in transport systems*") are strongly linked while the projects FLOW ([6]) ("*Furthering Less Congestion by creating Opportunities for more Walking and cycling*") and SUNRISE ([7]) ("*Sustainable Urban Neighbourhoods - Research and Implementation Support in Europe*") are weakly linked to this category.

The second new feature identifies whether the project addresses the following key topics: safety and security, travel behaviour and travel patterns, socio-economic issues including job generation and job equality, and finally, other, which encompasses additional aspects (e.g. ergonomics). This new reclassification was created for the purpose of this study and does not cover the research project as a whole. A project can address more than one STRIA roadmap, transport policy or transport topic. Therefore, in the subsequent analyses there will be more tags than projects. In other words, since some projects have more than once tick in the categories, the total number of ticks or tags will be greater than the number of projects studied.

Using this approach, 142 projects were analysed. Approximately 63% of the projects (89 projects) have a weak connection to women's issues in transport, and the remaining 37% of the projects (53) have a strong connection. Regarding the type of funding, 52% of them are funded by EU Member States, whereas the remaining 48% received European funding. As a consequence, there are more projects loosely connected to the topic. In total, a small number of projects within TRIMIS address women's issues in transport (approximately 2% of the projects), and there is no significant difference between Member States and the EU.

The majority of the research focuses on multimodal transport (57%) followed by road transport (32% of the research projects). Air transport (6%), rail (4%) and waterborne transport (1%) collectively represent 11% of the projects. The geospatial type of research can explain these figures since 30% of the projects address the urban environment and 68% of the projects belong to the category "other location". Just 2% of the research consider infrastructure node. Finally, 63% of the research projects focus on passenger transport, 2% on freight transport and the remaining 35% on both. A large proportion of the research projects investigate the problem at the city level for passenger transport where road and multimodal transport dominates, but in many cases, the solution or technology can also be useful for other levels and sectors.

With regard to the STRIA roadmaps, 142 projects have 182 ticks or tags. Of the total, 40% (57 projects) belong to the category "Other". The NTM and SMO roadmaps each have 36 projects (25% of the total). The remaining roadmaps have fewer projects. Figure 1 shows the share of these 182 selections or ticks among different roadmaps.

A total of 110 projects (77% of the total) are related to societal/economic policy issues, 52 projects analyse transport decarbonisation, and 45 projects examine environmental/emissions issues. Figures 1 and 2 show the proportion of each policy within the 277 policy selections/tags. It can be seen that only a small share of the projects are directly link to a specific technology. CAT, ALT, EV and VDM roadmaps can usually be allocated to specific technologies and they only have 20% of the selections altogether. Concerning the STRIA policies, safety and security and digitalisation can also be linked to certain technologies and they represent 15% and 2% respectively.

(4) https://trimis.ec.europa.eu/project/transport-innovation-gender-observatory
(5) https://trimis.ec.europa.eu/project/revealing-fair-and-actionable-knowledge-data-support-women%E2%80%99s-inclusion-transport-systems
(6) https://trimis.ec.europa.eu/project/furthering-less-congestion-creating-opportunities-more-walking-and-cycling
(7) https://trimis.ec.europa.eu/project/sustainable-urban-neighbourhoods-research-and-implementation-support-europe

Figure 1. Total projects divided by STRIA roadmaps

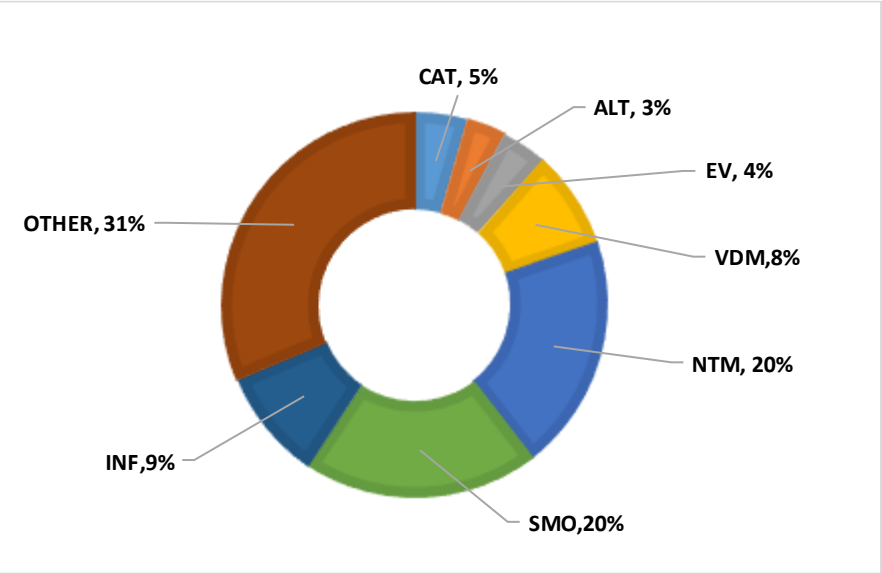
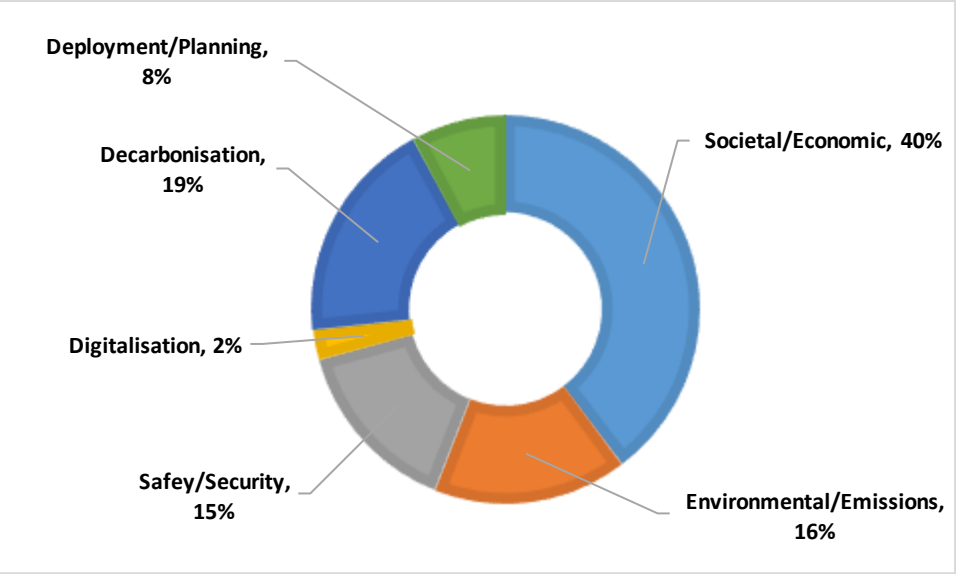
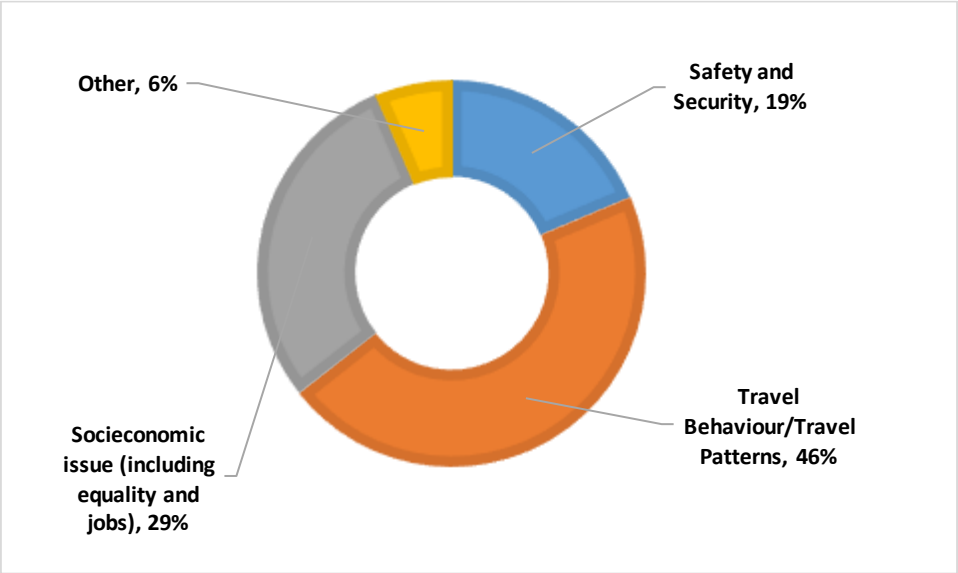


Figure 2. Total projects divided by STRIA policy



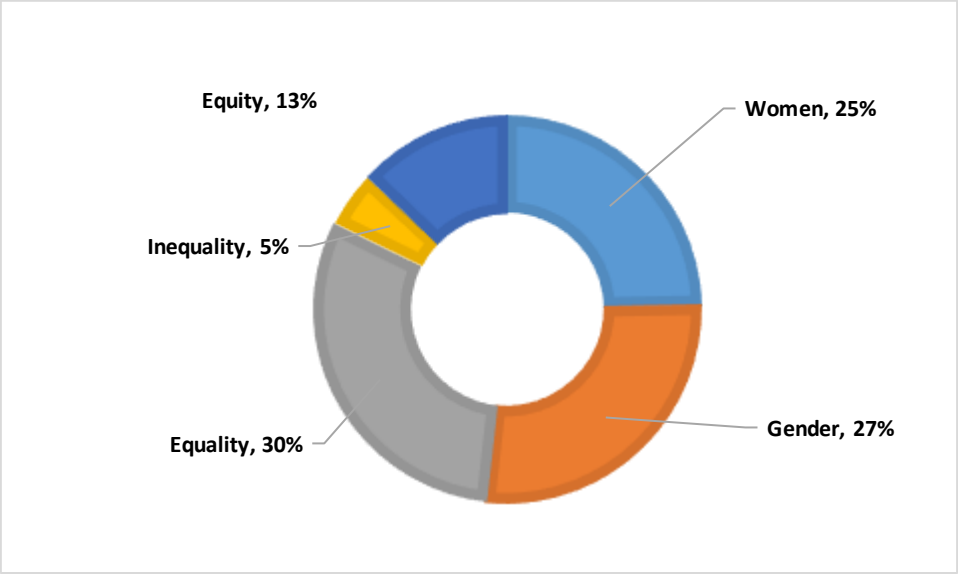
A more in-depth analysis shows that 86 projects (60% of the total) examine travel behaviour/travel patterns while 55 projects study socio-economic issues, 35 projects safety and security issues and only 12 projects belong to the category "Other". Figure 3 depicts how the 188 tags are shared across the four selected categories.

Figure 3. Total projects divided by transport topic



Taking into consideration the 142 projects selected, 170 single keywords appearances were found. As with other features, sometimes a project can have more than one keyword in its description. The most common keyword is *Equality* which is present in 52 projects followed by *Gender* with 46 appearances, and *Women* with 42 appearances (see Figure 4).

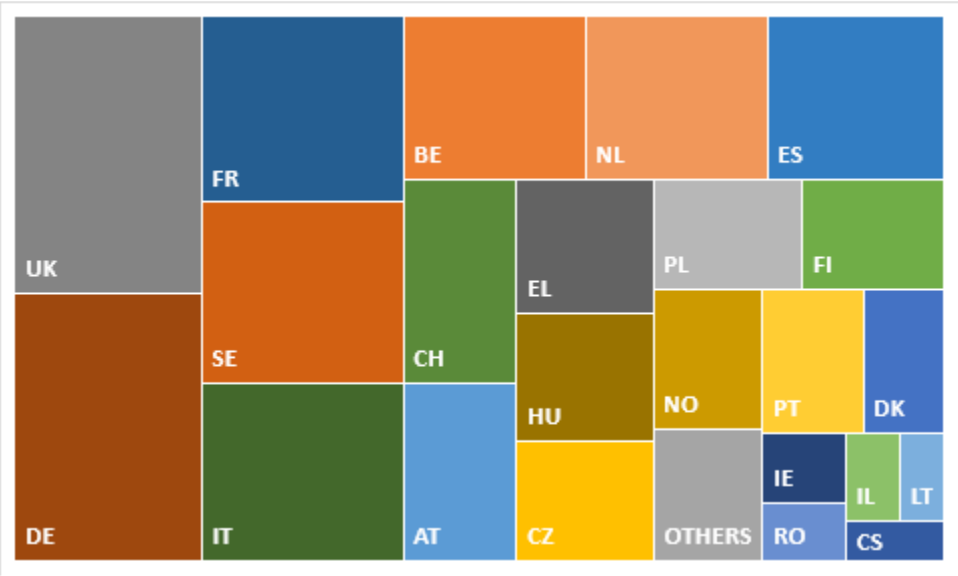
Figure 4. Total projects divided by keyword



The Figure 5 shows shows the participation of EU Member States, other European countries as well as third countries in the 142 research projects analysed. Larger countries with more significant economies have more projects than smaller countries. The United Kingdom and Germany have the highest number of research projects with 54 and 52 respectively. It appears that there is a link between the size of the country and its economy with the number of projects. However, other factors such as culture and sensitivity of the country to women's issues also appear to have an important influence on the research undertaken. Sweden (38 projects), Switzerland (24 projects) and Finland (16 projects) are the best examples since the size of their economy does not necessarily justify their position. These countries have similar characteristics: low unemployment, steady economic growth and a high proportion of national funded projects. It could be therefore concluded that countries with healthy economies might be more aware of women's issues in transport, tend to invest more at the national level due to socio-cultural factors, and are better prepared for European research programme calls. This higher awareness and socio-cultural factors are well reflected in the Scandinavian countries since, for

instance, they offer both partners the choice of equal parental leave and the position of women in the workforce is historically better than in other Member States.

Figure 5. Total projects divided by country participation

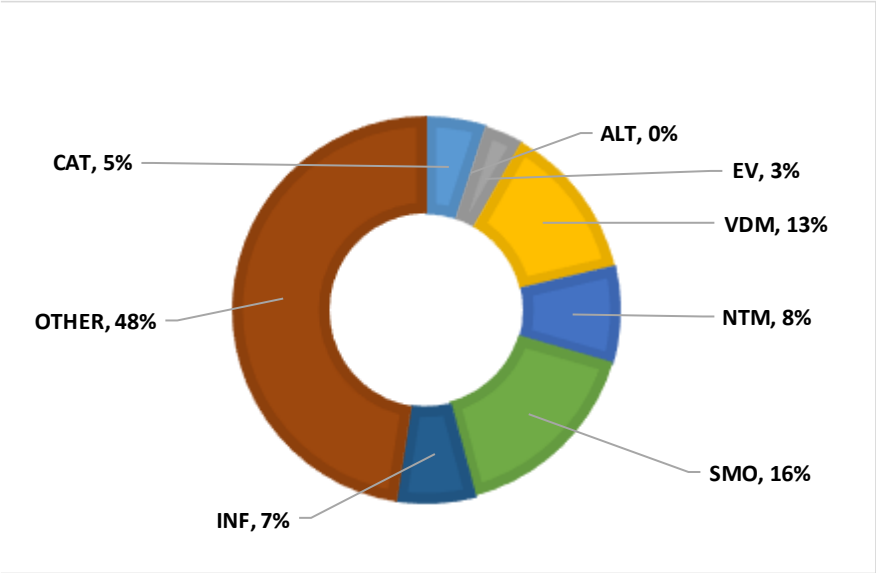


3.1 Strongly connected projects

If we focus the analysis on strongly connected projects, the results change. In this case, waterborne, rail and air transport addressed in 19% of the research projects, almost double the previous percentage when analysing all projects. Road and multimodal transport cover 41% and 40% respectively. Although these transport modes still dominate the figures, their share is less prominent than before. There are also significant changes in the geospatial scope of the projects; only 15% of the strongly connected projects target urban environment, whereas this percentage was 30% for all the projects. The majority of research projects (83%) have the category "*Other*" as a location. The projects with a strong connection do not have a specific target in geospatial scope, and the domain of road transport is not so large. The lessons and results obtained from the projects can therefore be applicable to several fields. Regarding the funding origin, the distribution is even, with 27 projects funded by EU Member States and 26 projects supported by European programmes such as H2020 or FP7.

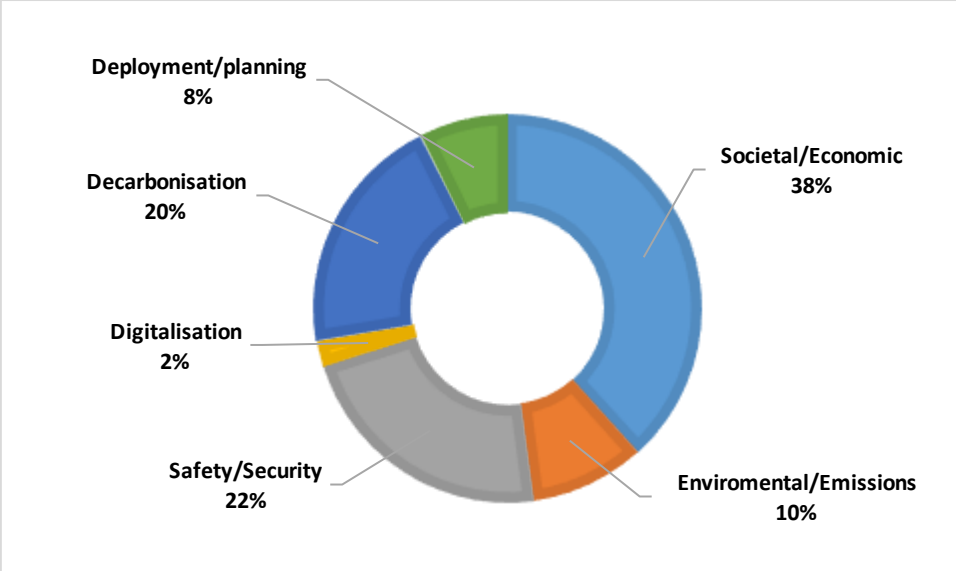
Classification according to the seven STRIA roadmaps shows that 53 strongly connected projects have 61 tags. There is a higher proportion of projects tagged as "*Other*" with 29 projects falling within that category. Ten projects are linked to the STRIA roadmap SMO and 8 projects are linked to VDM roadmap. The remaining roadmaps have fewer projects. Figure 6 presents the share of the 61 tags.

Figure 6. Strongly connected projects divided by STRIA roadmap



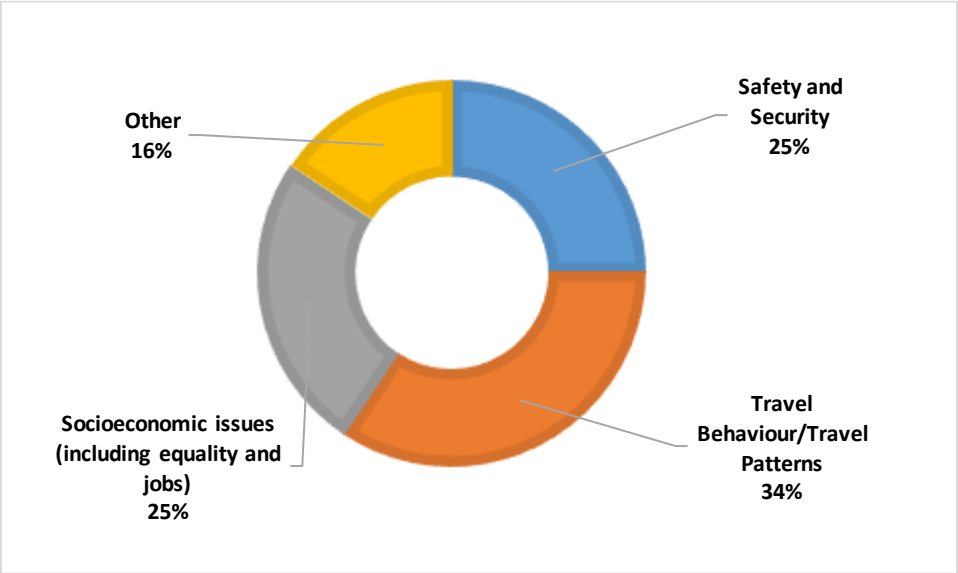
Regarding the STRIA policy, the 53 projects have 94 tags. 36 projects fall under societal/economic issues, 21 projects belong to safety and security issues, and 19 analyse the decarbonisation of the transport sector. Figure 7 depicts how the 94 tags are distributed across the different topic categories.

Figure 7. Strongly connected projects divided by STRIA policy



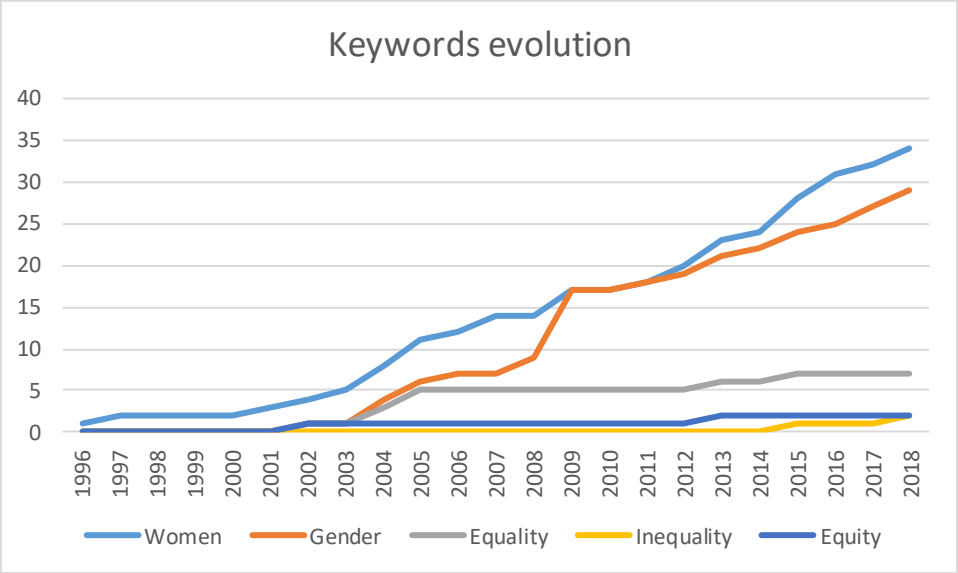
The picture is different with respect to women's issues, when compared to all the projects. The 53 strongly connected projects have 64 tags. Travel behaviour/travel patterns dominates with 22 projects but is followed by socio-economic issues and safety and security, which have 16 projects in each category. Figure 8 shows how the 64 tags are shared across the four issues.

Figure 8. Strongly connected projects divided by transport issue



The 53 projects contain in their description, methodology and results 74 times any of the keywords. Only seven projects include the keyword *Equality*, instead the keywords *Women* (34 projects) and *Gender* (29 projects) are widely used. The keyword *Gender* has been used in the description of projects since 2004, while the use of the keyword *Women* has grown steadily over time. Figure 9 shows the how the use of *Women* and *Gender* keywords compared to other relevant ones has evolved over time.

Figure 9. Accumulated Keywords appearances per year



It should be noted that within the H2020 context, gender is a cross-cutting issue that promotes equality and integrates a gender dimension in R&I. A comparison of strongly connected projects of FP7 and H2020 shows an 8.3% increase in the budget of the projects from €20.4 million to €22.1 million. This increase may be higher by the end of H2020. However, the percentage budget increase from FP7 to H2020 in current prices is more than 40% (approximately 30% in real prices). Therefore, although some progress has been made, the gender dimension in R&I is either not working or has not being fully followed in transport. In addition to increasing women in the research workforce, research consortia for the next European funding programme (*Horizon Europe* 2021-2027) should have a greater gender balance. In this way, R&I programmes will actively consider gender dimensions while supporting the research careers of women.

See Annex 3 for more in-depth information about the description and background of the strongly connected projects.

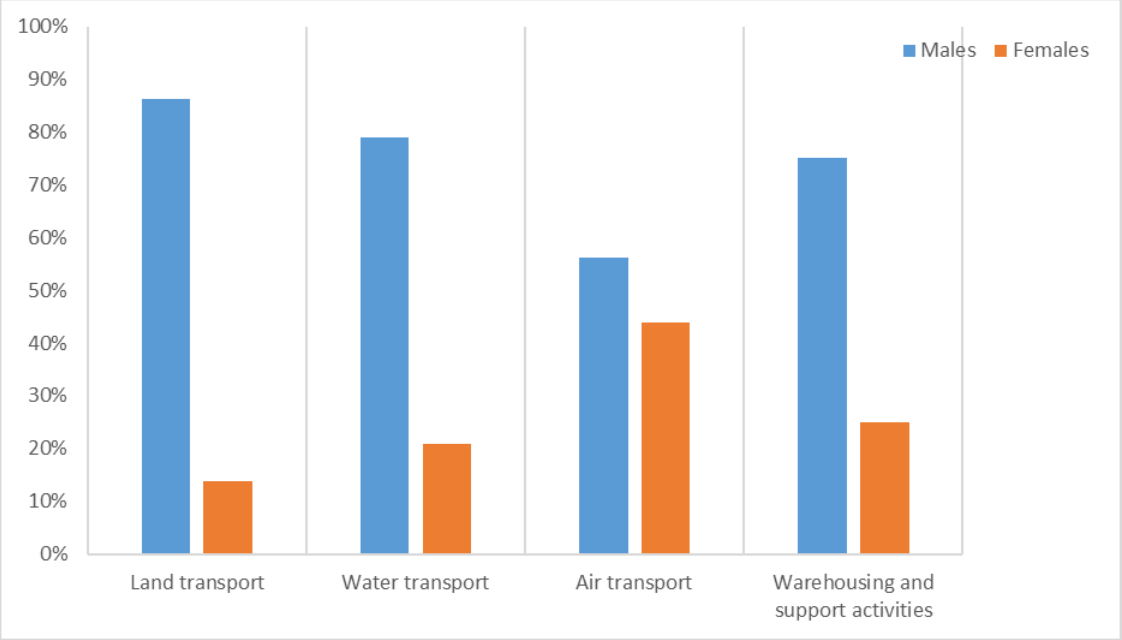
4 Women's participation in transport research and innovation

This section analyses the presence and the characteristics of women in the transport sector, by examining R&I activities. After a brief introduction on the general presence of women in the transport sector, the section focuses on the participation of women in R&I projects and on the analysis of research-related occupation and tasks of women in transport.

4.1 Women 's presence in the transport sector and in the research domain

Figure 10 shows the gender differences in each transport sub-sectors (land, water, air, warehousing and supporting activities) in 2018. Women are significantly underrepresented in the land transport sector, 6.2 males for every female employee, while in the air transport sector women represent almost 44% of the employed people.

Figure 10. Gender differentiation in the European transport sector (%, 2018)



Source: European Commission, Eurostat-Labour Force Survey (2018b).

Despite EC efforts to overcome gender differences, no major improvement can be observed from 2008 to 2018[8]. In this period, there was a slight increase in women employed in all the transport sub-sectors considered, following the observed trend in the total economy which grew nonetheless at a higher rate (See Table 1). However, some occupations are almost exclusively performed by men, for example, drivers of heavy trucks, buses and trams, cars and taxis (European Commission, 2018).

(8) No major differences were observed in the pre-crisis period, nor during or after it.

Table 1. Ratio of male to female employees and share of female employees in the transport sector (%, 2008-2018).

Transport mode	2008	2018
Land transport	6,3 (13,7% female)	6,2 (13.8% female)
Water Transport	4 (19.9% female)	3.8 (21% female)
Air Transport	1,4 (41,8% female)	1,3 (43.9% female)
Warehousing & supporting activities	3,1 (24,5% female)	3 (25% female)
Total economy	1,2 (44.9% female)	1,2 (46.2% female)

Source: European Commission, Eurostat-Labour Force Survey (2018b).

An examination of the representation of female researchers in all economic activities shows that the share of females employed was low at 33.4% (2015), even though there was an increase in the numbers of both female and male researches: 3.8% in female researchers from 2009 to 2015; 3.4% in male researchers.

In 2015, the majority of female researchers were employed in the higher education sector (HES) (62.5%) followed by the business enterprise sector (BES) (24.1%) and the government sector (GOV) (12.3%). In these sectors, female researchers are almost equally present as men in HES (42.1%) and GOV (42.5%). In these two sectors, female researchers are younger than their male counterparts with most of them in the age groups under 35 and 35-44, while male researchers were mainly in the age groups 45-54 and over 55 (European Commission, 2019d). This means that senior positions are predominately held by men and therefore research direction and leadership is male dominated. This is could be due to women having to balance household and career responsibilties and deal with work place discrimination. Further data on seniority of women in research teams (such as the number of women as principal investigators) needs to be collected to gain a better understanding.

The presence of female researchers in the transport sector is difficult to assess. Data are limited and scattered in relation to both geographical coverage and transport sub-sectors, leading to estimates and inconsistency in comparisons. In 2015, 11% of researchers out of 2,379 researchers ([9]) in the European transport service sector ([10]) were female. In the transport vehicle and equipment ([11]) production sector, the total number of researchers was higher, almost 150,000, of which 8.6% ([12]) were women. Data were not available for transport sub-sectors. (Grosso et al., 2019)

A clearer understanding of the presence and characteristics of women researchers in transport can be gained by analysing indicators related to occupation profiles, research activities and profiles of researchers engaged in R&D transport projects under the H2020 Framework Programme. To this extent Section 4.2 presents the results of a case study looking at researchers involved in H2020 projects in the transport field, and Section 4.3 proposes an analysis of research-related occupation and tasks of women in transport.

(9) Eurostat- Research and Development statistics (online data code: rd_p_bempoccr2). Employment if full time equivalent. The data need to be interpreted with caution since for many MSs the information is not available. Missing values for: BE, DK, EE, FR, LV, LU, NL, PL, FI, UK

(10) According to the NACE Rev. 2, Transportation and service sector (H)

(11) According to the NACE Rev. 2, Manufacture of motor vehicles, trailers and semi-trailers (C29) and Manufacture of other transport equipment (C30)

(12) Eurostat- Research and Development statistics (online data code: rd_p_bempoccr2). Employment if full time equivalent. The data need to be interpreted with caution since for many MSs the information is not available. Missing values for: BE, BG, EE, EL,FR, LV, LT, LU, NL, PL, FI, UK

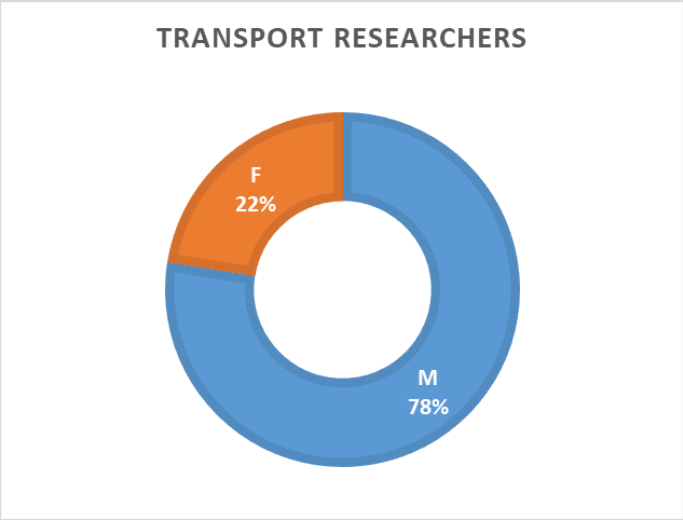
4.2 Case study on the presence of women researchers in transport R&I

A case study is used to examine the presence of female researchers engaged in H2020 funded transport R&I projects, and their educational qualifications. The analysis considers a sample of projects taken from the TRIMIS database to examine gender representation, typology and level of educational qualification obtained. The purpose of this analysis is to characterise transport researchers, with a focus on women ([13]).

Transport R&I projects were selected from the TRIMIS database, ensuring representation of the seven STRIA Roadmaps, transport modes, passenger and freight sectors and with a broad European geographical coverage. The seven STRIA roadmaps are represented by 3 projects for each roadmap; transport modes refer to: road, rail, waterborne, air and multimodal transport. Each project has organisations involved from a number of Member States ensuring wide geographical coverage. The final sample of transport researchers consisted of 769 people, working in 223 organisations and participating in 21 European projects.

Women are underrepresented and account for 22% of 769 transport researchers (see Figure 11). The transport sector seems unappealing to women to develop their research careers. More than half of the researchers have an educational background in engineering (53%) of which only 19% is represented by women. For 17% of the sample, the educational background is not explicitly mentioned; economists represented 8% of the total number of researchers of which 32% of transport economists are women. The remaining researchers belong to other educational domains (see Figure 12).

Figure 11. Gender differentiation between transport researchers in the TRIMIS project sample



Information was also collected on the attainment of a PhD degree, which is held by 208 researchers with 25% of them being female. The number of engineers with a PhD was 138, 24% of them women and 76% men. Also, the number of male colleagues with a PhD is higher than for female researchers (see Figure 13).

(13) Sources: TRIMIS and CORDIS available databases and Internal EC databases

Figure 12. Educational background of transport researchers in the TRIMIS project sample

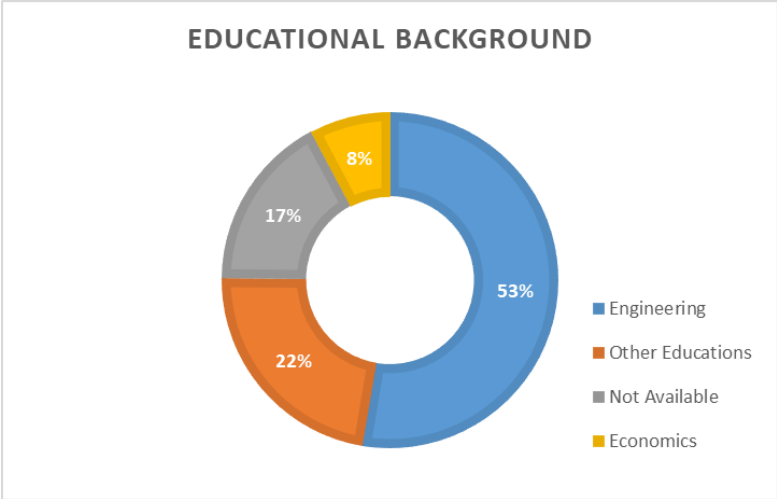
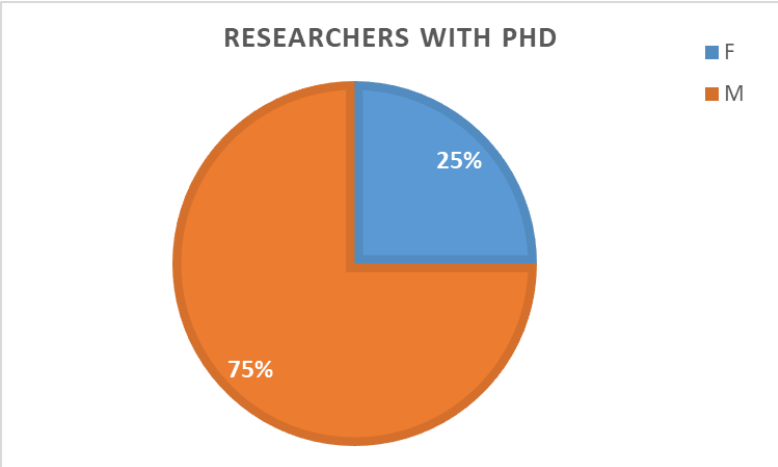


Figure 13. Gender differentiation between transport researchers with a PhD in the TRIMIS project sample



The analysis of a sample of TRIMIS R&I projects shows that women are less represented than men, regardless of educational attainment and confirms a gender bias in the transport sector.

4.3 Analysis of research-related occupations and tasks of women in transport

A detailed analysis of the presence of female researchers in the transport sector is challenging since data are not systematically collected and available databases only partially cover this aspect. Nonetheless, based on the available information, an occupation-task analysis has been developed to provide insightful statistics on research related occupations and tasks in transport, and gender differences over time.

In order to provide an overview of researchers in the transport sector, a number of assumptions have been made. The term "researcher" covers a broad range of activities linked to engineering, economics and design fields in the transport sector. The term "researcher' therefore needs to be associated to specific occupation categories according to the International Standard classification of Occupations Classification (ISCO-08). Within the ISCO-08 codes, the occupations that can be associated to transport research activities are: Code 21- Science and engineering professionals; and Code 31- Science and engineering associate professionals[14], which include, among others, engineers, architects, statisticians, physicists, statisticians and associate professionals (see Annex 1 for an extensive list of occupations included in Codes 21 and 31). The results presented in the previous section are in-line with this assumption, showing the high representativeness of engineers in the sample of TRIMIS projects. However, some occupations linked to research activities are excluded, and other non-purely research occupations are captured in these codes. This limitation needs to be considered in the present analysis.

(14) According to the ISCO-08 classification the differentiation among the categories is based on skills, tasks performed and thematic views

To link research occupations with the transport sector, the related economic activities associated to transport have been selected from the 'Nomenclature statistique des activités économiques dans la Communauté européenne (NACE Rev. 2) Classification', which are:

C29 - Manufacture of motor vehicles, trailers and semi-trailers

C30 - Manufacture of other transport equipment

G45 - Wholesale and retail trade and repair of motor vehicles and motorcycles

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. (For the extensive list of transport related economic activities, see Annex 2) ([15])

Based on the methodology presented in Fernandez-Macias et al. (2016) and using the data from Eurofound's European Jobs Monitor (1995-2014), a two-digit matrix combining ISCO-08 and NACE Rev.2 tables is created for each EU Member State, providing an overview of the occupation evolution in the transport sector with a focus on research related occupations.

To gain a better understanding of required skills, it is also necessary to know the tasks of researchers.

A job is a combination of tasks, defined as "a unit of work activity that produces output" and skills are defined as "stock of innate or acquired human capabilities that allow human being to perform tasks" (Autor, 2013). This involves different tasks and require skills, both in quantitative and qualitative terms. The task definition refers to two layers: the content and methods-tools used to perform it. The former refers to what is being produced (e.g. good/service) and it is associated with the sector to which the occupation belongs. The methods-tolls used are linked to the technology and social organisation of the production and is less dependent on the good/service produced but is more related to historical and institutional backgrounds (Fernandez-Macias et al., 2016). This approach identifies a list of tasks which are described in Table 2.

(15) For the years prior to 2008, the NACE Rev. 1.1 and ISCO-88 apply and the corresponding codes have been used.

Table 2. Classification of tasks according to content and methods-tools

Content
1. Physical tasks: Tasks aimed at the physical manipulation and transformation of material things, which can be further differentiated into two subcategories
• Strength: Tasks that primarily require the exertion of energy and strength.
• Dexterity: Tasks that primarily require a fine physical skill and coordination, particularly using hands.
2. Intellectual tasks: Tasks aimed at the manipulation and transformation of information and the active resolution of complex problems, which can be further differentiated into two sub categories
• Information-processing: Manipulation and transformation of codified information, which can be further divided into:
● Literacy: Manipulation and transformation of verbal information.
● Numeracy: Manipulation and transformation of numeric information.
• Problem-solving: Tasks that involve finding solutions to complex problems, which can be further divided into:
● Information-gathering and evaluation of complex information.
● Creativity and resolution.
3. Social tasks: Tasks whose primary aim is the interaction with other people, which can be further differentiated into four subcategories
• Serving/attending: Personally serving or attending customers, clients or patients.
• Teaching/training/coaching: Training and coaching others.
• Selling/influencing: Persuading and influencing others.
• Managing/coordinating: Supervising and coordinating others.
Methods and tools
4. Methods: The forms of work organisation used in performing the tasks, which can be further differentiated into three subcategories
• Autonomy: The extent to which the worker is free to carry out the task as they need.
• Teamwork: The extent to which the task is carried out in direct cooperation with a small group of co-workers.
• Routine: The extent to which the task is repetitive and standardised.
5. Tools: The type of technology used at work, which can be further differentiated into two main types of technology.
• Machines (excluding ICT)
• Information and communication technologies.

Source: Fernandez-Macias et al. (2016)

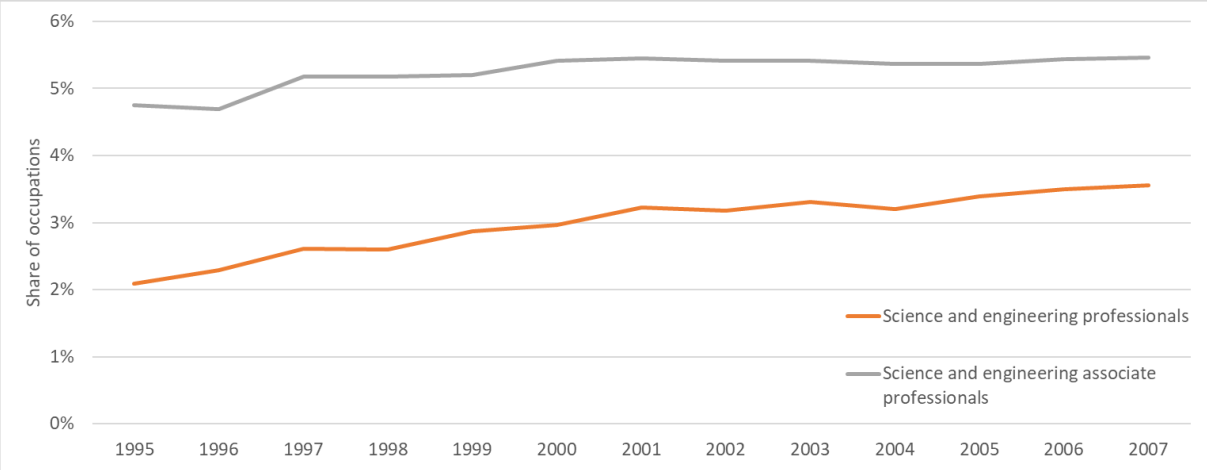
Fernandez-Macias et al. (2016) undertook an occupation-task based approach to show changes over time, and tasks analysis for the entire EU economy. The same approach was used here with a focus on transport research occupations and tasks to provide:

- the evolution of the research related occupations over two decades with a focus on gender differences; and
- the description of task and methods-tools used by transport researchers.

4.3.1 Occupations associated with transport research

An analysis of transport research occupation trends over the period 2008-2014([16]) showed that science and engineering associate professionals represent 8% of the people employed in transport. There has been no significant change in the share of these occupations in total transport employment over the last 20 years. Concerning the science and engineering associate professionals (ISCO-08, Code 31), a positive trend was observed. In 2014, the share reached almost 5.8% of the total transport employment. The remaining occupations in the transport sector represent more than 91%. In this case, no major variation was observed. The majority of the jobs in the transport sector are concentrated in the "*drivers and mobile plant operators*", accounting for almost 60% of the total occupations. The transport sector has not experienced any major occupational structure changes compared to other economic activities, as highlighted by Fernandez-Macias et al. (2016).

Figure 14. Evolution of transport occupations with a focus on Science and engineering professionals and associate ones (1995-2007)



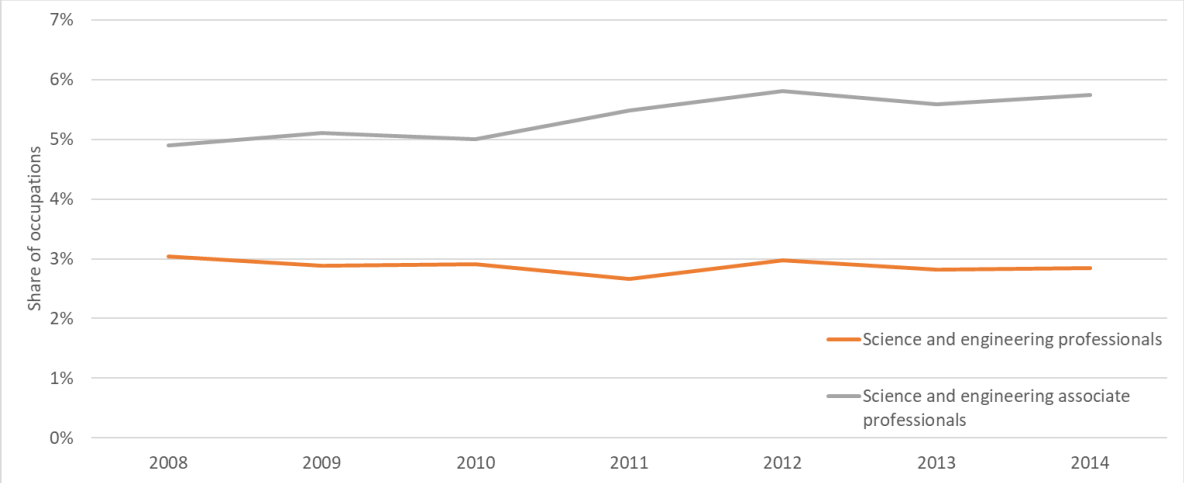
Source: TRIMIS's elaborations based on European Job Monitoring data, 1995-2007

The observed trend suggests that science and engineering professionals (ISCO-08, Code 21) and the science and engineering associate professionals (ISCO-08, Code 31) maintained their relevant role in the transport sector showing little modifications over the last two decades.

The presence of females in these two occupation categories shows that women are underrepresented in jobs linked to transport science and engineering. It can therefore be assumed that this is the case with regard to transport research. Figure 16 and Figure 17 show the gender difference for science and engineering professionals, science and engineering associate professionals and for the remaining transport occupations. This illustrates that while the presence of women is higher in the remaining transport occupations, 22% on average, the two research-associated occupations employ less women.

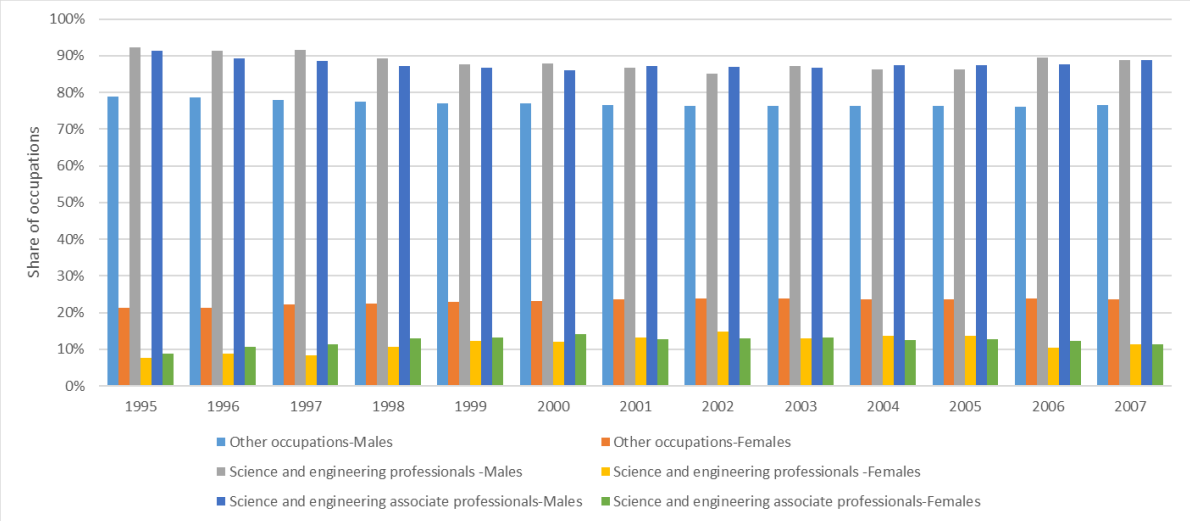
(16) Two periods 1995-2007 and 2008-2014 are presented due to revision of NACE and ISCO Classifications in 2008.

Figure 15. Evolution of transport occupations with a focus on Science and engineering professionals and associate ones (2008-2014)



Source: TRIMIS's elaborations based on European Job Monitoring data, 2008-2014

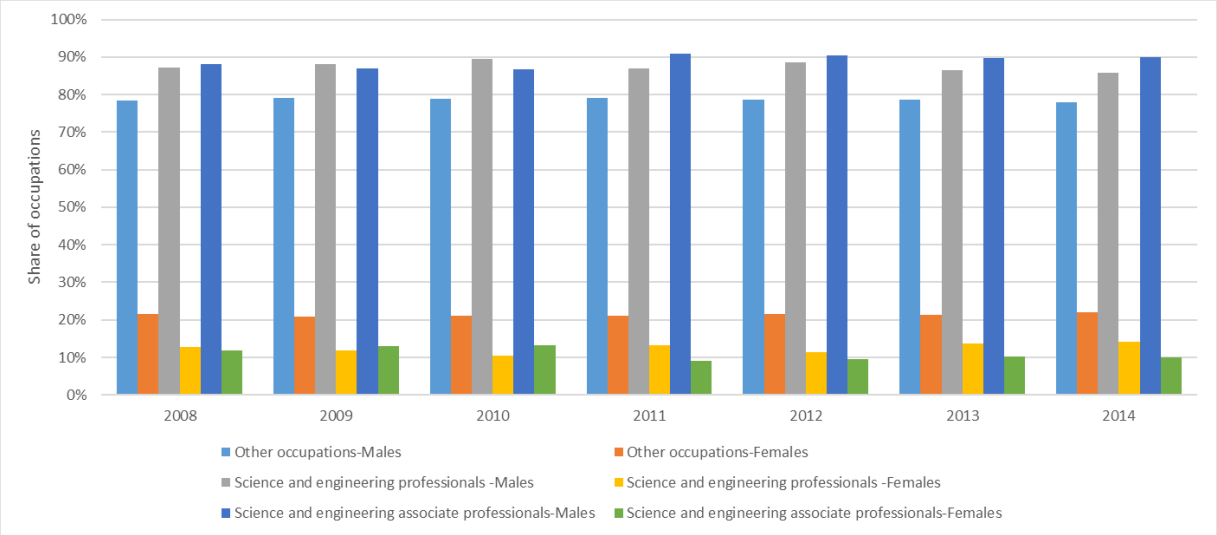
Figure 16. Gender differences in transport occupations with a focus Science and engineering professionals and associate ones (%, 1995-2007)



Source: TRIMIS's elaborations based on European Job Monitoring data, 1995-2007

In the period 1995-2007, the presence of women in science and engineering professionals (ISCO-08, Code 21) represented approximately 12% of the total people employed in the same occupation class. In the period, 2008-2014, the average share increased to 12.5%. In contrast, the women working as transport science and engineering associate professionals (ISCO-08, Code 31) decreased from 12.3% (1995-2007) to 11% (2008-2014). In the case of science and engineering professionals (ISCO-08, Code 21), the percentage of women employed increased. For science and engineering associate professionals (ISCO-08, Code 31) the positive trend was observed in the period 1995-2007, the opposite occurred from 2008 to 2014, when the number of women working as transport science and engineering associate professionals decreased.

Figure 17. Gender differences in transport occupations with a focus Science and engineering professionals and associate ones (%, 2008-2014)

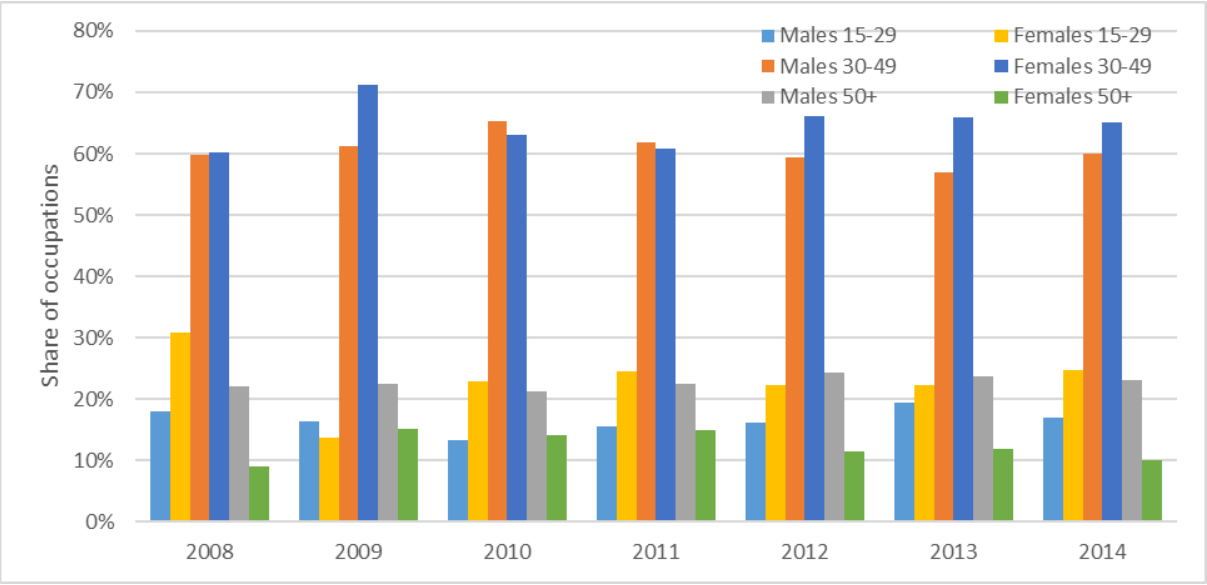


Source: TRIMIS's elaborations based on European Job Monitoring data, 2008-2014

These figures show that the presence of women in transport research is in line with the results of the previous analysis which examined the presence of women in research. In the majority of EU-28 countries (2017), fewer women than men were employed as scientists and engineers, 4.5% of men and 3.1% of women; moreover, the genders gap has increased from 2013 to 2017 (European Commission, 2019d). The share of women that studied and graduated in science, technology, engineering and mathematics (STEM) was smaller compared to men. In 2016, at EU-28 level, 32% of students and 36% of graduates with a Bachelor's and Master's degree were women. 37% of the students obtained a PhD in STEM, and 39% of the women with previous studies obtained a PhD in STEM. Furthermore, males, as previously illustrated, dominate the overall transport sector. The combination of these two elements, researchers in the transport field, leads to an even wider gender gap compared to other economic sectors or research fields.

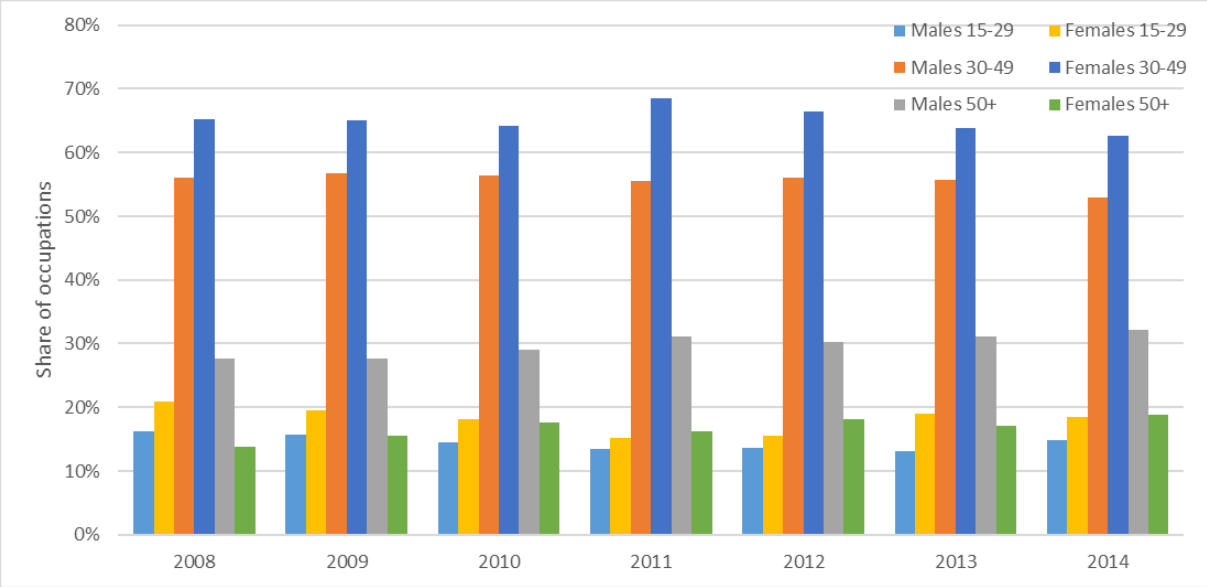
Women employed as science and engineering professionals (ISCO-08, Code 21) and associate professionals (ISCO-08, Code 31) in the transport sector, start working before and leave their occupation earlier than their male counterparts (See Figures 18 and 19).

Figure 18. Gender differences, according to age classes, in Science and engineering professionals (Code21-ISCO 08), (%, 2008-2014)



Source: TRIMIS's elaborations based on European Job Monitoring data, 2008-2014

Figure 19. Gender differences, according to age classes, in Science and associate engineering professionals (Code31-ISCO 08), (%, 2008-2014)



Source: TRIMIS's elaborations based on European Job Monitoring data, 2008-2014

In general, the presence of women is higher in the age group 30-49 compared to men, and the opposite occurs for workers older than 50 years (see Figure 19). These results reflect the outcome of studies that examined gender differentiation in research (European Commission, 2019d), showing that in many European countries, the majority of women researchers were under 35 and 35-44 age groups, while male colleagues were mainly present in the 45-54 and over 55 age groups.

In 2014, there was a differentiation between women and men in terms of contractual agreements. When signing a permanent contract, as scientist or engineer (ISCO-08, Code 21), almost 87% of men had a full-time contract, while only 13% of the female colleagues had the same. In the case of permanent part-time contracts, it was the opposite: almost 74% of female researchers compared to 26.5% of male researchers. Similar patterns exist in science and engineering associate professionals (Code31-ISCO 08) with even a bigger share of male employees (91%) compared to women (9%), obtaining a permanent full-time contract. In the case of permanent part-time agreements, 63% of the contracts were signed by men and 37% by women. In both groups, irrespective of the type of time arrangements, permanent contracts are signed more by men than women. Additional information on this topic and on gender pay gap is provided in the report produced by the European Institute for Gender Equality (2019a). This report shows that women are paid less than their male counterparts, due to lower level and lower paid jobs, more working hours, longer career breaks, and more frequent part-time work to reconcile work and care responsibilities.

The difference in contract typologies (Full-time/part-time) in the higher education sector has been highlighted also in *She Figures 2018* (European Commission, 2019d). This showed that 13% of EU women researchers and 8% of the men researchers had a part-time contracts in 2016. The predominance of women with part-time contracts can be linked to gender stereotypes related to family responsibilities, but also to gender segregation (European Commission, 2019d) which has been widely acknowledged in the transport sector (European Commission, 2014).

4.3.2 Task-based analysis of occupations associated to transport research

The task-based analysis developed here considers the task characterisation of the two occupations associated to research activities, namely science and engineering professionals (Code21-ISCO 08) and science and engineering associate professionals (Code31-ISCO 08) in the transport sector in 2014, for the EU-15 Countries([17]). Unfortunately, the task-based approach does not consider gender differentiation, nonetheless this approach allows an understanding of the typologies of tasks performed and on the methods and tools used.

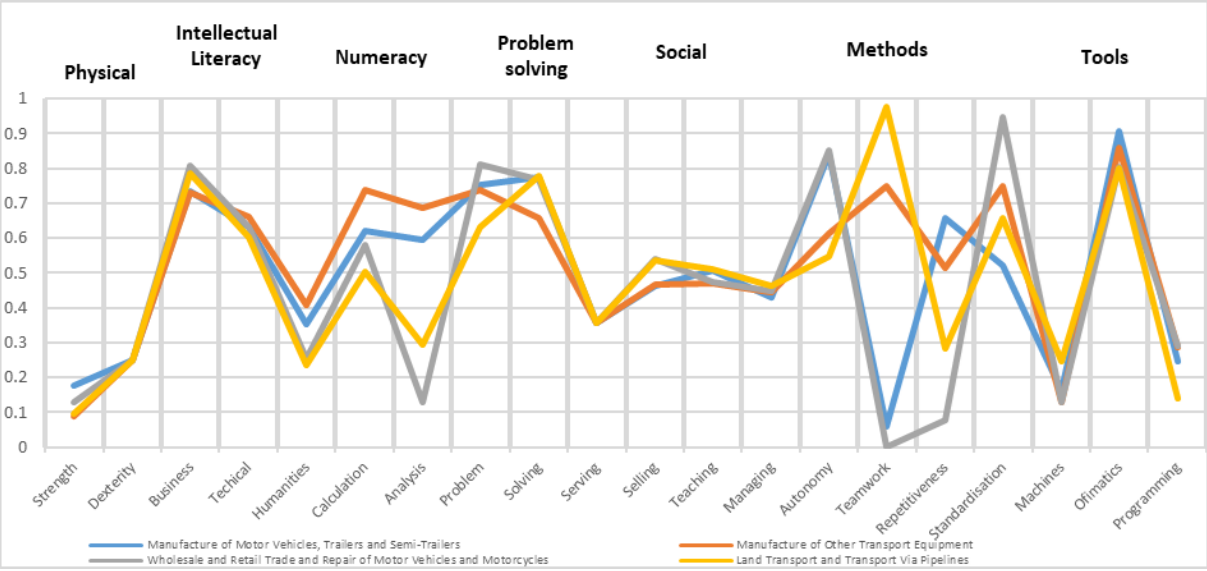
(17) The values of the task index can range from 0 to 1, indicating the intensity with which each job involves carrying out work in each of the task categories. (Fernandez-Macias et al. , 2016)

This is important information in assessing skills requirements, investigating links to jobs attractiveness and therefore making policy recommendations for future jobs.

For this analysis, different NACE Rev.2 transport economic activities are considered, which are: the manufacture of motor vehicles, trailers and semi-trailers (C29); manufacture of other transport equipment, (C30) wholesale and retail trade and repair of motor vehicles and motorcycles (G45) and land transport and transport via pipelines (H49)([18]).

Figure 20 and Figure 21 illustrate that science and engineering professionals (Code21-ISCO 08) and science and engineering associate professionals (Code31-ISCO 08) in general do not need to perform physical tasks. On the contrary, they are required to execute intellectual literacy tasks, mainly associated to business, for science and engineering professionals (Code21-ISCO 08) and to technical tasks, for science and engineering associate professionals (Code31-ISCO 08). Both groups seem to be dedicated to problem solving and less to social tasks. Concerning the methods used, it appears that differences exist among transport economic activities, nonetheless all these occupations are characterised by a certain degree of autonomy. Science and engineering professionals in transport (Code21-ISCO 08) present different patterns in relation to team work and repetitiveness, while in the case of science and engineering associate professionals (Code31-ISCO 08) they seem to perform more standardised tasks and to work more in a team. Regarding the tools used, for both categories and for all the transport economic activities it appears that no machines or programming tools are used, while it is more frequent to use computer machinery and software to optimise or automatise existing office processes.

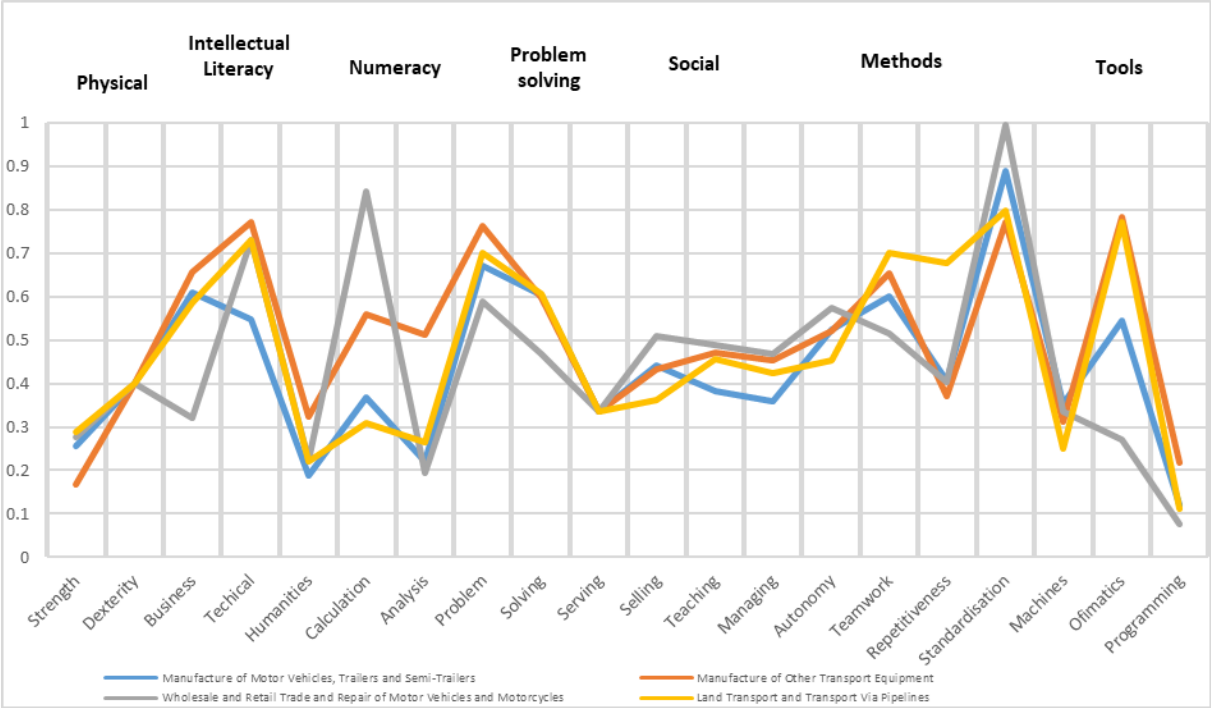
Figure 20. Task based analysis of Science and engineering professionals (Code21-ISCO 08)



Source: TRIMIS's elaborations based on European Job Monitoring data, EU15, 2014

(18) Low data quality for the other transport economic activities do not entail a similar analysis

Figure 21. Task based analysis of Science and engineering associate professionals in transport (Code31-ISCO 08)



Source: TRIMIS's elaborations based on European Job Monitoring data, EU15, 2014

The results shown in Figure 20 and Figure 21 are in line with the tasks characterisation presented in Fernández-Macías et al. (2016), which refers to these two occupations without any association to NACE economic activities. The link to the different transport economic activities explain differences presented in the above figures (e.g. for the wholesale and retail trade and repair of motor vehicles).

Based on the above analysis, a number of conclusions can be drawn to support the definition of future policies measures:

- The low number of women studying and graduating in science and engineering constitutes structural challenges for the future employment of women in the transport sector. The lower level of seniority of women compared to men, even when there are women involved in transport research, could mean barriers for women to develop their transport research career.
- There is little information about research-related jobs for women in the transport field, which tends to be a rather male dominated environment.
- A task-based approach can provide a better understanding for existing jobs - what is the content of the job and how it is normally performed.
- Better knowledge about job opportunities, tasks and skills requirements could change the transport sector's image and support future transport employment and training policy measures.
- Lack of data and inconsistency prevents a detailed analysis of gender differences among transport researchers. The collection of gender specific information at national and European level is needed.

5 Conclusions

This report provides an overview of women's issues in European transport. First, it provided a summary of key women and transport issues and described relevant EU policy initiatives and regulations regarding gender equality and transport. Second, it studied the status and evolution of European research in tackling women issues in transport. Finally, it analysed women's participation in transport R&I activities, including descriptive statistics, key features and relevant capacities.

The **main findings** are summarised below:

- Women have specific travel characteristics about mode choice, time of travel, trip purpose, route, trip chain and travel distance. Transport safety and security are critical factors in women's mobility choices, and the introduction of new innovative technologies, and increased automation, are not necessarily gender neutral, with women less willing to use them.
- Although research on equality and women (e.g. in the UK and the US) has been undertaken since the early 1980s, women's issues in transport is a relatively new topic. European regulations considered women and transport issues at the beginning of this century, and relevant European research funded projects began less than 20 years ago.
- Few projects within the TRIMIS database analyse women's issues in transport (approximately 2% of the projects). In terms of the number of projects funded, no significant difference exists between Member States and the EU. However, there are more EU funded research projects loosely connected to the topic than strongly connected. Moreover, although some financial progress has been made (8.3% budget increase in strongly connected projects from FP7 to H2020) the gender dimension in R&I programmes is either not working or has not been fully considered. Therefore, further progress in addressing women issues in transport research is needed.
- Most of the strongly linked projects have the category of multimodal (40%) and road transport (41%), and for 83% of the projects, their geospatial scope is "*Other*" instead of "*Urban*" or "*Infrastructure nod*". Moreover, 55% of the projects do not apply in particular to any one of the seven STRIA roadmaps. Travel behaviour/travel patterns dominate with 41% of the strongly connected projects followed by socio-economic issues and safety and security, which have 16 projects (30%) in each category.
- In the European transport sector, women are underrepresented compared to their male counterparts (22% of workers are female). An analysis of the 769 transport researchers working in 21 European projects (selected from the TRIMIS database) and 223 organisations, found that approximately 22% of the researchers are females. Only seven projects specifically addressed the problem of lack of qualified personnel and women, and all of these projects many had been completed some time ago (six belong to the FP7 programme and one to H2020). Member States funding do not seem to fund these types of projects. Women are also underrepresented in jobs linked to transport science and engineering and it can therefore be assumed that this is the case regarding transport research.

From the scientific findings described above, the report provides the following **policy recommendations**:

- More data about women-specific travel characteristics and lack of interest in the transport sector is needed. Targeted R&I research should collect data in a comparable manner across the EU and internationally.
- *Policies that enhance welfare should also promote equality in society.* The wealthier the country the more aware of social issues. Countries with prosperous economies are more aware of women's issues in transport, have higher levels of national investment, and seem better prepared for European research programme calls.
- *Transport policies should support greener mobility if they are to be beneficial to women.* Future low carbon mobility options should recognise women's transport needs to avoid further gender gaps. Women are more willing to use environmentally friendly transport modes. Therefore, policies that enable greener travel will also benefit women.
- *Policies should increase the awareness of equality and respect among men and women as in doing so they address gender equality.* Several reasons explain the underrepresentation of women (e.g. difficulty to find a work-life balance in shift work, lack of appropriate working environment and equipment, etc.) and this requires a diverse policy response.
- Greater understanding of the reasons behind the lack of female transport researchers is needed to increase the share of women in transport. The share of women has not increased, even after the finalisation of

projects addressing the lack of qualified personnel and women. The transport sector continues to be unappealing for women to develop their research careers. Additional data on seniority of women in research teams (i.e. number of women as principal investigators) could provide a better understanding of whether household dynamics (e.g. childcare responsibilities) acts as a barrier to career progression.

- *Gender-equitable research consortia should be actively incentivised in European transport research.* In addition to increasing women in the research workforce, research consortia for the next European funding programme (*Horizon Europe* 2021-2027) should have a greater gender balance. In this way, R&I programmes will actively consider gender dimensions while supporting the research careers of women.

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List of abbreviations and definitions

AT	Austria
BE	Belgium
BES	Business enterprise sector
BG	Bulgaria
CH	Switzerland
CY	Cyprus
CZ	Czech Republic
DE	Germany
DG MOVE	Directorate-General for Mobility and Transport
DG RTD	Directorate-General for Research and Innovation
DK	Denmark
EC	European Commission
EE	Estonia
EL	Greece
ES	Spain
EU	European Union
EU-28	European Union of 28 Member States
FI	Finland
FP7	7th Framework Programme
FR	France
GOV	Governmental sector
H2020	Horizon 2020
HES	Educational sector
HR	Croatia
HRST	Human Resources in Science Technology
HU	Hungary
IE	Ireland
ISCO	International Standard classification of Occupations Classification
IT	Italy
JRC	Joint Research Centre
LT	Lithuania
LU	Luxembourg
LV	Latvia
MS	Member State
MT	Malta
NACE	Nomenclature statistique des activités économiques dans la Communauté européenne
NL	The Netherlands
PL	Poland

PT	Portugal
R&D	Research and Development
R&I	Research and Innovation
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovakia
STEM	Science, technology, engineering and mathematics
STRIA	Strategic Transport Research and Innovation Agenda
TRIMIS	Transport Research and Innovation Monitoring and Information System
UK	United Kingdom

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212 Mathematicians, actuaries and statisticians

213 Life science professionals

214 Engineering professionals (excluding electrotechnology)

215 Electrotechnology engineers

216 Architects, planners, surveyors and designers

MAJOR GROUP 3: TECHNICIANS AND ASSOCIATE PROFESSIONALS

31 Science and engineering associate professionals

311 Physical and engineering science technicians

312 Mining, manufacturing and construction supervisors

313 Process control technicians

314 Life science technicians and related associate professionals

315 Ship and aircraft controllers and technicians

Annex 2. Statistical classification of economic activities (NACE), Revision 2 transport-related sectors

The table below shows the transport related economic activities relevant for this analysis.

C29 - Manufacture of motor vehicles, trailers and semi-trailers
C29.1 - Manufacture of motor vehicles
C29.1.0 - Manufacture of motor vehicles
C29.2 - Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
C29.2.0 - Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
C29.3 - Manufacture of parts and accessories for motor vehicles
C29.3.1 - Manufacture of electrical and electronic equipment for motor vehicles
C29.3.2 - Manufacture of other parts and accessories for motor vehicles
C30 - Manufacture of other transport equipment
C30.1 - Building of ships and boats
C30.1.1 - Building of ships and floating structures
C30.1.2 - Building of pleasure and sporting boats
C30.2 - Manufacture of railway locomotives and rolling stock
C30.2.0 - Manufacture of railway locomotives and rolling stock
C30.3 - Manufacture of air and spacecraft and related machinery
C30.3.0 - Manufacture of air and spacecraft and related machinery
C30.4 - Manufacture of military fighting vehicles
C30.4.0 - Manufacture of military fighting vehicles
C30.9 - Manufacture of transport equipment n.e.c.
C30.9.1 - Manufacture of motorcycles
C30.9.2 - Manufacture of bicycles and invalid carriages
C30.9.9 - Manufacture of other transport equipment n.e.c.
G - Wholesale and retail trade; repair of motor vehicles and motorcycles
G45 - Wholesale and retail trade and repair of motor vehicles and motorcycles
G45.1 - Sale of motor vehicles
G45.1.1 - Sale of cars and light motor vehicles
G45.1.9 - Sale of other motor vehicles
G45.2 - Maintenance and repair of motor vehicles
G45.2.0 - Maintenance and repair of motor vehicles

G45.3 - Sale of motor vehicle parts and accessories
G45.3.1 - Wholesale trade of motor vehicle parts and accessories
G45.3.2 - Retail trade of motor vehicle parts and accessories
G45.4 - Sale, maintenance and repair of motorcycles and related parts and accessories
G45.4.0 - Sale, maintenance and repair of motorcycles and related parts and accessories
H - Transportation and storage
H49 - Land transport and transport via pipelines
H49.1 - Passenger rail transport, interurban
H49.1.0 - Passenger rail transport, interurban
H49.2 - Freight rail transport
H49.2.0 - Freight rail transport
H49.3 - Other passenger land transport
H49.3.1 - Urban and suburban passenger land transport
H49.3.2 - Taxi operation
H49.3.9 - Other passenger land transport n.e.c.
H49.4 - Freight transport by road and removal services
H49.4.1 - Freight transport by road
H49.4.2 - Removal services
H49.5 - Transport via pipeline
H49.5.0 - Transport via pipeline
H50 - Water transport
H50.1 - Sea and coastal passenger water transport
H50.1.0 - Sea and coastal passenger water transport
H50.2 - Sea and coastal freight water transport
H50.2.0 - Sea and coastal freight water transport
H50.3 - Inland passenger water transport
H50.3.0 - Inland passenger water transport
H50.4 - Inland freight water transport
H50.4.0 - Inland freight water transport
H51 - Air transport
H51.1 - Passenger air transport

H51.1.0 - Passenger air transport
H51.2 - Freight air transport and space transport
H51.2.1 - Freight air transport
H51.2.2 - Space transport
H52 - Warehousing and support activities for transportation
H52.1 - Warehousing and storage
H52.1.0 - Warehousing and storage
H52.2 - Support activities for transportation
H52.2.1 - Service activities incidental to land transportation
H52.2.2 - Service activities incidental to water transportation
H52.2.3 - Service activities incidental to air transportation
H52.2.4 - Cargo handling
H52.2.9 - Other transportation support activities
H53 - Postal and courier activities
H53.1 - Postal activities under universal service obligation
H53.1.0 - Postal activities under universal service obligation
H53.2 - Other postal and courier activities
H53.2.0 - Other postal and courier activities

Annex 3. Table with strongly connected projects ranked by start year.

Acronym	Name	Start–End Year	Funded by	Description/Background	TOPIC			
					Safety and Security	Travel Behaviour / Travel Patterns	Socioeconomic issues (including equality and jobs)	Other
EUROPEAN FUNDED PROJECTS								
EXTRA 2	Euromethodologies for Travel Assessment	1996-1997	European (4th RTD Framework Programme)	The objective of EXTRA/2 was to assess the consequences of increased charges for road transport for groups that face some disadvantages in terms of mobility, such as the young, the elderly, women and the poor.	N	N	Y	N
SMILE LIFE	Sustainable Mobility Initiative for Local Environment	2001-2004	European (N/A)	Across Europe, the migration of people out of the city centre to the suburbs is leading to increasingly dispersed settlement structures with low population densities and long travel distances. This phenomenon of urban sprawl comes hand in hand with an increase in car ownership and commuter traffic. Today, most European local authorities are confronted with significant and increasing problems of traffic congestion and pollution.	N	Y	N	N
EURNEX	European Rail Research Network of Excellence	2004-2007	European (6th RTD Framework Programme)	The rail system in Europe is faced with a challenging situation. The Railway Business Scenario 2020 drawn up by the European Rail Research Advisory Council (ERRAC) has set a goal of almost tripling passenger traffic volume and more than a threefold increase in rail freight transport throughout Europe in twenty years. To achieve this ambitious goal, the competitiveness of the rail systems over other transport modes must be considerably improved, with the support of innovative products and services	N	N	Y	N
GMOSS	Global Monitoring for Security and Stability	2004-2008	European (6th RTD Framework Programme)	The aim of the GMOSS network of excellence is to integrate Europe's civil security research so as to acquire and nourish the autonomous knowledge and expertise base Europe needs if it is to develop and maintain an effective capacity for global monitoring using satellite earth observation.	N	N	Y	N
UNIACCESS	Design of Universal Accessibility Systems for Public Transport	2005-2006	European (6th RTD Framework Programme)	The European Union has committed itself to providing all citizens with equal opportunities. This means that, in as much as possible, people with different degrees of mobility (the young, the elderly, people with disabilities, people carrying infants or shopping, pregnant women, etc.) should be granted the same comfort, speed and capacity when using public transport.	N	Y	N	Y

Acronym	Name	Start–End Year	Funded by	Description/Background	TOPIC			
					Safety and Security	Travel Behaviour / Travel Patterns	Socioeconomic issues (including equality and jobs)	Other
SEAT	Smart Technologies for stress free Air Travel	2006-2009	European (6th RTD Framework Programme)	Passenger comfort is a major factor in user acceptance of transportation systems. An individual's reaction to a vehicle environment depends not only on the physical inputs but also on the characteristics of the individual. The findings of a number of passenger surveys indicate that there is not a universal optimal setting for comfort related parameters in a plane. Hence individual passengers are always likely to have certain conflicting requirements as perception of comfort is affected by a variety of factors - sex, gender and ethnicity among the most important ones.	N	N	N	Y
PROMARC	Promoting Marine Research Careers	2008-2010	European (7th RTD Framework Programme)	PROMARC will raise awareness of job opportunities in the marine transport technology sector in Research and Innovative product development	N	N	Y	N
SKILLRAIL	Training and Education for a more Competitive and Innovative Railway Sector	2009-2011	European (7th RTD Framework Programme)	The project aimed to contribute to the enhancement of the transport sector by fostering a better match between the human resources needs and the offer of skills to make railways a more competitive and innovative sector.	N	N	Y	N
FUTURAIL	Job Opportunities for the Railway Community of Tomorrow	2009-2010	European (7th RTD Framework Programme)	FUTURAIL dealt with making railways a more competitive and innovative sector. Rail Transport is therefore striving to improve its attractiveness, and be an affordable, safe, clean, competitive and reliable transport mode. FUTURAIL is oriented towards the future. To be competitive, there is a need for training and education programmes to support this vision.	N	N	Y	N
ITERATE	IT for Error Remediation and Trapping Emergencies	2009-2011	European (7th RTD Framework Programme)	The objective of ITERATE was to develop and validate a unified model of driver behaviour (UMD) and driver interaction with innovation technologies in emergency situations. This model will be applicable to, and validated for, all the surface transport modes. Drivers age, gender, education and experience and culture (whether regional or company/organisational) are factors that will be considered together with influences from environment and the vehicle.	Y	N	N	N
RESTARTS	Raising European Student Awareness in Aeronautical Research through School-labs	2009-2012	European (7th RTD Framework Programme)	Raising European Students Awareness in Aeronautical Research Through School-Labs is the main objective of the RESTARTS project. The project aims to contribute toward reversing the current trend of disinterest of young people towards aeronautics	N	N	Y	N
THOMO	Development of a finite element model of the human thorax and upper extremities	2009-2012	European (7th RTD Framework Programme)	The current project proposes to give to passive safety players a tool capable of assessing real safety. It aims to improve finite element models of the human thorax including upper extremities based on the research, development, and validation of the models for the 5th, 50th, and 95th percentile of each gender.	Y	N	N	Y

Acronym	Name	Start–End Year	Funded by	Description/Background	TOPIC			
					Safety and Security	Travel Behaviour / Travel Patterns	Socioeconomic issues (including equality and jobs)	Other
COVER	Coordination of Vehicle and Road Safety Initiatives	2009-2013	European (7th RTD Framework Programme)	Previous research in the field of vehicle passive safety contributed to significant improvements in vehicle and road safety. However, this research was focused on average protective measures optimised for 'average occupants' whereas in the real world substantial differences appear under factors like gender, age and size. Brought forward by stakeholders, this topic was recognised by the EU Commission and put high on the research agenda.	Y	N	N	N
THORAX	Thoracic Injury Assessment for Improved Vehicle Safety	2009-2013	European (7th RTD Framework Programme)	The objective of THORAX is to develop the required understanding in thoracic injury mechanisms and to implement this into numerical and experimental tools that will enable the design and evaluation of advanced vehicle restraint systems that offer optimal protection for a wide variety of car occupants.	Y	N	N	N
ADSEAT	Adaptive seat to reduce neck injuries for female and male occupants	2009-2013	European (7th RTD Framework Programme)	ADSEAT aimed to substantially reduce the whiplash injury risk for all vehicle occupants by preparing the ground work and initiate recommendations for future evaluation of the effectiveness of anti-whiplash systems.	Y	N	N	N
KNOW-ME	The European Academic and Industry Network for Innovative Maritime Training, Education and R&D	2011-2014	European (7th RTD Framework Programme)	Europe's maritime sector must sustain and improve its competitive advantage, with the groundwork for future international competitiveness resting with high quality and innovative education and training. Employees in the maritime transport sector need innovative educational opportunities that focus on their special working conditions.	N	N	Y	N
City-Hub	City-Hub	2012-2015	European (7th RTD Framework Programme)	City-HUB aims to make urban interchanges more accessible to all users. The approach is integrated, covering the different aspects of an urban interchange in order to increase the use of public transport, improve the efficiency and propose a new business model.	N	Y	N	N
PROMO-AIR	Promoting Aeronautics Innovation and Research	2013-2015	European (7th RTD Framework Programme)	Within the Promo-Air project, the consortium efforts will be focused on raising interest of teenagers in aeronautics-related studies through improving the image of an aeronautics career and stimulating their interest through the presentation of attractive educational material and hands-on experiences in Universities throughout Europe	N	N	Y	N
TEA	Transport Equity Analysis: assessment and integration of equity criteria in transportation planning	2013-2017	European (N/A)	The TEA COST Action contributes to the body of research by bringing together new approaches to incorporate equity consideration in transport project evaluation and decision making. The approaches consist of incorporating social justice, travel behaviour models and socio-economic impacts.	N	Y	Y	N

Acronym	Name	Start–End Year	Funded by	Description/Background	TOPIC			
					Safety and Security	Travel Behaviour / Travel Patterns	Socioeconomic issues (including equality and jobs)	Other
STRINGBIKE	Highly innovative push-pull handbike for boosting wheelchair mobility	2016-2017	European (Horizon 2020)	According to the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) to ensure effective personal mobility, wheelchair users need a wheelchair which fits them correctly and meets their specific needs. This requires an approach that is responsive to individual needs.	N	N	N	Y
ENABLE.EU	Enabling the Energy Union through understanding the drivers of individual and collective energy choices in Europe	2016-2019	European (Horizon 2020)	The ENABLE.EU project focuses on citizens-oriented energy transition to a low-carbon EU energy system. It aims to define key determinants of individual and collective energy choices in three key consumption areas - transportation, heating & cooling, and electricity – and in the shift to prosumption (users-led initiatives of decentralised energy production and trade).	N	N	N	Y
TrustVehicle	Improved trustworthiness and weather-independence of conditional automated vehicles in mixed traffic scenarios	2017-2020	European (Horizon 2020)	The TrustVehicle consortium brings together participants from the whole vehicle value chain to enhance safety and user-friendliness of level 3 automated driving systems.	Y	N	N	N
QUIET	QUalifying and Implementing a user-centric designed and EfficienT electric vehicle	2017-2020	European (Horizon 2020)	QUIET aims at developing an improved and energy efficient electric vehicle with increased driving range under real-world driving conditions. This is achieved by exploiting the synergies of a technology portfolio in the areas of: user-centric design with enhanced passenger comfort and safety, lightweight materials with enhanced thermal insulation properties, and optimised vehicle energy management.	N	N	N	Y
TranSim	The Next Generation Simulation-Based Training System for Optimal Transportation Systems	2017-2017	European (Horizon 2020)	Heavy industries such as transport or construction impose strict working conditions in terms of safety, economy and quality, and rely on professional drivers and operators (e.g. for trucks, excavators), with precise skills and manoeuvre expertise.	N	N	Y	N
DIAMOND	Revealing fair and actionable knowledge from data to support women's inclusion in transport systems	2018-2021	European (Horizon 2020)	Current transport systems do not sufficiently take into account physical and social characteristics of women in the design of products and services, and in fostering women's employability in the industry.	N	Y	Y	N
TInnGO	Transport Innovation Gender Observatory	2018-2021	European (Horizon 2020)	Women face higher risks and burdens than men in transport, due to unequal access to resources, education, job opportunities and entrenched socio-cultural norms. The TInnGO project will develop a framework and mechanisms for a sustainable game change in European transport using the transformative strategy of gender and diversity sensitive smart mobility. It will address gender related contemporary challenges in the transport ecosystem and women's mobility needs, creating a route for Gender Sensitive Smart Mobility in European Transport.	N	Y	Y	N

Acronym	Name	Start–End Year	Funded by	Description/Background	TOPIC			
					Safety and Security	Travel Behaviour / Travel Patterns	Socioeconomic issues (including equality and jobs)	Other
NATIONAL FUNDED PROJECTS								
A9 (NRP 41)	Pedestrian and cycle traffic	1997-2001	National (Switzerland)	The NRP 41 was launched by the Federal Council at the end of 1995 to improve the scientific basis on which Switzerland's traffic problems might be solved, taking into account the growing interconnection with Europe, ecological limits, and economic and social needs.	N	Y	N	N
Targeted public transport	Targeted public transport	2002-2002	National (Norway)	The objective was to produce a guidance handbook, aimed at giving planners in road offices, transport and communications departments and public transport companies advice on how to best implement differentiated public transport services. Targeted (or differentiated) public transport can be defined as public transport provision which is adapted to the market, i.e. oriented towards a defined market and adapted to the needs of existing and potential users.	N	Y	Y	N
SVI 2001/509	Sustainable development in the field of transport – Criteria and indicators for social aspects	2002-2005	National (Switzerland)	This research study aimed in the first place at improved and complemented sets of criteria and indicators for the social aspects of sustainable development in the field of transport. Different sets of criteria and indicators were developed for different use and levels of application. The resulting criteria and indicators aim at the completion of the criteria covering the social aspects of sustainable transportation.	N	Y	N	N
Air Travel & Venous Thromboembolism	Air Travel & Venous Thromboembolism	2003-2005	National (United Kingdom)	The WRIGHT (World Health Organisation Research Into Global Hazards of Travel) is a multi-centred multi-study project investigating the association between travel and venous thrombo-embolism (VTE), a term which covers deep vein thrombosis (DVT) and/or pulmonary embolism (PE).	N	N	N	Y
Household structure and car ownership	Household structure and car ownership	2004-2004	National (Norway)	The main objective of this study is to investigate to which extent the change in household structure has influenced the stock of cars in Norway, and the use of the cars.	N	Y	Y	N
CDV	Sustained Mobility – a chance for the future	2004-2010	National (Czech Republic)	The Programme of the Centre for Transport Research (CDV) is a representation of evolved transport policy in response to the prevailing condition of modern transport requirements.	N	Y	N	N
Early assessment of trends in transportation planning and road construction (SVI 2000/378)	Early assessment of trends in transportation planning and road construction (SVI 2000/378)	2004-2006	National (Switzerland)	The time required for the planning and realisation of road infrastructure projects has been on the rise for some time. This is due to the marked acceleration of social change, as well as the increasing complexity of political processes. Planning processes have to take into account new social needs emerging at increasingly short intervals. As a result, the lifespan of the road infrastructure regarding operation, equipment and design is increasingly often artificially cut short, which can easily lead to cost-intensive adjustments even for relatively new facilities.	N	Y	N	N

Acronym	Name	Start–End Year	Funded by	Description/Background	TOPIC			
					Safety and Security	Travel Behaviour / Travel Patterns	Socioeconomic issues (including equality and jobs)	Other
Gender and transport (SVI2004/013)	Gender and transport (SVI2004/013)	2005-2007	National (Switzerland)	This preliminary study focuses on gender differences in travel behaviour, choice of means of transport and trip-chaining, what the main causes for these differences are and how changes of family status, job or location can influence travel patterns.	N	Y	N	N
Mobility patterns of retired people: a challenge for the transportation system 2030?	Mobility patterns of retired people: a challenge for the transportation system 2030?	2005-2006	National (Switzerland)	By 2030, the number of retirees and their percentage of the overall population will be much higher than it has ever been before. Compared to today's seniors, the group of future seniors will be better educated, will have more money at their disposal and will enjoy better health. How will these attribute changes affect the mobility patterns of future seniors? How will traffic conditions and the number of accidents be affected? What are the requirements for the future transportation system?	Y	Y	N	N
Leisure Traffic in Urban Areas (SVI 2004/074)	Leisure Traffic in Urban Areas (SVI 2004/074)	2006-2009	National (Switzerland)	Leisure traffic is the most important segment of traffic, showing the highest share of road transport. Moreover, it contributes to high emissions and it is related to high energy consumption. Within research, leisure traffic is perceived as the most difficult segment to be influenced at all. A very detailed understanding of its complex structures is crucial in order to suggest approaches to a sustainable urban traffic system.	N	Y	N	N
Ways2go	Innovation and Technology for Evolving Mobility Needs	2007-2012	National (Austria)	Transport and mobility will remain key prerequisites for a well-functioning society in the future. At the same time, the demand for transport and mobility is significantly determined by developments in society. It is precisely this interweaving of social conditions and individual mobility preferences that confronts developers of future transport systems with major challenges.	N	Y	N	N
Improving Passive Safety of Vehicles (MSM6840770043)	Improving Passive Safety of Vehicles (MSM6840770043)	2007-2013	National (Czech Republic)	The research focuses on legislative field and experimental research related to computing simulation of passive safety of vehicles. The results of the project should enable the assessment of probability and extent of injury of pregnant women and embryos as a result of car accidents. The goal of the research is the introduction of intelligent and adaptive barrier systems in the category of cargo vehicles. Experimenting with car-motorcycle collision on a test polygon proved better potential alternatives.	Y	N	N	N
'Driver Inattention and Distraction' as Cause of Accident: How Do Drivers Behave in Cars?	'Driver Inattention and Distraction' as Cause of Accident: How Do Drivers Behave in Cars? (SVI2007/007)	2008-2012	National (Switzerland)	With an eye to the prevention of accidents that are attributable to the most frequent cause of accidents in Switzerland this research project seeks to determine what categories of 'Driver Inattention & Distraction' should be distinguished, and how frequently these categories occur in Swiss road traffic.	Y	N	N	N

Acronym	Name	Start–End Year	Funded by	Description/Background	TOPIC			
					Safety and Security	Travel Behaviour / Travel Patterns	Socioeconomic issues (including equality and jobs)	Other
Potential of car pooling (ASTRA2008/017)	Potential of car pooling (ASTRA2008/017)	2009-2012	National (Switzerland)	The project combines the simulation tool MATSim-T, which is capable to realistically replicate the mobility behavior in a given area, with RideShare, which is the first software able to automatically match requested routes for car pools. With this approach the amount of possible car pools and their impact on traffic and environment are calculated based on the present mobility behavior in Switzerland.	N	Y	Y	N
Differences in the effects of fuel price and income on private car use in Sweden 1999-2008	Differences in the effects of fuel price and income on private car use in Sweden 1999-2008	2011-2012	National (Sweden)	The objective of this paper is to analyse how the use of privately owned cars in Sweden varies across a number of background parameters including fuel price, disposable income, car purchase cost index, children over 18, employment and the car owners' distance to work. These factors are analysed separately for men and women, individuals living in urban, rural and sparsely populated areas as well as disposable income quartiles.	N	Y	N	N
SoMoMUT	Soft Mode Modeling in Urban Trips	2012-2015	National (Portugal)	SoMoMUT project is a research work financed by the Portuguese Science and Technology Foundation with the aim of defining and creating a new tool for estimating pedestrian and cyclists' indicators in urban areas considering not only time and distance, as has been seen in other pedestrian models, but also including local pollutant inhalation and energy consumption.	N	Y	N	Y
On the Move; Car, rail and bus travel trends in Scotland	On the Move; Car, rail and bus travel trends in Scotland	2012-2013	National (United Kingdom)	The project aims to asses: How much are we travelling as a nation? Who is travelling? What changes have there been over time? What might happen in the future?	N	Y	N	N
DEFAKTOS	New policies and procedures for the training of passenger control personnel	2013-2016	National (Germany)	Facing steadily increasing passenger numbers and ongoing terroristic threats, passenger screening in air traffic is a big challenge. The controls must ensure security at the highest level, meet international requirements and be economically feasible.	N	N	N	Y
Speeding	Speeding	2013-2013	National (Poland)	The opinion of people regarding speeding has been an important base for the Ministry of Transport. The objective of the project was to learn what the general population 15+ thinks about speeding on the road.	Y	N	N	N
The survey of attitudes of Poles in relation to road safety	The survey of attitudes of Poles in relation to road safety	2014-2014	National (Poland)	The objective of the project is to be aware of the opinions and attitudes of Poles on basic and current road safety problems. The survey was provided nationwide, at the random sample of n = 1000, representatives of Poles aged 15 and over. Both the total sample and the created subgroups were based on demographic variables (gender, age, education, occupational status - working / not working, place of residence) and the fact of having or not having a driving license (driver / non-driver).	Y	Y	N	N

Acronym	Name	Start–End Year	Funded by	Description/Background	TOPIC			
					Safety and Security	Travel Behaviour / Travel Patterns	Socioeconomic issues (including equality and jobs)	Other
Men's and women's chances to pass a driving test	Men's and women's chances to pass a driving test	2015 -2015	National (Sweden)	This study shows that there is an inequality in the practical riding test of the motorcycle since men are more likely to pass the test than women. The most obvious difference in test scores is that women perform worse on slow speed manoeuvres than men. One reason for this can be because of women's shorter height and lower body weight. When the speed increases, this is not as important and this is also supported by the fact that women manage the braking test and tests at high speed as well as or better than men. This suggests that the prospects for short women and men are not the same as others who are taller when it comes to their ability to carry out a manoeuvres at a slow speed. One important reason for this is the lack of low seat height motorcycles which can be used during the practical riding test.	N	N	N	Y
The use of seat belts in Poland in 2015	The use of seat belts in Poland in 2015	2015-2015	National (Poland)	The research was aimed at among other things, to collect data on the use of safety seat belts by drivers and passengers of cars.	Y	N	N	N
The use of helmets users of motorcycles, mopeds and bicycles in Poland in 2015	The use of helmets users of motorcycles, mopeds and bicycles in Poland in 2015	2015-2015	National (Poland)	Surveys on the use of helmets by users of motorcycles, mopeds and bicycles were carried out in the period from March, 30 to June, 5 in 2015.	Y	N	N	N
The use of seat belts in Sweden 2015	The use of seat belts in Sweden 2015	2015-2015	National (Sweden)	The objective of the project was to collect information about using of seat belt in Sweden in 2015.	Y	N	N	N
Forecasting intervals for the number of seriously injured in road traffic accidents	Forecasting intervals for the number of seriously injured in road traffic accidents	2015-2016	National (Sweden)	The aim of this study is to present the size of the uncertainty of the forecasts for different subpopulations such as geographical areas, roads user groups, age and gender.	Y	N	N	N
Evaluation of a Swedish alcohol interlock program for drink driving offenders	Evaluation of a Swedish alcohol interlock program for drink driving offenders	2016-2016	National (Sweden)	Several aspects of the alcohol interlock program are evaluated at VTI. This report presents the results of a survey in which 1,100 questionnaires were answered by both participants and non-participants. The response rate was 45 percent of the participants in the interlock program and 28 percent of the non-participants. The average age of the respondents was just over 50 years, with marginal differences between participants and non-participants. The proportion of women among the respondents in the program was 13 percent, compared to 20 percent of the respondents without alcolock.	Y	N	N	N

Acronym	Name	Start–End Year	Funded by	Description/Background	TOPIC			
					Safety and Security	Travel Behaviour / Travel Patterns	Socioeconomic issues (including equality and jobs)	Other
Innovation partnership programmes – mobilising new ways to meet societal challenges	Innovation partnership programmes – mobilising new ways to meet societal challenges	2016-2018	National (Sweden)	The Government is launching five innovation partnership programmes to help meet a range of the societal challenges that Sweden is facing. These programmes involve new ways of travelling, residing, doing business, living, communicating, and using and preserving the world's resources and ecosystems. Partnership between public actors, business and academia creates new, innovative solutions that strengthen competitiveness, contribute to sustainable development and create more jobs.	N	Y	N	N

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